Limestone Millstones
at Kurrajong, NSW

—

linked with
Norfolk Island's First Settlement

By Anne and Les Dollin

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Images on front cover:

Left, the two Calcarenite Limestone millstones on display at Kurrajong, NSW. Photograph by Anne Dollin.

Upper right, convicts in chains cutting Calcarenite Limestone on Norfolk Island. A painting by 'J.L.' in Jones, Robert (1823) Recollections of 13 years residence in Norfolk Island and Van Dieman's land. Manuscript, State Library of NSW.

Lower right, the First Settlement on Norfolk Island in 1790. Painting by George Raper, Natural History Museum, London.

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Chapter 1
Kurrajong's Millstones are made of Limestone!

1.1 A long-hidden secret

In late 2024, we discovered that two old millstones from the Singleton Family Watermills at Kurrajong, New South Wales, held a long-hidden secret.

Above, Les Dollin with the display of old millstones from the Singleton Family watermills in Kurrajong, NSW. Photograph by Anne Dollin.

These two 1.22m (4 feet) diameter millstones are currently displayed in Memorial Park in Kurrajong, 70 km northwest of Sydney in New South Wales (NSW), Australia. In about 1920, decades after the Kurrajong watermills had closed down, these stones were rediscovered by road workers at Kurrajong, and fortunately they were preserved as a rare part of the early history of Kurrajong.

We examined these two millstones closely, using specialised macro equipment. We also did some standard geological tests that did not harm the stones.

To our amazement, we discovered that both of these historic millstones were made out of Limestone from a prehistoric coral reef!

Each millstone is made of millions of tiny (about 1 mm long) grains of limestone. A very thin coating of calcite surrounds each grain and fuses them into a loose network. The stone's microscopic texture looks rather like a bowl of Rice Bubbles:

Left: The grain structure of one of the millstones from the Singleton Family watermills at Kurrajong. Most grains are 1 mm or less long. A thin white coating (see arrows) surrounds each grain. Inside most grains is a fragment of shell or coral from an ancient coral reef. Photograph by Anne Dollin.

Dr Anne Dollin has been an independent researcher since 1999. She previously worked for the CSIRO and then for CAPRAL Aluminium for 16 years, specialising in light and electron microscopy.

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We saw many fragments of fossilised shells and coral inside the grains from the Kurrajong millstones (read more in Chapter 2). These fossils were many thousands of years old. **This special type of stone is called 'Calcarenite Limestone'**.[A]

Left, detail of grains from one of the Kurrajong millstones. One grain contains a fragment of a shell (left) and another contains some coral.

These fragments turned into fossils, many thousands of years ago!

Photograph by Anne Dollin.

1.2 The mystery deepens!

It is extremely rare to make millstones from this kind of stone!

How could millstones, that were made out of limestone from an ancient coral reef, have ended up being used in the watermills at Kurrajong? We explored widely to find possible answers...

The most likely solution was that these millstones were made in Norfolk Island during its earliest Colonial history!

A. Calcarenite Limestone. This is a soft sedimentary rock composed of tiny pieces of shells, coral, and older limestones. These may have built up into a dune, beach, or sand bar, then, over long periods of time, been consolidated down into rock.

Chapter 2
Kurrajong's Millstones probably came from Norfolk Island

Our research indicates that the two Calcarenite Limestone millstones on display at Kurrajong Memorial Park were probably quarried at Norfolk Island during its First Colonial Settlement period, before 1814.

There are four key reasons for our conclusion:

2.1 ....Norfolk Island is most likely source of the millstones, historically.
2.2 ....Calcarenite millstones were quarried and used on Norfolk Island until 1814.
2.3 ....Norfolk Island Calcarenite millstones were exported to Sydney in 1805.
2.4 ....The Kurrajong millstone grain structure closely resembles a Norfolk Island limestone called Massive Calcarenite.

Read more in the Sections 2.1 to 2.4, below.

2.1. Norfolk Island is the most likely source of the millstones, historically

Where did Kurrajong's Calcarenite millstones come from originally? We explored five possibilities:

– From the United Kingdom?
– From Cape Town?
– Quarried in the Sydney area?
– Quarried elsewhere in Australia (our Colonial Millstones)?
– From Australia's outpost settlement at Norfolk Island?

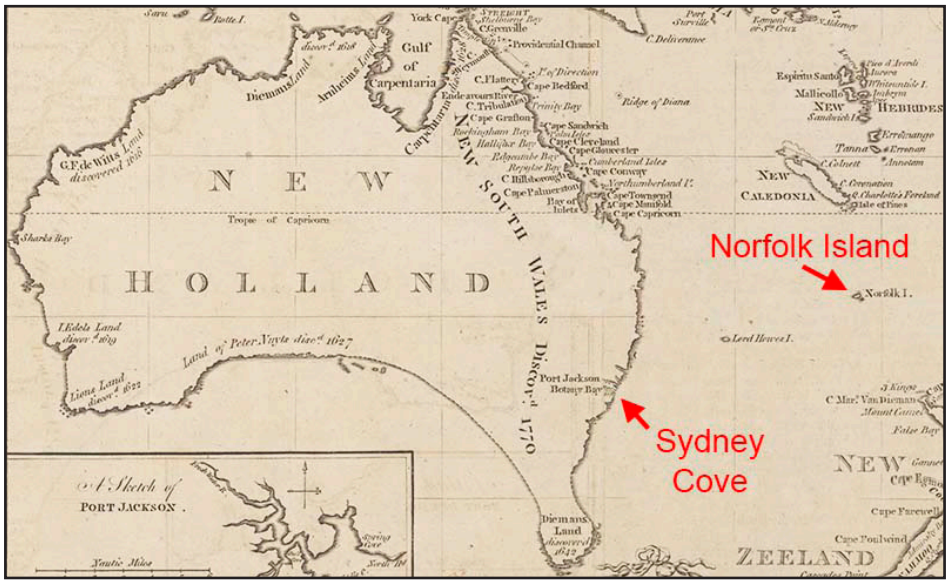
Read our full discussion of these five options in the Appendix.

The most likely and most intriguing possibility was that these stones were manufactured on Norfolk Island during its early colonial history in the late 1700s and early 1800s.

2.2. Calcarenite millstones were quarried and used on Norfolk Island, 1794 – 1814

2.2.1. The First British Settlement of Norfolk Island in 1788

Norfolk Island lies 1680 km northeast of Sydney, NSW, across the Pacific Ocean.



Right, a map, ca. 1790, showing the known coastline of Australia (then called 'New Holland'), as well as the position of the new British colony at Sydney Cove in Port Jackson. Norfolk Island is also shown, 1,680 km from Sydney across the Pacific Ocean.

Adapted from a map entitled 'New Holland & the adjacent islands, agreeable to the latest discoveries', National Library of Australia.

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Just a few weeks after Britain established their penal colony at Sydney Cove, NSW, in 1788, Lieutenant Philip Gidley King was sent out to Norfolk Island, with seven free settlers and 15 convicts, to begin an outpost settlement there. They had been sent to this extremely isolated place to develop the island's resources of timber and flax, and to grow food for the colony in Sydney.

The population of Norfolk Island grew to 1156 people by 1792, as ship after ship brought more convicts there from the parent colony at Sydney Cove. There was an urgent need to build large scale flour mills on Norfolk Island to feed this growing population.

2.2.2. Norfolk Island Calcarenite millstones

By 1791, the settlers had realised that a huge deposit of Calcarenite Limestone on the southern shore of Norfolk Island could be a valuable building material.[1]

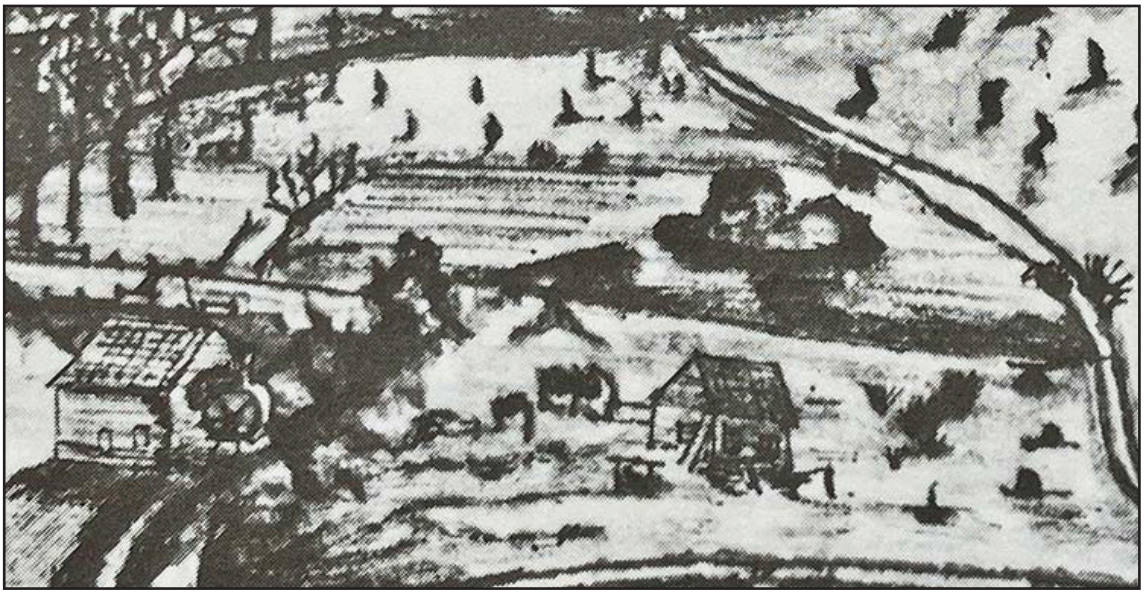
Left, a rare painting of convicts in chains cutting Calcarenite Limestone, during the First Norfolk Island Settlement period. A guard in military uniform watches them (lower right).

A painting, dated 1823, by 'J.L.' in a manuscript by Robert Jones, a gaoler during the First Settlement of Norfolk Island. [2] State Library of NSW.

Then in 1794, the settlement's resourceful stone mason tested this material for making millstones for flour mills, and he found that it worked very well. (See also Chapter 3: Where could the millstones have been quarried?).

2.2.3. Calcarenite millstones were used in Norfolk Island mills for twenty years

From 1794 until the end of the First Settlement in 1814, at least six full-scale flour mills were built on Norfolk Island. Calcarenite millstones, quarried locally on the island, were successfully used in all these mills for those 20 years.



Left, a drawing of the First Settlement watermill (far left) that was built on Norfolk Island. It was constructed from timber in Arthur's Vale by Nathaniel Lucas, in 1795. For a detailed description of this mill, visit our Flour Mills of the Norfolk Island First Settlement webpage.

Detail from: 'View of the Water Mill in Arthur's Vale, Norfolk Island', by William Neate Chapman. State Library of NSW.

Find out more at: www.singletonmills.com

The convict, Nathaniel Lucas, was involved in the establishment of most of the flour mills on Norfolk Island during the First Settlement. Lucas was a talented carpenter who learned to become a skilled millwright over his many years of building mills on Norfolk Island.

2.3. Norfolk Island Calcarenite millstones were exported to Sydney in 1805

In 1805, **Nathaniel Lucas** and his family sailed to Sydney on the Investigator, because the Norfolk Island settlement was being disbanded. An 1805 newspaper records that Lucas took a number of Norfolk Island millstones with him to Sydney:

'He brought also several pair of capital mill-stones, those of Norfolk being allowed superior in point of durability to any that can be procured here [in Sydney]'. [3] A copy of this article is shown on the right.

'Mr. Nathaniel Lucas, formerly ſuperintendant at Norfolk Island, came paſſenger in the Inveſtigator; and obtained permiſſion to bring with his other property moſt of the wood-work for a vind-mill, which will probably be erected at Farm Cove. He brought alſo ſeveral pair of capital mill-ſtones, thoſe of Norfolk being allowed ſuperior in point of durability to any that can be procured here.

The sets of Norfolk Island millstones that were brought to Sydney by Lucas are the only ones for which we have found clear documentary evidence. However, it is possible, given the scarcity of millstones in Sydney at that time, that other Calcarenite millstones were exported to Sydney from Norfolk Island during the First Settlement.

Soon after Lucas arrived in Sydney, he built two windmills in the Sydney Cove area. A newspaper report indicates that millstones, 'which are the best that could be procured at Norfolk Island', were used in at least one of these mills. [4]

Left, this magnificent, early painting provides a rare view of the Smock-style Windmill (left) built by Nathaniel Lucas near Sydney Cove. Norfolk Island Calcarenite Limestone millstones were used in this windmill.

Detail from a painting by Major James Taylor in ca. 1819–1821, 'Parramatta River Sydney Harbour', State Library of NSW.

Norfolk Island millstones later became available to the Sydney public. For example, advertisements for their sale appeared in Sydney newspapers in 1806 and 1817. [5]

An 1813 account mentions that limestone rock was also exported from Norfolk Island to Sydney as ship ballast. Whether this limestone was simply used to produce lime for mortar in Sydney, or was used for other purposes, was not recorded:

'This island, [Norfolk Island] moreover, produces an article which we have before mentioned as much wanted at Port Jackson, limestone of a most excellent quality. The vessels from Port Jackson not unfrequently return thither with this as their ballast.' [6]

In conclusion, the above historical evidence shows that Calcarenite Limestone millstones were manufactured on Norfolk Island between 1794 and 1814, and that some of these Norfolk Island millstones were brought to Sydney, used in flour mills there, and advertised to the public for sale. Therefore, based on the historical records, the Calcarenite Limestone millstones at Kurrajong could have come from this source on Norfolk Island.

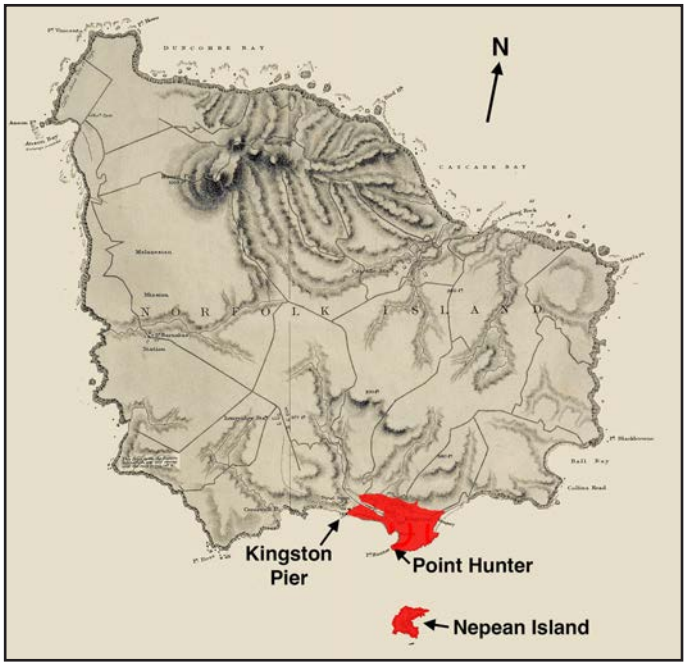
A high magnification study that we conducted on the grain structure of the Kurrajong Calcarenite millstones (see Section 2.4.3., below) strengthens this conclusion.

2.4. The Kurrajong millstone grain structure closely resembles the Norfolk Island limestone called Massive Calcarenite

2.4.1 Geological History of Norfolk Island

Norfolk Island formed during a series of massive underwater volcanic eruptions, about 2 to 3 million years ago. Then, during the last Ice Age, the sea level around Norfolk Island fell by about 100 metres. Coral reefs grew in shallow water on the southern side of the island.

Over time, the coral eroded and, many thousands of years ago, wind deposited dunes of coral fragments on the shore of Norfolk Island. These dunes gradually compacted down to form a broad deposit of Calcarenite Limestone on the southern shore of Norfolk Island.[7]



Right, a map of Norfolk Island drawn in 1855. The areas where Calcarenite Limestone, and closely-related calcareous sand, are found here have been highlighted in red. These areas are mainly around the original settlement area of the island (now known as Kingston), and on Nepean Island to the south.

Adapted from a map entitled 'Norfolk and Philip Islands', drawn by Captain HM Denham. State Library of NSW.

2.4.2 During the First Settlement, two major types of Calcarenite were used on Norfolk Island

Rubble Calcarenite – a bedded limestone, that splits easily into small, manageable blocks;
and
Massive Calcarenite – a fine-grained material without any layering, that carves easily in any direction.

An excellent talk on how Rubble Calcarenite and Massive Calcarenite were used to construct buildings on Norfolk Island can be viewed in a fascinating video on YouTube.[8] In this video, a very knowledgeable tour guide explains how these two types of Calcarenite were used in different ways to construct buildings at Kingston.

[Do you know who this guide is? We would love to give his tour company a link here. Please contact us!]

Left, this excellent tour guide points out the dramatic difference between the two types of Calcarenite Limestone that were used to build the New Gaol on Norfolk Island during the Second Settlement.

*– **Rubble Calcarenite** was used to build the rough porous wall where the guide is pointing.*

*– In contrast, **Massive Calcarenite** was used to cut the smoothly-finished stone blocks seen in the wall on the right, and at the bottom of the wall.*

Screenshot from 'History of Norfolk Island', a YouTube video posted by Kim Hewitt.

The tour guide explained that:

– **Rubble Calcarenite** was used to build the **walls** of many early buildings. These walls were originally rendered over with mortar to make them more water resistant. Documentation elsewhere [9, 10] adds that this coarse, bedded limestone easily broke into small horizontal blocks that were used to build the walls, and that the stone was jointed together with a **mortar** which was also made from Rubble Calcarenite burnt in local lime kilns. Rubble Calcarenite was also used to construct **roads and water systems.**

– **Massive Calcarenite** was used to carve beautifully-smooth, dressed blocks of stone to make **facades, window sills, lintels, and foundation work of buildings,** as well as robust **paving stones.** Documentation elsewhere [9, 10] adds that Massive Calcarenite was also used to make **stone archways, steps, door surrounds, chimneys, decorative features of buildings, and ornately carved headstones.**

*Right, the last remaining Constable's Cottage, which stands near the New Gaol. The walls of this now-restored building are made from **Rubble Calcarenite,** which has been rendered over and painted pale brown. The window sills, door step and lintels of this building are made from **Massive Calcarenite,** which has been painted a darker brown.*

2.4.3 High Magnification Study 1: Norfolk Island Massive Calcarenite *versus* Kurrajong millstone

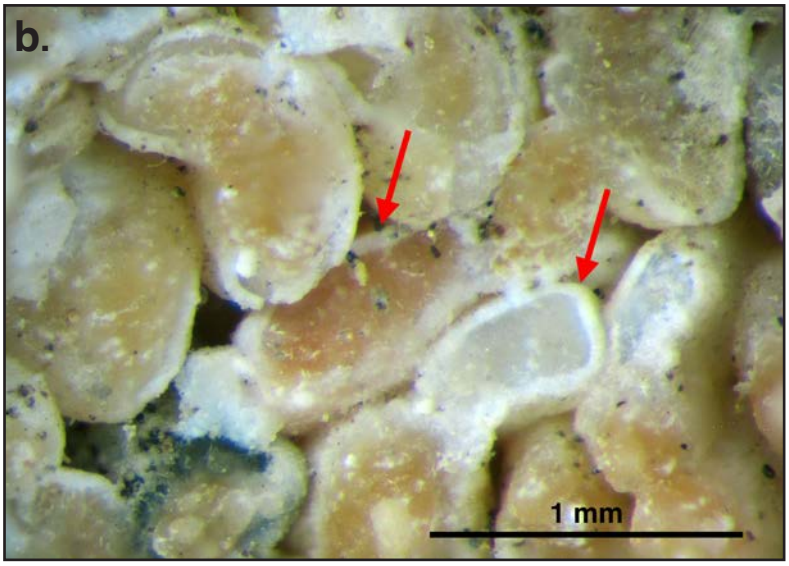
The best microscopic description of Norfolk Island Calcarenite Limestone that we have found was a report and a set of microscope photographs produced by Dr Brenda Franklin in 1998.[11] A copy of this report was kindly supplied to us by the KAVHA Research Centre on Norfolk Island.

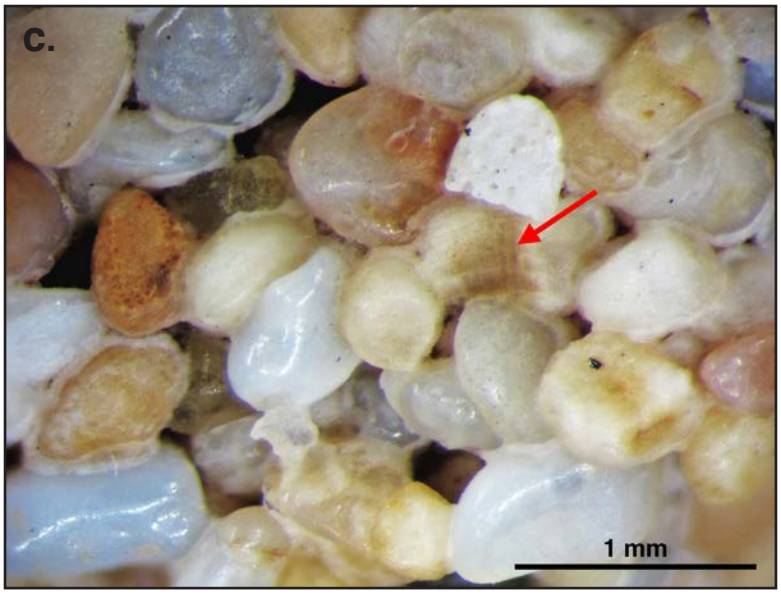
We compared Franklin's results for her Massive Calcarenite samples (from sills and lintels of Norfolk Island buildings) with our high magnification observations of the Kurrajong Calcarenite millstones.

Norfolk Island Massive Calcarenite *versus* Kurrajong Millstone:

	FRANKLIN'S MASSIVE CALCARENITE, 'SILL'	KURRAJONG MILLSTONE
Colour of fresh rock surface	Light yellow to light brown	**SIMILAR.** Pale yellow-brown
Grain size range (length)	0.2 to over 2 mm	**SIMILAR.** 0.4 – 1.5 mm
Grains containing shell and coral fragments [A]	Most grains	**SAME**
White calcite particles	Present	**SAME**
Black basalt rock particles	Present but uncommon	**SAME**
Grain coatings	A very thin, calcite layer surrounds each grain	**SAME**
Contact between grains	Grains are fused together only where adjacent grains touch.	**SAME**
Spaces ('voids') within the rock	Tiny, narrow interconnecting spaces are between the grains, evenly spread throughout the rock.	**SAME**

A. Franklin's full description of the shell and coral category: *'Shells of organisms: Both samples consist dominantly of the rounded fragments of shells of organisms – bivalves, gastropods and corals dominate. They range from colourless to dark yellow brown in colour and the internal features of the fragments (growth lines, striations, polyp chambers) can be clearly seen.'*





High magnification photographs of Kurrajong millstone material.

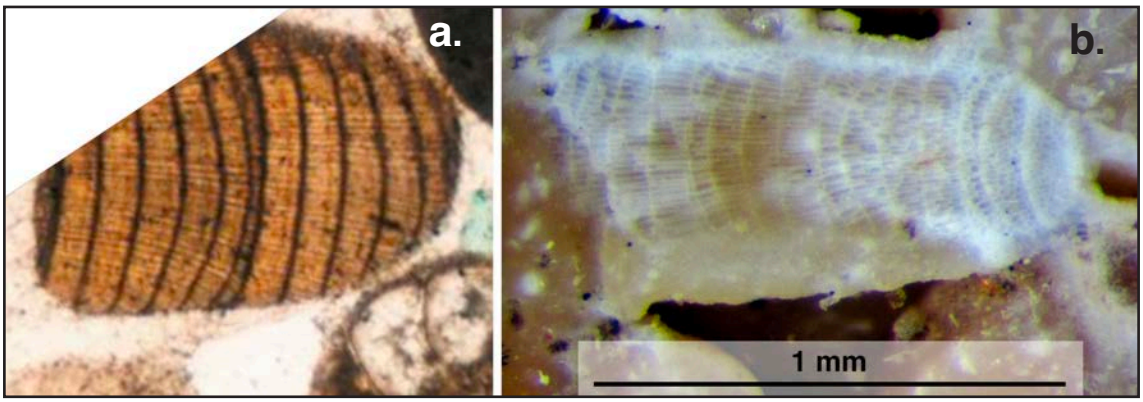
a. A group of grains from the Kurrajong millstone material with fine yellow-brown coatings, and narrow interconnecting spaces in between them. The grains are only connected where their tips touch one another. A black basalt grain is indicated with the red arrow.

b. A higher magnification view showing the fine coatings around the grains (arrows).

c. A group of grains that had been weathered in the rain for many years. The coatings on the top surfaces of these grains have dissolved away, revealing the colourful materials within. White grains can be seen, as well as fragments of coral in various colours, and a piece of shell (arrow).

Photographs by Anne Dollin.

Below, we found fossil shells in the Kurrajong millstone material that resembled shells shown in Franklin's report on Massive Calcarenite ('Sill') from Norfolk Island. Even though Franklin was examining ultra-thin sections of her stone samples, while we were making observations of the stone surface using macro cameras, the similarity in the shell structures is still clear.
a. A shell fragment shown in Franklin's report. b. A shell fragment from the Kurrajong millstone material. Photograph by Anne Dollin.
Both images are shown at the same magnification.



We found close similarities
between Franklin's 'Sill' Massive Calcarenite and the Kurrajong Millstone material.

Find out more at: www.singletonmills.com

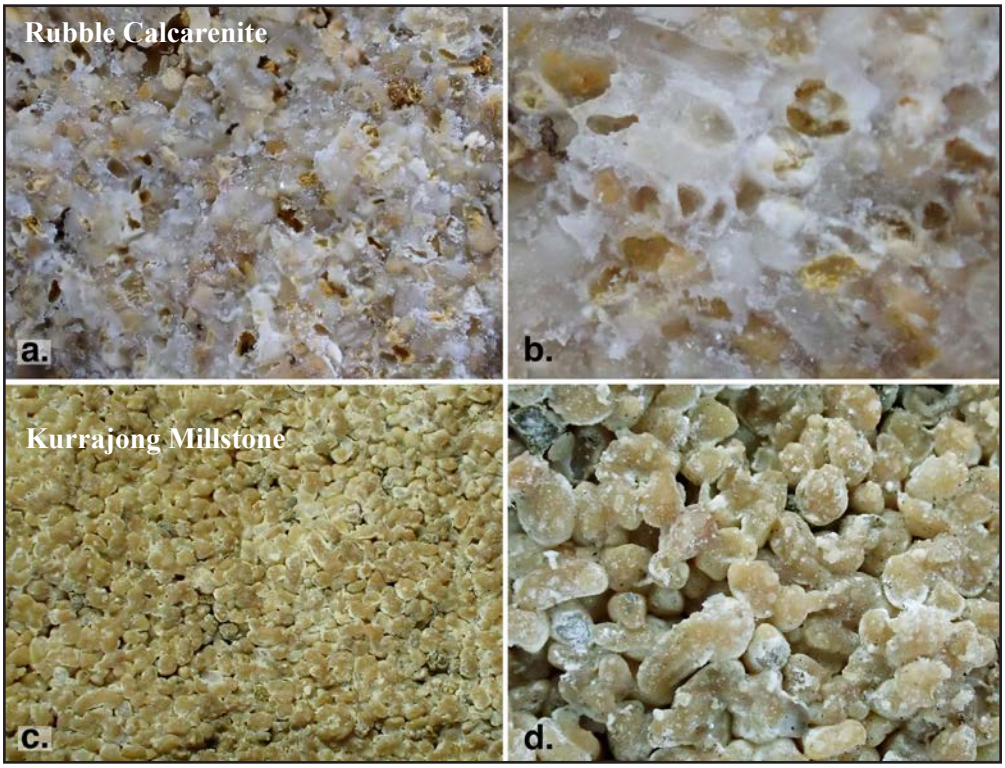
2.4.4 High Magnification Study 2: Norfolk Island Rubble Calcarenite *versus* Kurrajong millstone

We obtained some recent samples of Rubble Calcarenite from above-ground outcrops of Limestone on Norfolk Island. We compared these samples, using high magnification, with the Kurrajong Millstone material.

Norfolk Island Rubble Calcarenite *versus* Kurrajong Millstone:

	RECENT RUBBLE CALCARENITE SAMPLES [B]	KURRAJONG MILLSTONE
Colour of fresh rock surface	Whitish brown	**DIFFERENT.** Pale yellow-brown
Grain size range (length)	0.2 – 1.6 mm	**SIMILAR.** 0.4 – 1.5 mm
Grains containing shell and coral fragments [A]	Most grains	**SAME**
White calcite particles	Present	**SAME**
Black basalt rock particles	Present but uncommon	**SAME**
Grain coatings	A colourless to white calcite cement heavily coats the grains in most areas.	**DIFFERENT.** A very thin, calcite layer surrounds each grain
Contact between grains	Cement fills most spaces between the grains.	**DIFFERENT.** Grains are fused together only where adjacent grains touch.
Spaces ('voids') within the rock	No spaces between most grains. Occasional large holes within the rock, up to 3mm wide.	**DIFFERENT.** Tiny, narrow interconnecting spaces are between the grains, evenly spread throughout the rock.

B. Rubble Calcarenite samples. The sample areas, described here, were **not** affected by surface weathering.



Comparison of **Rubble Calcarenite,** *recently sampled on Norfolk Island (top row) with* **Kurrajong Millstone material** *(bottom row).*

a. Lower magnification photograph of Rubble Calcarenite, showing the extensive layer of whitish cement which fuses the grains together.

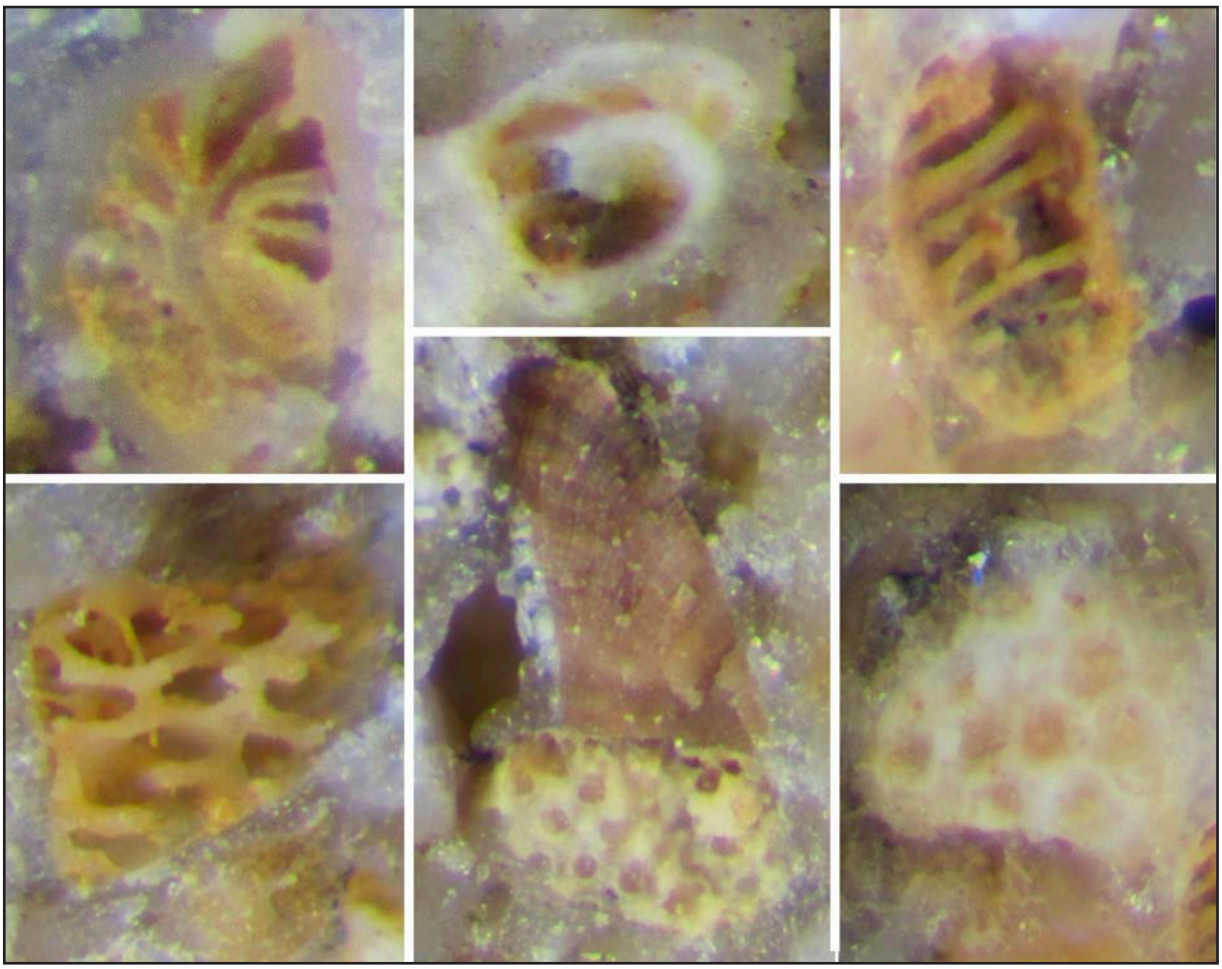
b. Higher magnification photograph of Rubble Calcarenite showing detail of the whitish cement enclosing the grains.

c. Lower magnification photograph of Kurrajong millstone material, showing the mass of individual grains, each coated in a yellow-brown layer of calcite.

d. Higher magnification photograph of Kurrajong millstone material, showing detail of the grains, with their thin coatings and the narrow inter-connected spaces between the grains.

Photographs by Anne Dollin.

Find out more at: www.singletonmills.com



Above, high magnification views of the remains of a variety of tiny marine organisms that were also seen in the recent Rubble Calcarenite rock samples from Norfolk Island.

Photographs by Anne Dollin.

We found four distinct differences between Rubble Calcarenite, recently sampled on Norfolk Island, and the Kurrajong Millstone material.

In particular, the grains in the Rubble Calcarenite were heavily cemented together, [C] whilst the grains in the Kurrajong Millstone material were loosely and evenly linked into a uniform network.

Overall Conclusion from our High Magnification Studies

Our high magnification studies of the grain structure of the Kurrajong Millstones suggest that these millstones were cut from a Massive Calcarenite stone resembling that on Norfolk Island.

C. Rubble Calcarenite structure. Franklin (1998) fully analysed a second Calcarenite material in her study, which she termed 'Ashlar'. It was sampled from the walls of Norfolk Island buildings. We found the terminology that she used for this material unclear, but it appears that it was Rubble Calcarenite. She stated that this *'Ashlar'* material was *'light grey to grey-brown',* cemented by a continuous *'grey finely crystalline carbonate cement'*. The voids were *'irregular in size, shape and distribution'*. This description is consistent with our recent Rubble Calcarenite results, presented above, and differs from the Kurrajong Millstone material.

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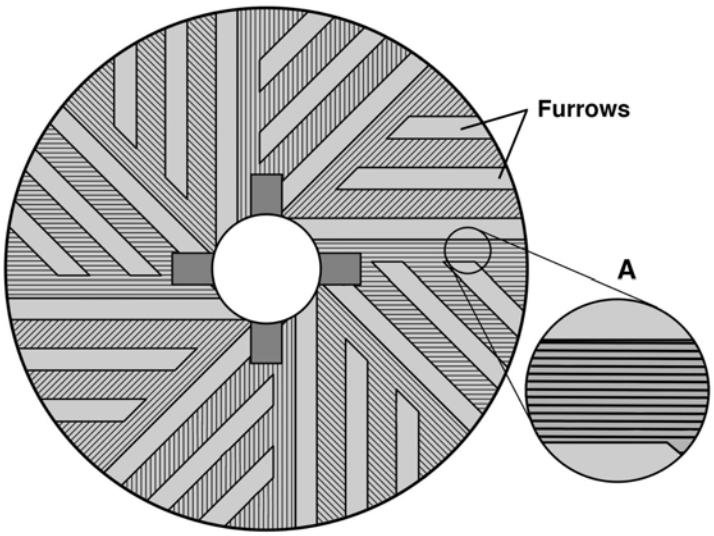
2.4.5 Massive Calcarenite would be better than Rubble Calcarenite for making millstones

Based on our research on the qualities of stone needed to make good millstones, we can also see why Norfolk Island's Massive Calcarenite would have been much better than Rubble Calcarenite for making millstones:

• A millstone dressing pattern could be more easily carved into Massive Calcarenite.

Millstones in flour mills have dressing patterns carved into their grinding surfaces, to help them mill grain. These patterns are quite complex and intricate, with furrows, going in all directions, carved into the surface of the stone (see diagram on right). Massive Calcarenite would be more suitable for making a stone with a dressing pattern, as it has an even texture and carves well in all directions. In contrast, Rubble Calcarenite would be less suitable, as it has weak bedding planes running through it – a fracture through the stone, along one of these planes, could greatly damage the painstakingly dressed surface.



Right, a diagram of a millstone dressing pattern that was used in Australia. Major furrows, running in all directions, were chipped into the stone surface. The flat surface between the furrows (the 'Land') usually had additional very fine rows of lines (called 'Cracking') chipped into it (as suggested in Inset A).

Illustration modified from a diagram by Steve Gray, Wikimedia Commons.

• A millstone made from Massive Calcarenite would better withstand the stresses of the milling process.

Inside a flour mill, the giant millstones, weighing about one tonne each, must be spun at high speed (about 120 revolutions per minute) to successfully grind grain. A millstone made from a bedded limestone such as Rubble Calcarenite, with weak fracture planes through it, could easily shatter, with catastrophic consequences, during the milling process.

Conclusion from Chapter 2

Our research strongly suggests that Kurrajong's Calcarenite Limestone millstones were quarried on Norfolk Island, during its First Settlement period before 1814.

If this is the case, the Kurrajong Calcarenite millstones are rare relics from the earliest phase of Colonial history at Norfolk Island, and they are far more significant historically than was previously realised.

Chapter 2 References

1. Letter from Philip Gidley King, 29 December 1791. Colonial Office Records, Series CO 201, image 108.
2. Jones, Robert (dated 1823, but probably after 1850) Recollections of 13 years residence in Norfolk Island and Van Dieman's land. Manuscript, State Library of NSW.
3. The Sydney Gazette and New South Wales Advertiser, 17 March 1805.
4. The Sydney Gazette and New South Wales Advertiser, 16 February 1806.
5. The Sydney Gazette and New South Wales Advertiser, 27 April 1806; The Sydney Gazette and New South Wales Advertiser, 28 June 1817.
6. Turnbull John (1813) A voyage round the world, in the years 1800, 1801, 1802, 1803, and 1804. W. McDowall for A. Maxwell, London, page 109. Internet Archive.
7. Hicks, John (1988) The natural history of Norfolk Island. In: Nobbs, Raymond (ed.) (1988) Norfolk Island and its first settlement 1788 – 1814. Library of Australian History, Sydney.
8. Kim Hewitt (2022) History of Norfolk Island. Two segments of particular interest begin at 5.26 and 14.03 minutes.
9. Wilson, Graham and Davies, Martin (1980) Norfolk Island: Archaeological survey Kingston – Arthur's Vale region. Department of Housing and Construction of the Commonwealth Government, page 16.
10.Blucher, Janelle (2021) Calcarenite: Limestone, Sandstone or Coral Stone. Discover Norfolk, Volume 2(1). Retrieved 12 April 2025.
11. Franklin, Brenda J (1998) Geological assessment of KAVHA stonework, Norfolk Island. Consulting Mineralogist / Petrologist, Specialist in Industrial Minerals, Dee Why, NSW.

Find out more at: www.singletonmills.com

Chapter 3
Where and How could the Kurrajong Millstones have been Quarried on Norfolk Island?

3.1 Documentary evidence is very scarce

Unfortunately, there is very little documentary evidence about exactly where on Norfolk Island they quarried their Calcarenite millstones before 1814. The only specific records that we have found concern the very first millstones that were cut on the island.

In 1794, Lieutenant-Governor Philip Gidley King's journal records that an attempt was made to cut Millstones from boulders of Calcarenite Limestone that were *'lying on the beach'*:

'The stones we find lying on the Beach are easily made into Mill Stones, *and if they should grit, the Evil must be borne; As the few Iron Mills we have ever been possessed of are now entirely Useless.'* [1]

and

'I ... employed the Stone Mason making ***a Pair of Mill Stones, Three Feet Six Inches Diameter [1070mm], which is the largest Size the stones will admit of ...*** *'* [2]

Above, a painting of ***the many Calcarenite Limestone rocks which were on the beach near the First Settlement on Norfolk Island in 1790.*** *This scene shows the frantic attempts made by the settlers to salvage goods from the First Fleet sailing ship, Sirius, which had just become wrecked on the offshore reef.*

Detail of a painting entitled 'Part of the Reef in Sydney Bay, Norfolk Island, on which the Sirius was wreck'd. 19 March 1790.' by William Chapman from his journal, `A Voyage to New South Wales', State Library of NSW.

3.2 The last millstone which may survive on Norfolk Island

An interesting archaeological description has also been published about the only Calcarenite millstone that is still known to exist on Norfolk Island.[3] It was originally found close to the water's edge, near the heritage Lime Kiln site between Slaughter Bay and Emily Bay. However, no further clues about exactly where this millstone was quarried were reported by the authors.

This unused millstone was reported to be about 1350mm (4ft 6in) in diameter and 300mm (12in) thick.

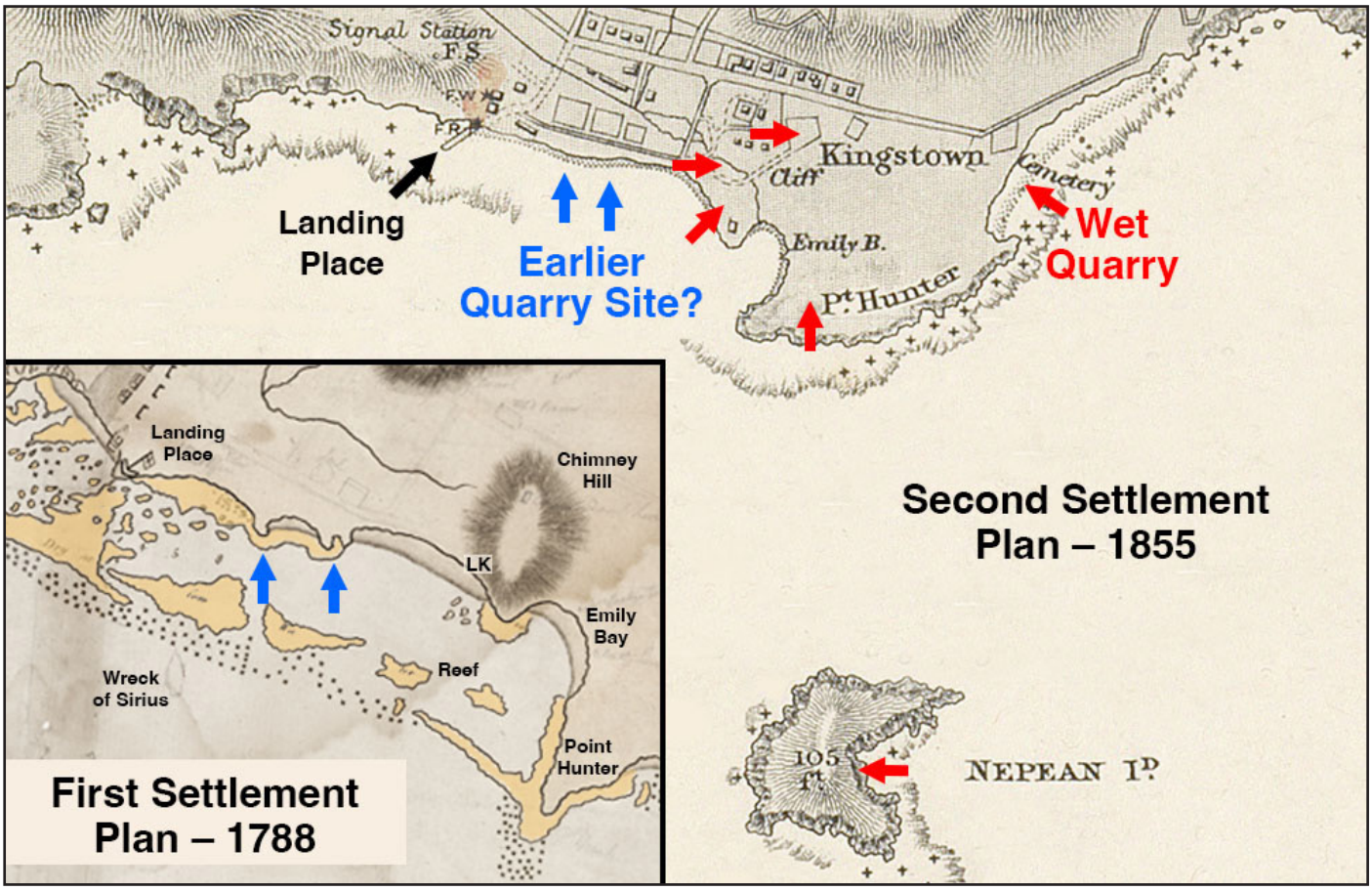
NOTE: This last surviving Norfolk Island millstone was 1350mm in diameter, [3] and the Calcarenite Millstones at Kurrajong are both 1220mm in diameter. **These three stones are all larger than the biggest millstones that the stone mason was able to cut on the beach (1070mm diameter) in 1794** (see Section 3.1, above).

This suggests that **the three more recent millstones may have been cut in one of the other Norfolk Island quarry sites** (see below), rather than from the boulders on the beach.

3.3 Other Calcarenite Limestone quarries on Norfolk Island

3.3.1. Quarry locations

Extensive quarrying of the Calcarenite Limestone deposits on Norfolk Island for building materials began in 1791. **Multiple quarry sites were progressively established,** during both the First Settlement period (until 1814), and the Second Settlement period (1825–1855):



*Above, maps showing the **locations of sites where Calcarenite Limestone was quarried** during the First and Second Settlement periods of Norfolk Island. Above-ground outcrops of limestone were quarried in the Emily Bay and Point Hunter areas, and on nearby Nepean Island (see red arrows). The offshore reefs along the southern side of the settlement (see blue arrows), and near Cemetery Bay, were also sources of Calcarenite Limestone. A major Wet Quarry for cutting Massive Calcarenite was located near Cemetery Bay during the Second Settlement.*

In the 1788 plan, the extensive offshore limestone reefs near the main settlement have been highlighted in yellow-brown. The label, 'LK', near the Chimney Hill outcrop, shows where three Lime Kilns were built, at different stages, to produce lime by burning limestone quarried from Chimney Hill. The reef areas marked with the blue arrows are further discussed below.

Plans modified from the following sources: 1788 plan, 'Norfolk Island ; S. end of Norfolk Island', by William Bradley; 1855 plan, 'Norfolk and Philip Islands', surveyed by Captain H.M. Denham R.N. Both charts from the State Library of NSW.

Little documentation has been found about the location of First Settlement quarry sites. However, as pointed out by Varman (1988),[4] evidence of early quarrying can be found by comparing early and later illustrations of the foreshores. See, for example, the plans shown above. Two prominent outcrops of limestone, extending into the sea, shown in Bradley's 1788 plan above (see blue arrows), are no longer visible in the 1855 plan, nor in present day aerial photographs of the area. Intensive quarrying appears to have occurred in the mid beach area along the settlement site, as well as around the small point of land adjacent to the Lime Kilns (LK).

Above right, this large Second Settlement Lime Kiln near Lime Kiln Point was later used by the Pitcairn Islanders to produce lime from quarried Calcarenite. A photograph taken in ca. 1920, Les Brown Collection, reproduced by Wilson and Davies (1980).[5]

Find out more at: www.singletonmills.com

3.3.2. Where was Massive Calcarenite quarried on Norfolk Island?

The Kurrajong Millstones appear to have been cut from Massive Calcarenite (see Chapter 2).

On Norfolk Island, Massive Calcarenite quarries have been reported in the following locations:

– **on Nepean Island** – a small isle predominantly made of Calcarenite Limestone, and

– **under the shallow seas off the beaches at Slaughter Bay, Emily Bay, and Cemetery Bay.** [6]

At some stage, it had been discovered, that **the best quality grade** of fine-grained, easily carved Massive Calcarenite on Norfolk Island was located just offshore, **under the sea.** [7] There were extensive, flat reefs of this Calcarenite there, below the high tide level (see the 1790 map of the First Settlement, above).

The stones 'lying on the beach', that were cut into millstones in 1794 (see Section 3.1.), **may have originally come from these extensive reefs, too.** Norfolk Island is subject to massive storms, as well as the occasional cyclone. Boulders of Massive Calcarenite may have been torn from the reefs and dumped onto the beach by the huge waves generated in such storms.

3.3.3. Nepean Island stone quarries.

Nepean Island is a small isle, about 10 hectares in size and about 800m south of Norfolk Island. Nepean Island is made of Calcarenite Limestone and has beds of this stone over 35m thick.[8] Stone was extensively quarried there during the Second Settlement, but quarrying began during the First Settlement.[9]

Left, a watercolour painting, ca. 1851, showing Phillip Island (at the back), Nepean Island (centre), and the south-eastern shore of Norfolk Island (in the foreground). By this stage, extensive quarrying for Calcarenite Limestone had been done on Nepean Island, especially during the Second Settlement.

From an album of paintings by F. R. Nixon and Anna Maria Nixon: 'Tasmania and Norfolk Island. A collection of watercolour drawings', State Library of NSW.

Governor King wrote in March 1792:

'Since the discovery of Lime Stone on this Island, [Norfolk Island] I have been anxious to ascertain whether the Stone on Nepean Isle is of that Quality. On the 26th I went there, & found it composed of a very fine Lime & Building Stone.' [10]

The remains of convict-built stone steps and some post holes dug into the stone still exist on the east coast of Nepean Island. These features indicate that a timber slide and/or derricks, for moving the stone and loading it onto boats, were used.[11]

Nepean Island has no running fresh water. Furthermore, the sea surrounding Nepean Island is infamous for its massive waves and powerful currents. [12] So quarrying stone there, and transporting it to the main island, must have been immensely challenging.

Above, a screenshot from drone footage of Nepean Island showing where Calcarenite Limestone was once quarried for the Norfolk Island settlements. This image shows the eastern coastline of Nepean Island (see red arrow on inset). Two vertical walls in the limestone, that would have been cut by the convict quarrymen, are indicated with the short red arrows. The black arrow shows where convict-built steps are located near the waterline. The southern coastline of Norfolk Island is visible at the top of the image. This screenshot is from a beautiful video posted on the Glencar Luxury Villas Facebook page, on 5 April 2024.

3.3.4. The Notorious Wet Quarries

The places where convicts cut blocks of Massive Calcarenite from reefs under the water were called 'Wet Quarries'. This gruelling labour was reserved for convicts sentenced to the harshest punishments.[13] Substantial quantities of huge, heavy blocks of stone were quarried in this way to meet the Settlement's needs. Wet Quarries were actively used during the Second Settlement period, but this kind of work may have begun during the First Settlement.[14]

Above, convicts quarrying Calcarenite Limestone, offshore from the beach on the southern side of Kingston, during the Second Settlement of Norfolk Island. The inset shows detail of the men who were working to cut the stone.

A watercolour drawing, ca. 1851, by FR Nixon and Anna Maria Nixon, from Volume 6: Tasmania and Norfolk Island. State Library of NSW.

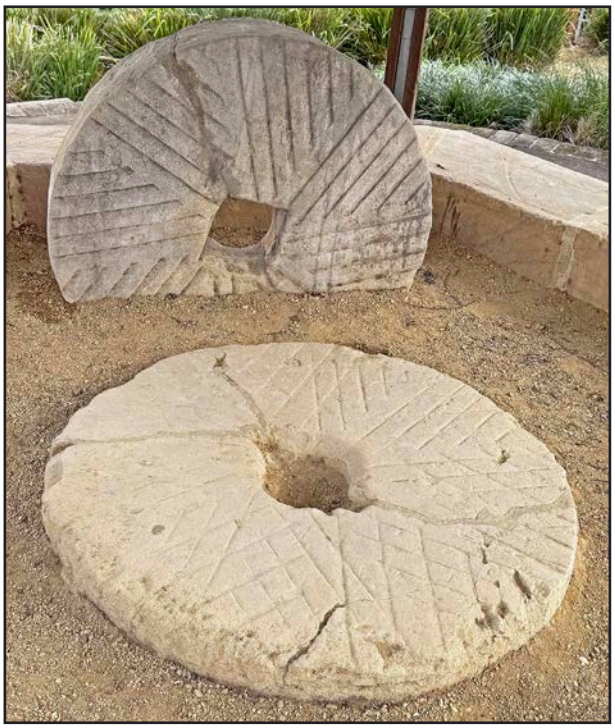
During the Second Settlement of Norfolk Island, an additional major use for Massive Calcarenite was found. Deep, stone bowls called **'Dripstones',** for filtering water, became very popular with higher-income households in Sydney, NSW, during the mid 1800s. They were also used to filter water on board sailing ships.

Massive Calcarenite is ideal for making dripstones, and a profitable industry began on Norfolk Island, manufacturing these filtration units and exporting them to Australia. [15, 16]

Unfortunately for the convict population of Norfolk Island during the Second Settlement, **the best stone for making dripstones came from the Wet Quarries**. Many convicts stood for long hours, up to their waists in the surging sea, to cut dripstones for this industry.

Right, a dripstone water-filtration unit on display in the excellent Bathurst District Historical Society Museum. Photograph by Anne Dollin.

3.4. So, Where were the Kurrajong Calcarenite Millstones Quarried?



There are **three possible locations on Norfolk Island where the Calcarenite millstones of Kurrajong may have been quarried:**

They may have been cut:
– from boulders of Massive Calcarenite lying on the beach at Norfolk Island,
– or on Nepean Island,
– or even in one of Norfolk Island's infamous Wet Quarries.

This research continues!

Can you provide any further information on this subject?
Please contact us.

Chapter 3 References

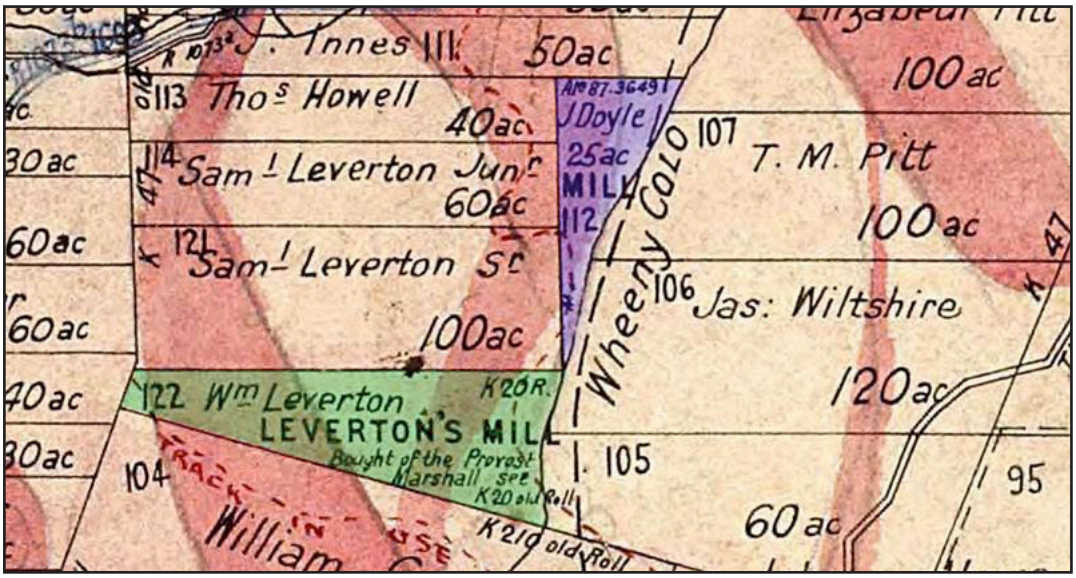
1. Journal of Philip Gidley King while Lieutenant-Governor of Norfolk Island and Letter to Mrs Gov. King, 1791-1796, image 137.
2. Ibid, image 146.
3. Jackson Greg and Forbes Pam (ca. 2024) A Mill Stone on Norfolk Island. (Full article can be read near end of this page, without signing in.)
4. Varman, Robert VJ (1988) Chapter 12. Material life including the evidence from Archaeology. In: Nobbs, Raymond (ed) (1988) Norfolk Island and its first settlement 1788–1814. Library of Australian History, North Sydney.
5. Wilson, Graham and Davies, Martin (1980) Norfolk Island : Archaeological survey Kingston–Arthur's Vale Region. Department of Housing and Construction of the Commonwealth Government. Volume 2.
6. mrbbaskerville (2013) The seven bridges of Kingston. Blog, footnote 3, retrieved 12 April 2025, (by Dr Bruce Baskerville, historian).
7. Lewis, Miles (2024) Australian Building: A Cultural Investigation. Section 3.06. Stones. Section (c) Local limestones. Retrieved 9 April 2025. Miles Lewis is an Honorary Professor at the University of Melbourne.
8. Hicks, John (1988) The natural history of Norfolk Island. In: Nobbs, Raymond (ed.) (1988) Norfolk Island and its first settlement 1788 – 1814. Library of Australian History, North Sydney, page 160.
9. Nepean Island Reserve, Plan of Management, Part B, Section 8, 2003, Norfolk Island Parks and Forestry Service, page 2.
10. Journal of Philip Gidley King while Lieutenant-Governor of Norfolk Island and Letter to Mrs Gov. King, 1791-1796, image 26.
11. Nepean Island Reserve, Plan of Management, Part B, Section 8, 2003, Norfolk Island Parks and Forestry Service, page 4.
12. Turnbull, John (1813) A Voyage around the world in the years 1800 - 1804, London, page 114.
13. Bunbury, Thomas (1861) Reminiscences of a Veteran. Volume II, Charles J. Skeet, London, page 314.
14. Stanbury, Myra and MacLeod, Ian D (1988) Colonies, convicts and filtering stones: roads to solutions. Bulletin of the Australian Institute for Maritime Archaeology, 12(2):1-10, page 8.
15. Blucher, Janelle (2021) Calcarenite: Limestone, Sandstone or Coral Stone. Discover Norfolk, Volume 2(1). Retrieved 12 April 2025.
16. Stanbury, Myra and MacLeod, Ian D (1988) Colonies, convicts and filtering stones: roads to solutions. Bulletin of the Australian Institute for Maritime Archaeology, 12(2):1-10.

Chapter 4
How did the Kurrajong Watermills Use these Limestone Millstones?

Looking at the two Calcarenite millstones in Memorial Park, Kurrajong, in different ways, can suggest further intriguing details about their history.

4.1. One millstone was found near each of the two Kurrajong watermills

In about 1920, the vertically-mounted stone in the Kurrajong Memorial Park display was found buried near the Lower Mill, and the horizontally-mounted stone was found near the Upper Mill:



Left, an old Parish Map with both of the Kurrajong watermills marked on it.

We have highlighted the two locations on this map: the site of the Lower Mill is shown in purple; and the site of the Upper Mill is shown in green.

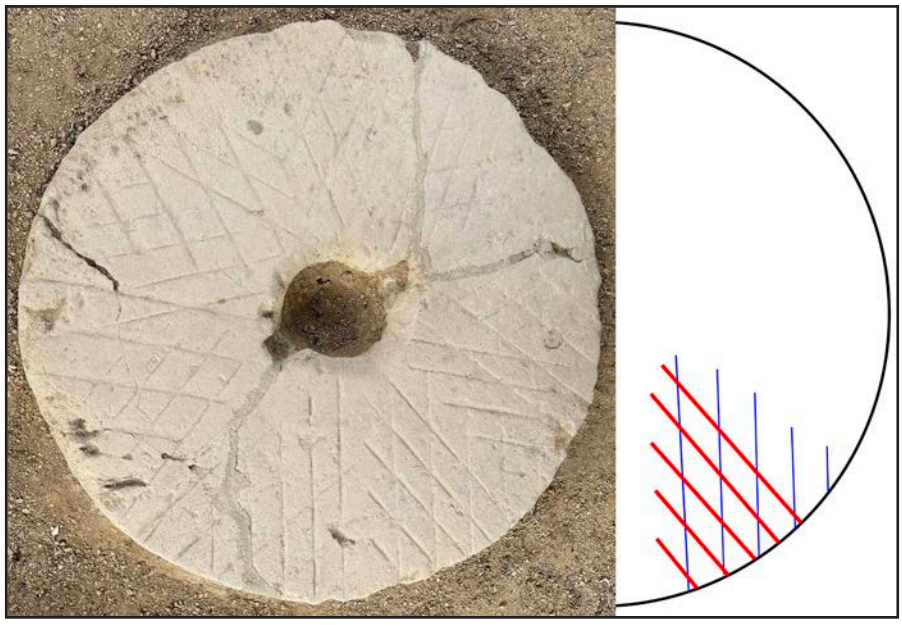
(The terms 'Upper' and 'Lower' refer to the direction of the water flow in the creek.)

These two watermills were about one kilometre apart, and one millstone was found near each mill. **This suggests that both of the Kurrajong watermills may have used these Calcarenite millstones at some stage.**

4.2. One of these millstones has a very unusual dressing pattern

Complex dressing patterns were chipped into the grinding surface of millstones to help them break open the hard wheat grains, and to transport the milled flour towards the outer edge of the millstone.

The surface of the horizontally-mounted millstone in Kurrajong Memorial Park, remarkably, has two different dressing patterns chipped into it, going in opposite directions. See illustration on right.



*Right, the horizontally-mounted millstone from the Kurrajong watermills has **two different dressing patterns** carved into its grinding surface.*

The earlier, fainter dressing pattern (shown in adjoining diagram in blue) runs in one direction, and the more recent, deeper dressing pattern (shown in red), which was carved over top of the earlier pattern, runs in the opposite direction.

Photograph and diagram by Anne Dollin.

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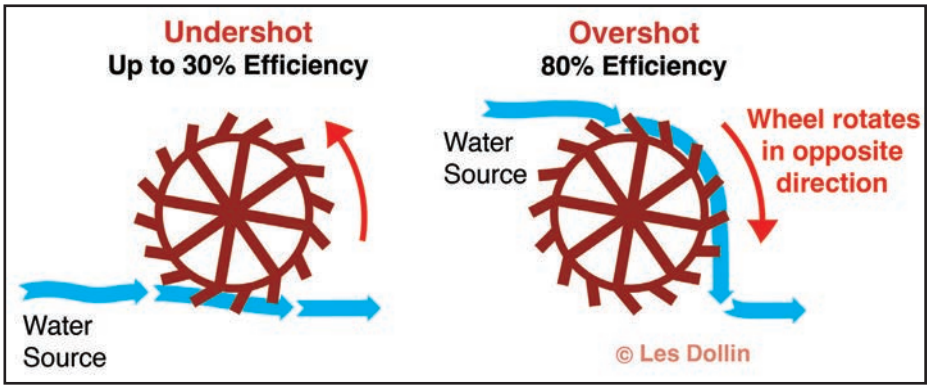
The unusual, double dressing pattern on this millstone suggests that, at some stage during the working life of that millstone, the miller wished to change the millstone's direction of rotation.

• **One situation when this can occur is when a watermill is converted** from an Undershot mill to a more efficient Overshot mill.

This can be done by raising the height of the water race (or channel) that delivers water to the waterwheel, as shown in this diagram.



It has the following results:

– This conversion makes the waterwheel rotate in the opposite direction.

– The millstones connected to the waterwheel will then also rotate in the opposite direction.

– Each millstone will need to have a new dressing pattern applied to its surface, over the top of the old dressing pattern, to suit its new direction of rotation.

– The orientation of the new dressing pattern would be in the opposite direction to that of the old dressing pattern.

• **Another situation when this can occur is if a millstone is moved to another watermill** that has a waterwheel rotating in the other direction.

Regardless of the reason why this millstone has a double dressing pattern, the evidence suggests that this stone may have been used at the Kurrajong watermills for quite a long time.

The Calcarenite Limestone millstones at Memorial Park in Kurrajong hold hidden clues to many intriguing mysteries!

Chapter 5
The New Significance of the Kurrajong Millstones

The two Calcarenite Limestone millstones from the Singleton Family watermills at Kurrajong had been lost for decades after they finished their working life in the watermills. We are very fortunate that the workmen, who found these millstones in about 1920, realised their value, and that the stones were preserved for future generations.

- Millstones made from Calcarenite Limestone are **extremely rare.**
- Our research suggests that these two millstones have **a very long history,** that probably dates back to the early 1800s, and to the first settlements of both Norfolk Island and Sydney.
- They **may even be the only two Norfolk Island millstones** that survive on the Australian mainland.

We are indeed privileged to have these two exceptional and historic millstones on display in Memorial Park in the Kurrajong village of NSW.

Can You Help Us?

Do you have any further information about the topics covered in this eBook?

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Appendix
Where did Kurrajong's Calcarenite millstones come from originally?

The first Singleton Family watermill at Kurrajong was established well before 1816. **The two Calcarenite Limestone millstones on display at Memorial Park, Kurrajong, may have been amongst the earliest stones used in the Kurrajong watermills.**

French Burr Stones had been purchased for at least one of the watermills at Kurrajong by 1824.[1, 2] These millstones were widely recognised as the best millstones in the world. French Burr Stones were very expensive, but mill owners would try to buy a set for their mill as soon as they became available. However, imported French Burr millstones did not become widely available in Sydney until the 1820s.

Before the 1820s, millstones were scarce in Sydney, and millers had to manage with a small number of lower-quality, gritty millstones.

The Kurrajong Calcarenite Limestone millstones were probably purchased for the Singleton Family watermills during this period of scarcity, in the 1810s or very early 1820s, before the preferred French Burr Stones became available.

Where could Calcarenite Limestone millstones have been obtained in the 1810s or very early 1820s?

1. In the United Kingdom? – Unlikely.

By the 1800s, limestone was generally considered to too soft for making good millstones in the United Kingdom (UK). Instead, during the 1810–1820 period, millstones of the following types were being used in the UK:

– French Burr Stones. Imported into the UK since the 1400s.

– Cullen (Basalt-like) Millstones. Imported into the UK from Germany during the 1700s.

– Millstone Grit, Old Red Sandstone, Greensand, and Puddingstone millstones. Quarried within the UK for centuries.

So, it is unlikely that Calcarenite Limestone millstones could have been obtained in the UK for the Kurrajong watermills during the 1810s or 1820s.

2. At Cape Town, in present day South Africa? – Unlikely.

In the 1780s, Cape Town was a major Dutch trading post where Britain purchased supplies for its NSW Colony. The First Fleet spent a month there on its way to NSW. The ships were packed with provisions purchased at Cape Town: fresh fruit, vegetables, wheat, bread, and meat, as well as more than 500 live animals: cattle, sheep, pigs, goats, horses, and poultry.[3]

Some modern reviews suggest that four millstones were also purchased in Cape Town in 1787 and taken to NSW on the Scarborough. However, our analysis of documents in the Historical Records of NSW suggests that these millstones may actually have came from Britain.

Even if millstones were purchased for the Colony in Cape Town, they were unlikely to have been made from Calcarenite Limestone. The stone quarried for millstones near Cape Town during that period was mainly a hard grade of sandstone.[4]

3. Quarried in the Sydney area? – No.

Calcarenite Limestone is not found in any area that had been explored around the Sydney Settlement by 1810–1820.

4. Quarried elsewhere on the Australian mainland or Tasmania? – Possible but unlikely.

Calcarenite Limestone does occur in Tasmania, and on the southern and western shores of mainland Australia.

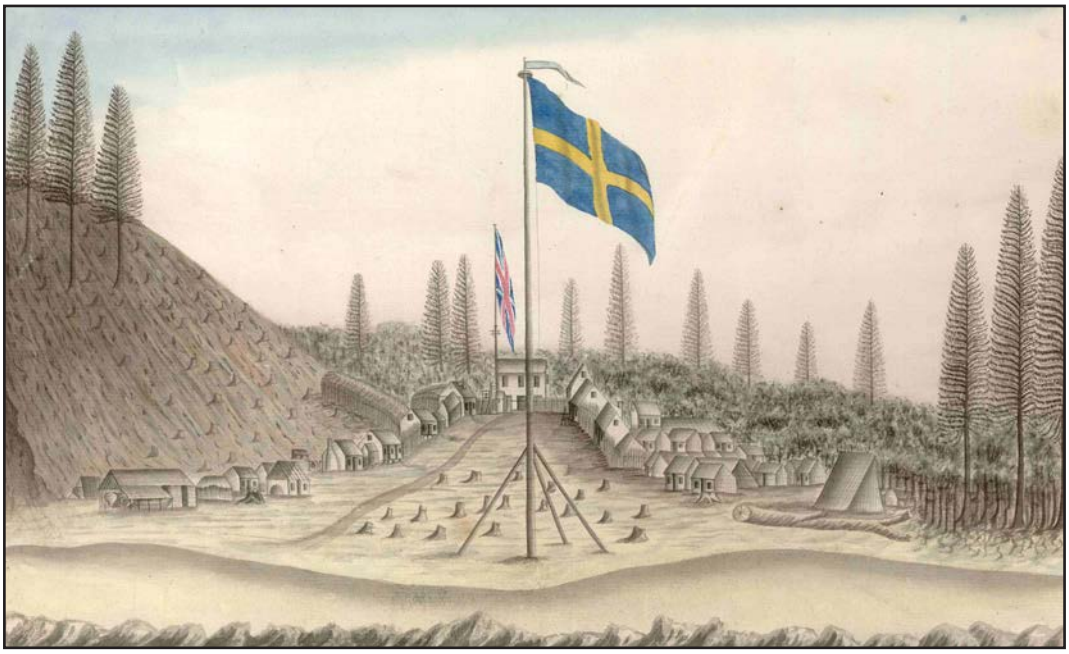
Some 'Colonial Millstones' were quarried from various types of local stone in these other parts of Australia. However, newspaper records suggest that this did not begin until 1820 in Tasmania, and until the 1830s and 1840s in the other states.

So, Australian 'Colonial Millstones' would not have been available early enough to supply millstones for the Kurrajong mills when they were first built in the 1810s.

The final possibility is much more likely:

4. Quarried on Norfolk Island and exported to NSW in the early 1800s – The most likely option.

Norfolk Island was an outpost penal settlement established by Britain in 1788, at the same time as their settlement at Sydney, NSW. Significant numbers of Calcarenite millstones were manufactured and used on Norfolk Island before 1814, and records show that at least some of these were exported to Sydney in 1805.



Left, the First Settlement of Norfolk Island in 1790, just two years after it began.

The extremely isolated settlers had to find ways to survive with very little equipment and almost no support.

They managed to use local resources to make what they needed – including millstones for their flour mills, quarried from Massive Calcarenite Limestone on the island.

Painting by George Raper, Natural History Museum, London.

For full details about Norfolk Island's Calcarenite millstones, read Chapter 2.

Appendix 1 References

1. The Sydney Gazette and New South Wales Advertiser, 10 June 1824.
2. The Sydney Herald, 26 February 1842.
3. Phillip, Arthur (1789) The Voyage of Governor Phillip to Botany Bay, John Stockdale, Piccadilly. Project Gutenberg.
4. Walton, James (1974) Water-mills, windmills and horse-mills of South Africa. C Struik Publishers, Cape Town and Johannesburg. Internet Archive.