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## ARCHAEOLOGY IN NEW ZEALAND



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## **James McDonald and his Kilns North Otago**

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### **Introduction**

Archaeology is the study of people in the past through the things they left behind. Often this is limited to a rubbish pit, a filled-in latrine, a toy boat found under a house, or a mention in an old newspaper. With industrial archaeology, these things left behind are sometimes very large indeed, a bridge, factory site, or a railway, and they often tell the story of more than one person. Tucked into the side of a limestone outcrop just to the east of the historic Totara Estate in North Otago is a cylinder of roughly shaped limestone blocks with the remains of limestone walls on either side and more blocks scattered down the hillside. At Sandymount on the Otago Peninsula are other limestone cylinders. One in particular stands out. It is an imposing structure of squared limestone blocks laid to course, with an arched opening at its base and a smaller opening above this. The cylinder sits above a complex of squared limestone block walls. These are lime kilns and they bookend a rather large story, that of James McDonald the founder of the Milburn Cement works and probably the leading figure in the production of industrial and agricultural lime in nineteenth century New Zealand.

### **James McDonald**

Born in Belhelvie, Scotland in July 1837, James McDonald trained as a stonemason before sailing with his wife and family from Glasgow to Dunedin in 1860. Originally securing work as a stone mason, McDonald became interested in the possibility of producing industrial lime on the Otago Peninsula (McDonald n.d.). After initial investigation, the Peninsula limestone was judged to be of good quality and McDonald constructed his first lime burning kiln (I44/85) in partnership with Walter Riddell at Sandymount in 1865 (Thornton 1982). A second kiln, larger and of better construction (I44/84) was built soon after, when it became apparent that the local limestone was of good quality for industrial lime, particularly lime mortar. Three kilns were eventually constructed, all of which are recorded archaeological sites on the New Zealand Archaeological Association Site Recording Scheme: I44/83, I44/84, and I44/85 (ArchSite).

While the local limestone was of good quality, transporting the processed product to the railhead and port from these sites was a problem (McDonald, undated). To

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this end McDonald tried to obtain government assistance to construct a railway line and when this was not forthcoming he moved his main base of operations to Milburn, where he established the Milburn Lime and Cement Company. Rather than try and seek government assistance to establish his new works, McDonald borrowed heavily to set up the operation and construct a private railway line to Milburn Station (*Otago Witness*, 18 March 1887).

McDonald moved his family back to Dunedin in 1886 and established a store on the corner of Vogel and Cumberland Streets, which he operated, along with his other established works at Milburn, Pelichet Bay and Walton Park, Green Island. Unfortunately borrowing money during the depression of the 1880s was a risky undertaking. McDonald's creditors grew impatient for a return on their investment and he was declared bankrupt in May 1888, losing everything (*Otago Witness* 13 July 1888, *Otago Daily Times* 15 July 1891). This was a bad time for James McDonald, seeing him serve a week in prison for using obscene language in public, the result of having seen one of his former creditors in the street and uttering a few choice words in his direction (*Otago Witness* 13 February 1890). He also suffered an episode of ill health in 1891, which led to the abandonment an inquiry into the settlement of the bankruptcy proceedings against him (*Otago Daily Times* 15 July 1891).

In the mid-1890s James McDonald and family moved to Totara in North Otago. It is unclear exactly when he constructed his lime burning kiln (known as McDonalds First Lime Kiln, NZAA ArchSite J41/218) on the site at Section 74 Block V Oamaru District, but it appears to have been prior to 1900. His presence in the province is first noted in a newspaper article in 1895, which notes the passing of one of his daughters (*Otago Daily Times* 1 April 1895). McDonald is described as "of the Lime Kilns, Oamaru," indicating that he was already producing agricultural lime at this time. A tramway was established to transport the processed stone to the Whitecraig Railway siding (NZAA ArchSite J41/241, Siding J41/242).

James McDonald suffered a stroke on 9 March 1900 and passed away on 12 March 1900 (*Oamaru Mail* 13 March 1900). Somewhat unusually for the time, James's daughter Sophia took up the reigns of the family business and established industrial lime kilns at Flat top Hill in 1902 (NZAA ArchSite J41/203). Sophia oversaw the construction of a private railway from the lime kilns at Flat top hill to the siding at Whitecraig (*Oamaru Mail* 21 July 1911). A new lime works was established at Kakanui in 1924, and the private tramline was extended to this new site (*New Zealand Railway Observer* No. 294, April/May 2009).

## The Kilns

Lime kilns are constructed for the purpose of burning raw limestone to produce calcinated lime powder used in agriculture or construction (Thornton 1982). Kilns are usually cylindrical with an entrance at the base for the firebox and to remove the burnt lime. The basic process involves raw limestone being tipped into the top of the kiln, burnt, sometimes in a stack with timber in between layers, and then removed via the entrance at the base of the kiln. Agricultural lime is used to sweeten soil, while industrial lime is of a higher quality than agricultural lime and is used in mortar for brick and masonry construction. The best limestone for either purpose is called McDonald limestone, after James McDonald, and “consists of a hard, massive, finely granular to semi-crystalline, creamy white aggregate of calcareous organic remains” (Gage 1957).

The lime kilns considered here mark the beginning and end of James McDonald’s involvement in lime processing. The kilns at Sandymount were constructed between 1865 and 1880 and produced industrial lime for construction. The later kiln constructed at Totara in ca.1895 produced agricultural lime.

### Sandymount Kilns (I44/83, I44/84, I44/85)

The first kiln built by James McDonald at Sandymount (Figure 1) was constructed of local volcanic stone, some of which was squared and some of which was rubble (unfinished unshaped stone blocks) set in lime mortar (ArchSite, I44/85). It has been built into the hillside and the structure can be divided into three main chambers: the charging bowl, firebox and drawing eye. The charging bowl is the cylinder that sits atop the main body of the kiln and where the raw limestone was dumped into the kiln. This section of the structure also functions as a chimney, releasing the smoke and gases produced from the lime burning process. The rest of the kiln is comprised of the fire box, where the fuel was burnt and the drawing box which makes up the base of the structure and from which the burnt lime was removed after firing.

As noted above the second lime kiln (Figure 2) built by James McDonald circa 1865 at Sandymount on the Otago Peninsula is an imposing structure, imposing enough to feature on the front of Geoffrey Thornton’s book *New Zealand’s Industrial Heritage* (Thornton 1982). The kiln has been built into the side of a hill facing east. The approximate height of the kiln is 5.85m, and the length is 5.37m however, much of it has been built into the hillside and is below the ground surface.

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*Figure 1. The first limekiln at Sandymount on the Otago Peninsula (site I44/85).*



*Figure 2. The second limekiln at Sandymount (site I44/84).*

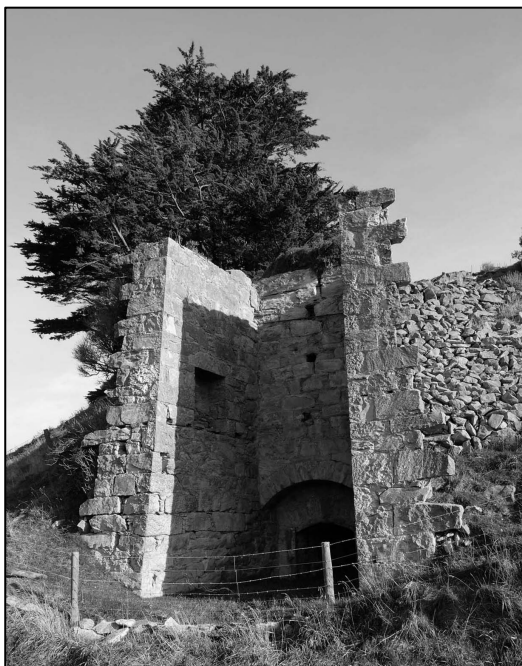
### *Mitchell - Limekilns*

The charging bowl on top of the structure is a large cylindrical drum (approximately 2m diameter) is, where the limestone ‘charge’ was loaded in layers for burning. As the top of the charging bowl is separated from the quarry on the hillside there was originally a wooden bridge connecting the two. The charging bowl is clad in large limestone blocks laid using squared limestone and volcanic tuff blocks laid to course. Firebricks line the interior of the charging bowl and the firebox. The drawing eye compartment entryway is approximately 1.58m high and the entryway is 1.5m wide. The external stonework sides and base masonry are laid using the random rubble technique. Cut limestone blockwork with roughly hewn faces forms the archway over this entrance and is largely complete. The inner western wall of the drawing eye compartment, as well as the drawing eye chute, are made from bricks.

The interior of the firebox exhibits a mixture of stone and brick masonry. The lower courses of the northern and southern walls (which remain) are brick with the higher courses using larger dressed limestone blocks. A sprung arch made from firebricks forms the entrance to this chamber. Along the western inner wall of this chamber are three stoke holes with brick arch surrounds. The central stoke hole is open and the two holes either side look to have been sealed. This kiln was modified slightly in 1890 after The Milburn Lime and Cement Company had taken over McDonalds operation at Sandymount (Middleton 2008).

The third kiln (Figure 3) associated with James McDonald (144/83), located beside Sandymount Road, was of a slightly different design with a flat wall of dressed stone at the front of the charging bowl with wing walls at right angles forming an open square with the firebox at the base of this.

*Figure 3. The third (top) limekiln at Sandymount (site 144/85).*



**Totara (J41/218)**

Built in 1895 the agricultural lime kiln at Totara, like the kilns at Sandymount, was located adjacent to a source of McDonald limestone, in this case on a small hill at 519 Fortification Road, Alma (Figure 4) (Mitchell 2020). Unlike at Sandymount, this kiln is close to a railway line making transportation of the finished product to market considerably less problematic.

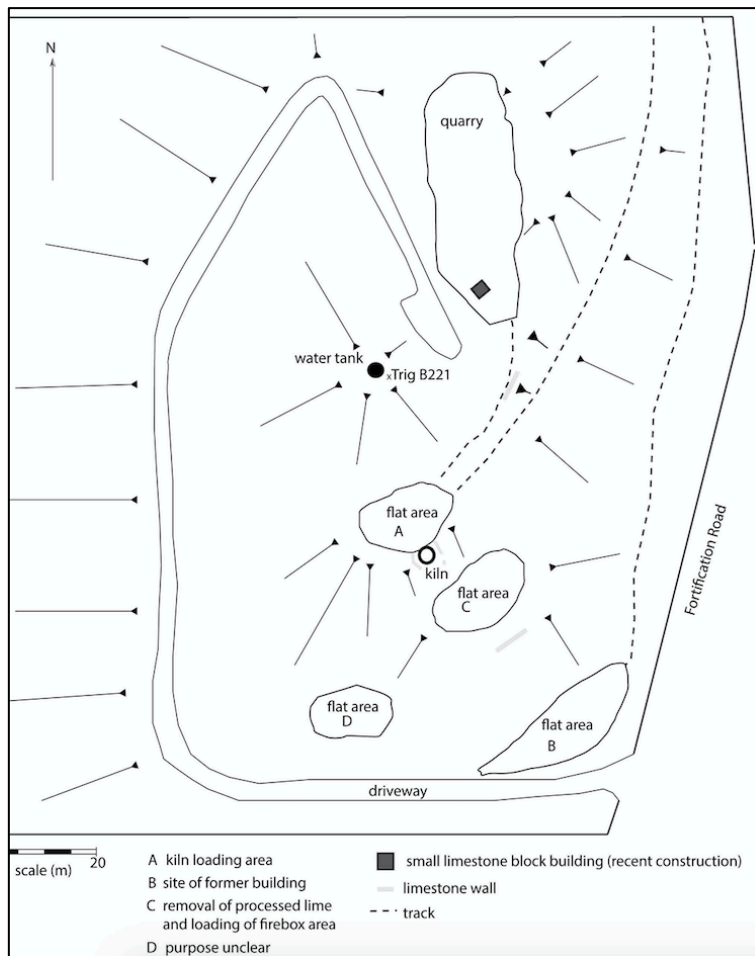


Figure 4. Site plan of limestone quarry and kiln at Totara (site J41/218).

### *Mitchell - Limekilns*

The kiln at 519 Fortification Road was probably originally surrounded by square masonry walls (Figure 5). What remains (Figure 6) consists of a conical tower that rises three metres from the side of the hill and has an internal diameter of 1.7 m (5 feet 7 inches). The exterior is of randomly laid limestone rubble, and there are the remains of wing walls, also of limestone rubble, on either side. The interior of the kiln is lined with fire bricks, with a layer of ordinary bricks outside this. The lower portion of the tower with its firebox and drawing eye buried in the hillside, probably due to land slippage. The top of the charging bowl is level with a flat area on the east face of the hill. This enabled the raw limestone chunks to be tipped into the kiln for burning without having to construct a bridge between the hillside and the top of the charging bowl.



*Figure 5. Detail of historic image showing McDonald's lime kiln on Fortification Road, looking southwest (Image Waitaki District Archives 4022p).*

There is a repair done in brick on the exterior of the kiln that appears to date to the early twentieth century (Figure 7). This lime kiln is one of the few which has not been filled in and has an interior depth of six metres. The interior appears to have been relined at some stage, probably at the time of the repair to the exterior. There is some debris at the base of the interior and the curved base of the firebox is not visible.



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*Figure 6. McDonalds lime kiln on Fortification Road, looking west.*



*Figure 7. Brick repair in the Fortification Road limekiln.*

## *Mitchell - Limekilns*

The entrance to the firebox is not visible and this kiln appears to lack a drawing eye. It is most likely that these are not visible from the exterior due to the collapse of the walls around the kiln and associated land slippage. There are no openings apparent on the inside of the kiln, which may be due to the interior base being filled with soil and debris.

The path of the track to and from the kiln is visible and there are various flat spots and remains of limestone walls associated with the site. The quarry from which the lime was obtained lies at the top of the hill (Figure 4).

### **To Compare**

As noted above the lime kilns at Sandymount and Totara bookend the contribution of James McDonald to the processing of industrial and agricultural lime in New Zealand. Of the three Sandymount kilns constructed by McDonald the second I44/84, is a statement of intent as well as showcasing McDonald's skills as a stonemason and producer of quality industrial lime. Although ideally situated for obtaining raw materials, transportation of the finished product hamstrung the kilns at the Sandymount site from the start. The unwillingness of the government of the time to contribute to a railway from Sandymount to the port or railhead spurred McDonald to purchase the works at Milburn and fund the construction of the transport infrastructure himself. This was an admirable intention, but the depression of the 1880s made paying back his creditors difficult and they proved an impatient bunch. This resulted in bankruptcy, imprisonment, and ill health. Ruin if you like.

James McDonald moved north to Totara for health reasons and probably to start again, as the area abounds in the hard limestone full of organic remains that is named after him (there are 13 lime kilns in the area around Oamaru). Even with its original square stone surround walls the kiln at 519 Fortification Road was a humble structure, built for purpose, with no thought of display. It was self-contained and close to the railway line the ideal spot for a new start. Unfortunately, James McDonald passed away before the new enterprise really became established. His daughter Sophia, having inherited her father's tenacity and drive as well as learning his craft, expanded and ran the business well into the twentieth century.

The archaeology of James McDonald's contribution to New Zealand's industrial heritage extends far beyond the sites presented here, most notably in and around Dunedin and South Otago. They do however neatly bookend his career. The

imposing structures at Sandymount announcing his arrival and intent and the more modest Totara site, built purely to do a job, but do it well.

## **Acknowledgements**

The author would like to thank Vicky Pringle and Grant Farrell, the owners of the property at 519 Fortification Rd for permission to publish details of the site. Carl Murray and Peter Petchey for providing information regarding the Sandymount kilns. Oamaru historian Bruce Comfort for information regarding James McDonald and lime kilns in the North Otago area, and the Archives of the Waitaki District Council for assistance and images.

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