

1980/3. Investigation of a proposed lawn cemetery site at Old Beach

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Abstract

The site of a proposed lawn cemetery at Old Beach has two distinct regions. The western half, around Thistly Gully, is an area of low relief with a rounded mature landscape underlain by mudstone. The eastern half is an area of high relief with a harsh cliffed landscape, bordering on Gunners Quoin and Mt Direction and the upper Risdon Brook valley; this section comprises dolerite sills underlain by thick quartzose sandstone benches, the latter frequently covered by dolerite talus deposits. This section is considered unsuitable for development as a cemetery site because of the lack of soil cover, difficulty of digging in such rocks and the type of country.

The eastern half around Thistly Gully, although a more suitable type of landscape, has a lack of soil cover and material suitable for digging graves on the ridges and higher slopes of the valley sides. Tunnel and gully erosion also occur. Subsurface investigation by auger drilling was confined to the valley floor and lower valley slopes of Thistly Gully. From the reconnaissance auger drilling, the area with a depth of cover suitable for digging by a back-hoe appears to be 1% of the total area of the site. The presence of clay soil and an underlying clay horizon will give drainage problems, as well as problems with excavation when the clay becomes wet. The water table, though localised to the valley floor, is shallow at the rock and clay interface.

LOCATION

The site of a proposed lawn cemetery at Old Beach extends from 3.5 km south-east of Old Beach Back Road from close to the junction of this road with the East Derwent Highway [EN240638] (fig. 1). The 225 ha site covers all the area known as Thistly Gully and extends south-east over the divide between Mount Direction and Gunners Quoin into the cliffed upper valley of Risdon Brook and Quoin Gully.

LANDFORM AND RELIEF

The western half of the proposed site, comprising Thistly Gully, is drained by two ephemeral streams. The northernmost of these streams drains into Cassidys Bay, while the southern stream joins the River Derwent by a narrow alluvial filled valley between sandstone cliffs that border the East Derwent Highway. Thistly Gully is formed by the middle and upper sections of these two streams behind the sandstone cliffs. The gully is a north-west south-east elongate shallow basin; its slopes are gentle and the relief is low, with a rounded mature landscape.

In contrast the eastern half of the cemetery site has a high relief and harsh landscape, with many cliffs.

GEOLOGY

The geology of the eastern area is dominated by the thick upper dolerite sills that form the high, flat ridges of Gunners Quoin and Mount Direction. A lower dolerite sill separated from the upper sills by a thin sandstone horizon forms the dolerite of the divide between Gunners Quoin

and Mount Direction and the dolerite that crops out in the upper Risdon Brook area. The lower dolerite overlies a sequence of thick quartz sandstone of Triassic age. The sandstone is coarsely bedded with thick sandstone beds separated by the thin micaceous mudstone beds.

The thick sandstone is mantled by dolerite talus deposits; these are composed of a mixture of dolerite blocks, boulders and cobbles, with a small percentage of soil and fine gravel separating the blocks. The thickness of the talus deposits is variable and these overly most of the benches of the sandstone. The lower dolerite contact and the sandstone are seldom exposed because of the talus. Only occasionally does the sandstone crop out, as near the H.E.C. transmission line below Madmans Hill (fig. 1).

Bedded brown micaceous mudstone forms a thick sequence below the upper sandstone. The mudstone weathers to form a soft yellow mudstone and clay, which is overlain by a dark brown and clayey loam soil. The soil and yellow clay above the mudstone bedrock is frequently seen in the shallow incised streams of Thistly Gully and averages 1.2 - 1.5 m thick. Softer thin sandstone beds are present in this dominantly mudstone sequence. It is thought that because the mudstone is the dominant rock type in the Thistly Gully area, differential erosion of the softer mudstone has occurred, forming the gully and leaving the harder sandstone as ridges around the periphery. It is the distribution of mudstone below the sandstone and dolerite succession that forms the contrasting landscape between the eastern and western half of the cemetery site.

SUITABILITY OF AREA FOR A CEMETERY

The dolerite, dolerite talus and thick quartz sandstone in the eastern half of the site would be very difficult to excavate with a back-hoe to the depth required for graves. All of these three rock types are too hard and lack any depth of soil cover.

On the western half of the site, flat sandstone crops out along the ridges bordering Thistly Gully. In the upper reaches of the two streams, tunnel erosion and gully erosion are prevalent. Outcrops of micaceous mudstone with thin sandstone beds occur in these incised shallow stream courses. The cover of clay and soil above the band of yellow mudstone is 1 - 1.5 m thick. This depth of cover is inadequate for graves. Therefore, the area of potential suitability for the cemetery must be confined to the floor of the valley below these micaceous mudstone outcrops (fig. 1).

SUBSURFACE INVESTIGATION, THISTLY GULLY

The subsurface investigation was confined to the lower slopes and the narrow valley floor of the two streams. Thirteen holes were drilled; the locations and depths to the weathered micaceous mudstone are given on Figure 1. The lithological logs of these holes are given in Appendix 1.

In Holes 9 and 10 the drill hit rock close to surface at depths of less than one metre. A depth of 3.3 metres was reached in Hole 8, but the 3.0 m isopach does not include this hole because the drill apparently ran down a weathered vertical joint, and the depth reached was not a true overall indication of the depth to bedrock at this locality.

Thickness of cover

If the depth of cover required for a cemetery is in excess of three metres, the isopachs drawn from the drilling results show that this thick-

ness of cover is confined to two small areas in the middle reaches of the two stream valley-floors, a total area of 2.5 ha or approximately 1% of the total site. If a depth of 2.5 m is considered an adequate cover for a lawn cemetery, the area is increased to 12.5 ha or approximately 5.5% of the total area.

It is likely that the auger drill used would penetrate deeper than a back-hoe, the auger tending to wind down weathered joints into the underlying mudstone, whereas the bucket of a back-hoe tends to bounce across the top of an uneven weathering profile between the clay and the mudstone. Consequently, the depths shown as isopachs from drilling should be checked by some trial trenching with a back-hoe.

Groundwater and drainage

All the holes were dry except Hole 1, which is situated in a dried up lagoon area in the lower section of the northern stream. Water was struck in this hole at 1.8 m and rose after six hours to 1.65 m. The water flow was at the interface between the clay and the weathered mudstone.

Thistly Gully is in a rain shadow area and very low water tables could be anticipated at the time of investigation because of the prolonged drought in south-east Tasmania. In a year of normal rainfall, particularly in winter, a small amount of groundwater is likely to accumulate at this interface between the bedrock and overlying clay and clayey soil. These surface layers are almost impervious to water infiltrating from the ground surface, but water would infiltrate into this zone in the valley floor from exposures of mudstone in the shallow stream beds higher up the valley.

With the continued watering necessary for a lawn cemetery and the existence of a clayey soil underlain by a thick clay, surface drainage would be a problem in summer.

Excavation problems

The sequence drilled in all the auger holes was a black organic clay-loam soil of a variable thickness. This soil layer was underlain by a clay layer of a grey-brown clay subsoil which changes to a yellow clay then deeply weathered yellow mudstone. This weathered mudstone is soft and forms a transition zone to the hard yellow weathered mudstone rock which overlies the brown micaceous unweathered mudstone. The hard yellow mudstone forms the rock layer and could not be drilled to any great depth with the auger. Outcrops of this yellow mudstone occur in the drains at the sides of tracks and in the stream beds. Some small sandstone pebbles and mudstone fragments were encountered in the clay.

All of these materials, the soil, clay and deeply weathered mudstone, could be excavated by a back-hoe with little difficulty when dry. When wet, the clay and clay soil would be very sticky and difficult to dig. The walls of the trenches below the soil layer should stand vertically, particularly when dry.

Some large sandstone boulders were encountered close to the surface near Holes 5, 6 and 7. Several locations had to be drilled before the auger could penetrate below a metre in depth. These sites are close to the old road to the Ravensbourne ruins and barn, and the boulders were thought to be sandstone flags used originally in the construction of this road and buildings which have since become buried.

CONCLUSIONS

The site is considered unsuitable for a cemetery site because the area with a suitable depth of cover for graves is very restricted, totalling about 1% of the total site area. The eastern half of the site is one of high relief and underlain by dolerite and hard quartzose sandstone covered with dolerite talus, all of which are unsuitable for digging of graves. The western half, the lower relief area, known as Thistly Gully, is underlain by mudstone and is the area in which subsurface investigation was carried out. The following conclusions apply.

- (1) The clay subsoil is likely to give drainage problems in the lower levels of the site by the presence of groundwater at the interface of the clay and rock.
- (2) The clay soil and subsoil when wet is likely to be very sticky and difficult to dig.
- (3) Any excavation, particularly an open grave, collecting surface water from rain or irrigation will be difficult to drain, probably requiring pumping.
- (4) On the higher slopes tunnelling and gully erosion are likely to provide a further problem.

[8 February 1980]

APPENDIX 1

Lithological logs of auger holes, Thistly Gully

Hole 1

Depth 2.9 m
 Black organic clay (upper layer))
 Dark grey organic clay (middle layer)) swamp deposits
 Brown sandy clay (lower layer)
 small sandstone pebbles 1 - 3 mm
 Angular pebbles of brown sandstone
 Sandstone - 2.7 m

Hole 2

Depth 2.7 m
 Dark brown organic clay soil and clay (upper layer)
 Light brown clay with mudstone fragments (lower layer)
 Mudstone - 2.7 m

Hole 3

Depth 1.85 m
 Brown clayey soil (upper layer)
 Yellow clay and mudstone (lower layer)
 Mudstone - 1.85 m

Hole 4

Depth 1.5 m
 Dark brown clayey soil
 Yellow clay
 Hard mudstone - 1.5 m

Hole 5

Depth 2.9 m
 Dark grey organic clay
 Yellow clay
 Hard mudstone - 2.9 m

Hole 6

Depth 3.3 m
 0 - 0.7 m Dark grey clayey soil
 0.7 - 1.5 m Black organic clay
 1.5 - 3.0 m Yellow clay
 3.0 - 3.3 m Hard yellow mudstone

Hole 7

Depth 2.1 m
 0 - 1 m Dark grey clayey soil and grey brown clay subsoil
 1 - 2 m Yellow clay
 2 - 2.1 m Hard mudstone

Appendix 1 (continued)

Hole 8

Depth 3.2 m
 0 - 0.5 m Dark grey organic clay soil
 0.5 - 1.5 m Grey brown clay
 1.5 - 3.1 m Yellow clay and soft mudstone
 3.1 - 3.2 m Mudstone

Hole 9

Depth 0.6 m
 0 - 0.5 m Clay soil
 0.5 - 0.6 Yellow mudstone

Hole 10

Depth 0.7 m
 0 - 0.5 m Clay soil
 0.5 - 0.7 m Yellow mudstone

Hole 11

Depth 2.3 m
 Dark grey organic clay soil
 Yellow clay
 Mudstone - 2.3 m

Hole 12

Depth 3.5 m
 0 - 1 m Black organic clay soil
 1 - 2 m Yellow brown clay
 2 - 3.4 m Yellow clay and soft mudstone
 3.4 - 3.5 m Hard mudstone

Hole 13

Depth 2.3 m
 0 - 1 m Brown clay soil
 1 - 2.2 m Red brown clay
 2.2 - 2.3 m Mudstone?

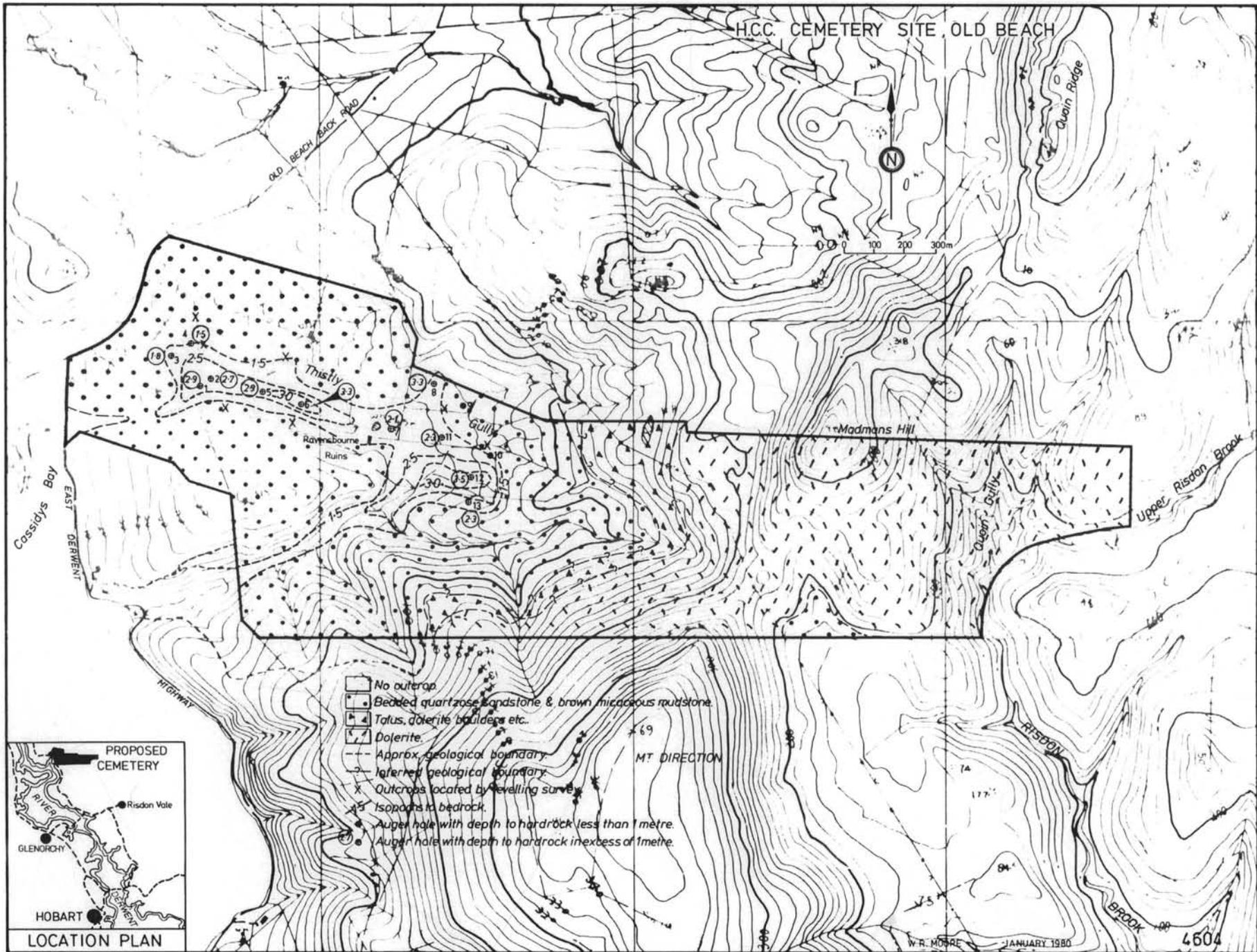


Figure 1. Proposed cemetery site, Old Beach.