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Reimagining life and death: Results and interpretation of geophysical and ethnohistorical investigations of earth mounds, Mapoon, Cape York Peninsula, Queensland, Australia

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ABSTRACT

Ground-penetrating radar (GPR) and magnetic surveys were conducted on 13 earth mounds within Mapoon Aboriginal Lands, western Cape York Peninsula, Queensland. Detailed analysis of GPR profiles and amplitude maps of the mounds were compared to those from previously recorded, known burials at the Mapoon Mission Cemetery. Based on these models, burials were identified in ten of the 13 mounds. Both European-style (coffin) and traditional burials were identified, suggesting that they were used for human interment for some time and that there may have been continuity of burial practice in these features after European contact. GPR and magnetics also indicate that a number of mounds had constructed floors or platforms at the base of the mounds, and evidence for burning. Stratigraphic layers identified with GPR show that many of these mounds have complex internal layering, suggesting multiple building episodes. Based on the GPR and magnetics results, in conjunction with ethnohistorical and oral history research, we conclude that the mounds are constructed features that appear to have had a long history of use for multiple purposes, including mortuary. These results demonstrate the cultural continuity of mortuary practices within Mapoon from pre-contact times to the present.

Keywords: cultural continuity, burial mounds, earth mounds, ground-penetrating radar, Mapoon, Queensland Australia, mortuary landscapes

RÉSUMÉ

Des relevés géo-radar ou encore appelés radar de pénétration au sol (GPR) et magnétique ont été effectués sur 13 monticules de terre situés sur les terres autochtones de "Mapoon", dans I'ouest de la péninsule du Cap York, dans le Queensland en Australie. Une analyse détaillée de ceb profils et des cartes d'amplitude des monticules, a été comparée à celles d'enterrements connus et précédemment enregistrés dans le cimetière de la mission de "Mapoon". À partir de ces relevés, des inhumations ont été trouvées dans dix des 13 monticules. Des sépultures traditionnelles, de style européen (en cercueil) ont été identifiées, suggérant qu'elles étaient utilisées pour I'enterrement d'humains et qu'il pourrait y avoir eu une continuité de la pratique de I'inhumation après les premiers contacts avec une civilisation européenne.

Ces analyses indiquent également qu'un certain nombre de monticules avaient des sols ou des plates-formes construits à leurs bases, ainsi que des traces de brûlures. Les couches stratigraphiques identifiées avec géo-radar montrent que beaucoup de ces monticules présentent une stratification interne complexe, suggérant de multiples épisodes de construction. À partir de ces résultats, ainsi que de la recherche en histoire ethno-historique et orale, nous concluons que les monticules ont des caractéristiques de construction démontrant une utilisation à des fins multiples, y compris en tant que morgue.

Ces résultats démontrent la continuité culturelle des pratiques mortuaires au sein de la mission de "Mapoon" depuis les temps précédant le contact avecu une civilisation européenne et continué de nos iours.

Mots-clés: continuité culturelle, tumulus, monticules de terre, géo-radar, Mapoon, état du Queenslad en Australie, paysages mortuaires

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INTRODUCTION

Earth mounds in Mapoon, Queensland, were generally thought by the Aboriginal community to be natural landforms or the nests of the orange-footed jungle fowl (*Megapodes reinwardt*) and were largely overlooked as features of cultural or archaeological interest. Recently, two earth mounds (Jack Brown's Mound and Shadforth's Landing Mound A) located in Cullen Point, north of Mapoon township (Figure 1), were identified by Elders as sites remembered to be burial places for family members (Susie Madua and Elder A pers. comm. 2013). The identification of these sites as burial mounds raised questions about the nature of these and similar mounds in the immediate area. Here, we report the results of non-invasive geophysical and ethnohistorical investigations of earth mounds on Cullen Point, Mapoon, to determine the nature and function of these features as potential cultural sites. Traditional Owners requested the use of GPR as a non-invasive, culturally appropriate technique, as they did not wish to disturb or excavate culturally and environmentally sensitive sites.

The study area

Mapoon township is located near Cullen Point, on the western side of Cape York Peninsula, Queensland. Cullen Point is bordered by the Gulf of Carpentaria to the west and Port Musgrave to the east (Figure 1) and is located within the lands of the Tjungundji people, the Traditional Owners of the country where many of the mounds identified to date are situated. The Cullen Point peninsula has a central spine of a subdued plateau remnant of strongly weathered pisolitic bauxite and ferricrete (ironstone) overlying early Tertiary and Cretaceous sandstones and mudstones of the Rolling Downs Group (Taylor *et al.* 2008). The margins comprise two coastal barrier systems with sand dunes, lagoons and a large area of mangrove swamp, reed beds and salt pans between the barrier ridges (Mitchell 2017: 1). No absolute dates have been obtained on sediments or landscape features in this coastal sector; however, a few mid-Holocene dates have been published from the Skardon River dunes, to the north, and the Pennefather River dunes, to the south (Burne & Graham 1995). The accuracy of these dates is uncertain, as the samples appear to have been obtained from mechanical auger holes and no details of the analyses are provided. However, they are broadly consistent with the mid-Holocene time sequence of land-forming events determined on the Arnhem Land coast (Woodroffe *et al.* 1985a, 1985b). Sea-level rise occurred at the end of the last ice age and reached a level about 1–3 m higher than today about 5000–6000 years BP (Chivas *et al.* 2001). Data suggest that the sand dunes and barrier ridges of Cullen Point are not likely to be more than 5000–6000 years old and that the most recent human occupation of the Mapoon area probably began after that time, when seas had regressed to about their present level (Mitchell 2017). The presence of both freshwater wetland and marine environments surrounding the low-lying terrain along Cullen Point provides a rich array of subsistence resources.

Cullen Point has a complex and traumatic contested history. Mapoon Traditional Owners experienced violence at the hands of early European settlers (the Jardines, c.1880s), and with the kidnapping of children to work in the pearl shell industry (McIntyre-Tamwoy 2000; Sutton 2015) in areas of Mapoon Lands that included Cullen Point, Batavia and Pennefather, as well as further inland. This violence led to the later establishment of the Mapoon Mission at Cullen Point by the Moravians in 1891 (Sutton 2015; Wharton 1996). The mission was forcibly closed by the Queensland State government in 1963 and family homes were burnt to the ground (Sutton 2015; Wharton 1996).

Limited archaeological survey of the Cullen Point and the Mapoon area more generally indicates that sites are dominated by middens; however, scarred trees, mission-time remains and cemeteries, unmarked burials and cultural sites are also present (Sutton 2015). Cullen Point is the location of known mythological sites, as well as bora grounds, dancing and fighting grounds, and story places associated with Chivaree, an important spirit being in Tjungundji cultural history (McConnel 1936, 1937; Thomson 1934). These mythological sites are in close proximity to many clusters of mounds discussed in this study, bora and dancing grounds, and the current homes of Tjungundji Traditional Owners. As discussed by Thomson (1934) and McConnel (1936), dancing grounds were connected with structures made of sticks and timber used for initiation rites at Cullen Point and elsewhere. To date, no published archaeological excavations have been conducted on Cullen Point, and no radiometric dates for occupation of Mapoon Aboriginal Lands are publicly available.

Two earth mounds (Jack Brown's Mound and Shadforth's Landing Mound A) were identified on Cullen Point as sites remembered by Elders as burial places for family members during Sutton's (2015) PhD research (Susie Madua and Elder A pers. comm. 2013). A subsequent limited survey, confined to the corridor adjacent to Cullen Point Road, identified a further 25 mounds on Cullen Point. However, an analysis of LIDAR data and current satellite imagery identified hundreds of additional similar features. The Cullen Point mounds are between 15 m and 25 m in diameter and average 1.7 m in height, with the highest approaching 4 m; only a few mounds are lower, between 0.5 and 1 m high. The mounds are generally circular; however, Shadforth's Mounds C and D (which are also low relief) are elongate in shape. Mounds are found as single features or in groups of up to four. These mounds are predominantly composed of sand overlying the bauxite/laterite bedrock and have occasional pieces of shell (amounts vary between mounds). Marine shell is never a dominant component of the mounds and the shell that is present is usually naturally occurring terrestrial snail (*Xanthomelon s*p., Mitchell 2017). Mounds 16, 17 and 18 are located on a buried chenier, which is exposed nearby, and Mounds 16 and 18 contain abundant shell hash, associated with the chenier (Mitchell 2017).

Figure 1. The study area and the locations of the mounds and known cemeteries examined with GPR. (© The State of Queensland, 2017. Includes material © Planet Labs Netherlands B.V. 2017, reproduced under licence from Planet and Geoplex, all rights reserved. Landsat data available from the U.S. Geological Survey. Data acquired under the Spatial Imagery Subscription Plan (SISP) and QSat initiative).

In addition to the two mounds remembered by Elders as burial places, Mound 14 has a marked child's burial at its base, and a number of the mounds have grave goods or markers including coral pieces (which are also used as grave markers at the Mapoon Mission Cemetery), historic items such as a metal-pronged spear head, and flowering trees such as frangipani and native flowering species. The mounds on Cullen Point were recorded during the mission time (1891–1963) as shell mounds or scrub fowl nests (Nelson 1936). Some of the mounds have been repurposed by scrub fowl (e.g. Mounds 14 and 18) where there is an abundance of organic litter; however, many of the mounds have no evidence for current or past scrub fowl use.

Earth mounds in northern Australia

Earth mounds are defined by Brockwell (2006: 47) as "those which are composed mostly of soil and sand" and may also contain artefacts, charcoal, burnt termite mounds and faunal remains (including shell). While there is some intersection between earth and shell mounds, where the ratio of earth to shell is on a continuum, here we discuss earth mounds as defined by Brockwell (2006: 47). The earth mounds of the Mapoon and Weipa region are distinct from the prominent shell mounds of the Weipa area, which can reach up to 14 m high (but are generally less than 1 m), are dominated by a shellfish matrix of *Anadara granosa* and represent food production strategies focused on estuarine ecosystems (Morrison 2010, 2013; Morrison *et al.* 2018; Shiner & Morrison 2009). Morrison (2010: 123) notes that the low earth mounds of Aurukun contained little or no shell and were probably formed as a result of different activities than those of the Weipa shell mounds.

Earth mounds appear in the Australian archaeological record from the mid-Holocene, proliferating in the late Holocene from 2000 years BP (Brockwell 2006; Brockwell *et al.* 2009; Westall & Wood 2014). The increase in earth mound construction during this time has been linked to the debate on changes in socio-economic patterns apparently observed in the archaeological record for this period (e.g. Lourandos 1983; Williams 1988). Westall and Wood (2014: 35) note that the emergence of mound construction has been connected to "a more sedentary mode of occupation supported through the intensive and systematic exploitation of resource rich habitats from the mid- late Holocene" (e.g. Lourandos 1983; Williams 1988).

The earth mounds of northern Australia are mainly located on the coastal plains of Arnhem Land and around Weipa in western Cape York Peninsula (e.g. Bourke 2000; Brockwell 1996a, 1996b, 2001, 2005, 2006; Brockwell *et al.* 2017; Burns 1999; Cribb 1986, 1996; Meehan 1988, 1991; Meehan *et al.* 1985; Shiner & Morrison 2009; Peterson 1973; Woodroffe *et al.* 1988). In a review of northern Australian earth mound research, Brockwell (2006) concluded that mounds vary in morphology and function. These various functions include burial places (Cribb 1986; Guse 2006; Meehan 1971), but also territorial markers (Burns 1999: 67), foundations for shelters (Peterson 1973), seasonal base camps (Brockwell 2001, 2005; Burns 1999; Cribb 1986; Guse 2006; Meehan 1988, 1991; Peterson 1973; Roberts 1994), ovens (Bourke 2000; Guse 2006; Meehan 1988, 1991; Peterson 1973) and "kitchen sinks" (Ó Foghlú 2017) and domiculture or gardens (Cribb 1996). Brockwell (2006) concluded that many earth mounds were probably multifunctional.

A recent study by Brockwell *et al.* (2017) of earth mounds in Wathayn country examined coastal/estuarine earth mounds on the floodplains near the Embley River, Weipa (also see Ó Foghlú 2017; Ó Foghlú *et al.* 2016). The mounds are described as low-lying and easily overlooked (Brockwell *et al.* 2017: 129). Photographs of the mounds

Figure 2. Mound 14, the highest mound surveyed, has been repurposed by a scrub fowl. This mound has a child's burial (Ling family) dating to the mission period at the base of the mound with a grave marker (fenced area at left of photograph). [Colour figure can be viewed at wileyonlinelibrary.com]

(refer to Brockwell *et al.* 2017: 129, fig. 2; Ó Foghlú 2017: fig. 1) indicate that these mounds are low-lying and not readily distinguished from the surrounding landscape. This contrasts to the mounds on Cullen Point, Mapoon, where the average height of the 13 mounds discussed in this paper is approximately 1.7 m and nearly all are easily recognised as high points in the landscape. Detailed excavation and analysis of seven mounds revealed the presence of stone artefacts, charcoal and limited shell, as well as the remnants of burnt termite mounds (Brockwell *et al.* 2017: 129). No evidence for human remains was reported.

These mounds have been interpreted as "kitchen sinks", defined by Ó Foghlú (2017: 56) as "sites focused around fire, earth oven and surface cooking, and all of the social and utilitarian products and by-products of intense, concentrated, human activity". Radiocarbon dates on both shell and charcoal from excavation of these mounds indicates that they came into use after 2200 BP, but mainly within the past 500 years (Brockwell *et al.* 2017). Although the mounds located on Cullen Point are also coastal, they are significantly different in their size and composition, to mounds reported by Brockwell *et al.* (2017) and Ó Foghlú (2017).

The use of mounds for burial purposes in northern Australia is noted by Cribb (1986: 150), who stated, of an earth mound at Mithanganaw, Aurukun (160 km south of Mapoon), that "there was some speculation that low depressions on the surface filled with dark soil containing fragments of bone may have been the result of cremations but it was felt prudent by all not to pursue this line of investigation further, cremation grounds being considered extremely sensitive places". Woodroffe *et al.* (1988) also reported the presence of human remains within one of four "surface" mounds, composed of shelly silt or clay, located on the floodplains of the South Alligator River, Northern Territory. Guse (2006) discussed the presence of eroding human remains at a number of mounds in the Daly River region of the Northern Territory. Guse (2006: 107) stated that "some of the cranial fragments found were painted with ochre, indicating secondary mortuary practices were undertaken at these sites. The interment of the dead at these mounds is significant for the Aboriginal and mythological landscape. Estate ownership may have been strengthened through the burial of a clan group's ancestor at a particular site."

Mortuary practices in Mapoon

Information concerning Tjungundji mortuary practices is sensitive and mission impacts may have restricted cultural knowledge being passed down, particularly to children who grew up in dormitories and were spatially isolated from camping sites. Some contemporary Elders were told that it was customary for family members to carry the bones of their deceased wrapped in a particular tree bark for "three moons", not talking to anyone during this time (Flinders & Day 2010). Mortuary practices were also perhaps influenced by age, gender and whether the deceased had surviving kin (Sutton *et al.* 2013). Prior to missionary influence and contact with Europeans, circa the 1890s, McConnel (1936: 340) maintains that mummification was the "orthodox procedure" for mortuary practices for the language speakers of the region. Her description of traditional mortuary practices (McConnel 1936: 350) share similarities with those of Roth (1906), specifically with respect to the removal of internal organs from the body and placing the corpse on "a platform supported on four forked sticks … in some tribes it is tied to a pole which is supported on two forked sticks". In Aurukun country, south of Mapoon, mounds were also used for cremations (Peter Sutton pers. comm. 2016). McConnel (1936: pl. 1b) showed a funerary platform similar to a pyre, with mourners standing on a low-level mounded surface in Archer River within Aurukun country.

Mortuary practices post-mission (c.1898) in the Pennefather River region, south of Mapoon, were documented as being "fairly typical" of other parts of "the upper portions of Cape York Peninsula", where "Old men and women, as well as young women, are buried within a day or two after death in the neighbourhood of the camping ground, and the camp shifted" (Roth 1906: 368). In this part of Mapoon Lands, Roth (1906: 368) reports that children "are usually put out of sight directly after death, though sometimes they may be carried about, wrapped up in bark, until they get dried, before being stowed away rather than buried among the roots of a tree, in a cave, etc." Documentary material indicates that younger men who died at the Mapoon Mission and other sites throughout Cape York Peninsula were bound in "a sheet of bark" and "slung to a pole supported by two forks" and then smoked or partially cremated, "the nearest tree is marked … and the camp shifted" (Roth 1906: 368-70).

The full impact of the missionaries on traditional mortuary practices is unclear. McConnel (1936: 349) recorded different mortuary practices in western Cape York Peninsula (including Mapoon Aboriginal Lands), including placing dead bodies in "bark bundles" in caves and interment of the dead by burial, mummification and cremation on funeral pyres. McConnel (1936: 349, 356) attributed changes in mortuary practices due to the decrease in the numbers of "mourners" in the mission time to perform elaborate rituals of mummification and cremation and due to the encouragement by missionaries for adoption of Christian burial. As observed by Rev. Hey (1900: 10), burials were the predominant, if not the only, method of mortuary practice from around 1900 as a result of his or other missionaries' coercion: Hey's account indicates that Christian burial was accepted by some but may have been rejected by others living at Mapoon Mission in the earliest decade of its establishment, and perhaps even later. If Indigenous people did accept some form of Christian burial as Hey reported, this probably occurred from 1900 onwards, based on the absence of earlier archival, oral or archaeological evidence. During the mission time, timber caskets were used; however, blankets or wrappings were also known to be used, even up to the mid-1950s, influenced perhaps partially by the availability of coffins and the operation of the saw mill (Rev. Filmer pers. comm. 2017). Burials within the Mapoon Mission Cemetery (detected by GPR) are predominantly casket burials; however, there are clusters of non-casket burials in this area that may predate the mission (Sutton *et al.* 2013).

As argued by Hey (1900) and McConnel (1936), the impact of missionaries on traditional mortuary practices is contested. As noted by the last missionary, Rev. Filmer, there were times when a missionary was not present to oversee final mortuary practices or the burial; such tasks were often left to the Mapoon women. The missionary would come to provide a Christian service when asked (Rev. Filmer pers. comm, 2017); however, it is unclear whether "traditional" burial practices ever ceased during the Mapoon mission time. The outstations and camp sites of Shadforth's Landing are over 6 km south of the Mission compound at Cullen Point, and are more concealed than those identified closer to the Mapoon Mission due to distance, denser vegetation and the layout of the historical tracks associated with the Mission. These places were perhaps havens for traditional cultural and burial practices, as indicated by the presence of bora, dancing and fighting grounds near these locations.

Continuity of cultural practices from the mission time to the present is seen in burial customs still used today. Coral pieces and shell (local mixed marine species of varying sizes) were often used to decorate burial places, and evidence of this practice is visible within Mapoon graves and cemeteries today. During the mission time, the "old people" would collect shells from the beach in handmade baskets and later use them to line graves (Mrs Harriet Flinders, interview, 17 December 2010; Audio Recording #VN680010 cited from Sutton 2015). Flowering trees such as frangipani and Christmas trees were also sometimes planted on top of burial sites to demarcate their locations. During mourning, the name of the deceased was not mentioned for some period of time, a practice that continues in Mapoon today. Burials have tombstone opening ceremonies many months after the burial ceremony, which include customs similar to those of the mission time, such as the decoration of tombstones with ribbons, flowers, mementoes, shells and other decorative items (Sutton 2015).

METHODS

A total of 13 mounds (of 27 surveyed), at six sites were investigated with ground-penetrating radar and magnetometry (note that Mounds 14 and 18, Shadforth's Mounds A and B and Jack Brown's Mound were not investigated with magnetometry) (for a summary of the sites, see Table 1). Prior to GPR survey, low vegetation was cleared, grids established and located using real-time kinematic (RTK) GPS mapping and drone imagery was taken where vegetation allowed. The GPS points collected for each grid were used to produce a digital elevation model, in order to adjust the GPR reflections to topography. Radar reflections were collected with the GSSI (Geophysical Survey Systems Inc.) Subsurface Interface Radar (SIR) Model 3000, with a 400 MHz centre-frequency antenna. A survey wheel was used for encoding distance into the reflection data string, which was then tied to the grid datum points. Reflections were recorded in a 55 ns time window and received frequencies lower than 200 MHz and higher than 800 MHz were filtered out. Profiles were spaced every 50 cm for complete coverage, except at Mound 14, where profiles were collected every 1 m spacing due to the steep, unstable nature of the mound (this is the steepest and highest mound at ~3.9 m).

Reflection profiles were created with stacked traces showing variations in amplitudes of reflected radar waves in two dimensions (Conyers 2012: 26; 2013: 36), all of which were adjusted for topography using the digital elevation model. All profiles were analysed individually and the varying amplitudes in space were recorded as three-dimensional (3D) plot points in order to predict whether these features were representative of dipping beds of sand dune strata, contact layers of sand and bauxite, tree toots, animal burrows, and physical properties of burials, caskets and associated materials within the sediment matrix. The higher the physical contrast between the burial and the surrounding sediment, the greater was the amplitude of the reflected wave generated at that contact (Conyers 2013: 59).

Previous GPR studies of burials on Cullen Point identified from local peoples' memories (Conyers 2015; Sutton *et al.* 2013; Virtus Heritage 2017), areas with eroding human remains (Sutton *et al.* 2013) and extant grave markers (Sutton *et al.* 2013) at the Mapoon Mission Cemetery were used as models for what burials look like in the mounds reported on here. The Mapoon Mission

Table 1. A summary of the mounds investigated with magnetometry and/or GPR.

Site name		Approximate height (m)	Approximate diameter (m)	Features	Number of potential burials
Mounds 5–7	Mound 5	1.5	22.5 × 20	Coral	44 (including and between Mound 6)
	Mound 6	2.2	15 × 15	Coral	44 (including and between Mound 5)
	Mound 7	1.6	15 × 15		12
Mound 12	Mound 12	1.5	14 × 13		5
Mound 14	Mound 14	3.9	25 × 20	Coral, marked grave	3
Mounds 16–18	Mound 16	1.9	18 × 18		0
	Mound 17	1.2	15 × 15		0
	Mound 18	1.7	13 × 13	Coral	0
Shadforth's Landing	Mound A	1.5	20 × 18	Frangipani	11
	Mound B	1	10 × 8		3
	Mound C	1	30 × 18	Native flowering tree, building foundation seen with GPR	8
	Mound D	0.5	23 × 15		1
Jack Brown's Mound	Jack Brown's Mound	1.4	20 × 18	Coral, frangipani trees, metal spear	27

Cemetery contains interments of both ordered and well-organised rows of wooden coffins (European-style graves, probably mission-time remains) as well as random clusters of burials (probably traditional-style or wrapped). The latter were usually lower in amplitude, tended to be grouped together and were often marked on the surface by coral clasts.

Both at the Mapoon Mission Cemetery and in the mounds, burials are visible in GPR profiles as hyperbolic-shaped reflections ranging in depth from 1 to 2.5 m. They are visible as this shape when viewed in profile (Conyers 2006; 2012: 129; 2013: 61), as radar energy moves out from a surface antenna in a cone, and therefore detects a burial prior to being directly over top of it, and then again as it moves away from it (Conyers 2013: 62). The apex of the hyperbolic reflection is therefore the location of the burial. At Mapoon, it was found that if burials were in caskets or wrapped in a material that retained the shape of the body, a velocity contrast with the surrounding sand occurred and reflection hyperbolas were created when GPR data were collected in profiles. There are many variations in this general hyperbolic reflection feature. In general, caskets that may still contain void spaces are more reflective than the textile-wrapped interments, with retained voids producing distinctive radar velocity contrasts that reflect high-amplitude radar waves. Older, traditional burials, which have largely decomposed, still reflect energy-generating hyperbolic-shaped features, but the amplitude of the reflections is lower, as the velocity contrast between the human remains and the sand is less than that produced by a void space.

Animal burrows, which contain void spaces, produce distinctive air waves, which produce straight lines on the reflection profiles. These are generated as radar waves that move to and from the surface antennae into the highly reflective voids, and back to the radar antennae. Metal debris on the surface produces "barber pole"–shaped reflections as radar energy reflects many times between the metal objects and the surface antennae, creating multiple, stacked, high-amplitude reflections. Reflections that are indicative of these features were identified by examining each profile individually, in concert with neighbouring profiles and amplitude maps, in order to discount these as cultural features of interest.

In order to identify burials, as distinct from other features, each reflection profile was interpreted individually, the typical hyperbolic reflections produced from burials (based on the Mapoon Mission Cemetery models: Sutton *et al.* 2013) were marked and the locations of all the burials were recorded in 3D space. To be confirmed as burials as opposed to tree roots, miscellaneous stones or animal burrows, hyperbolic reflections interpreted as being produced from burials had to be visible in three parallel GPR reflection profiles (separated 50 cm apart) and their subsurface orientation needed to be consistent with the size and general shape of a human body.

The magnetic data were collected with a Bartington dual-sensor magnetic gradiometer on a cart with all data points placed into space with GPS within each GPR grid. Data points were placed into space so that both GPR and magnetic values and profiles could be directly compared. The results of the GPR and magnetometry methods were first analysed and interpreted separately, and then integrated along each profile of data that were collected as well as in plan view. In this way, the GPR reflections that show 3D aspects of the stratigraphy in the mounds could also be interpreted with respect to their remnant magnetism and magnetic susceptibility (Conyers 2018: 42).

RESULTS

Details on the GPR method and its integration with magnetometry from a methodological standpoint has been published elsewhere (Conyers *et al.* 2018). In that work, the methodological approach was presented using Mounds 5, 6, 7, 16, 17 and 18 as case studies. Here, the results of that geophysical integration are presented, in addition to those from other mounds, and interpretations are discussed in relation to ethnohistorical burial practices and the continuity of burial practices by Traditional Owners in particular.

GPR evidence for potential burials

The GPR profiles of the Cullen Point mounds contain a variety of reflections including roots and animal burrows, and in some cases surface and near-surface metal debris (Figure 3). Roots are mostly visible in the upper 30–40 cm of each profile as low-amplitude reflection hyperbolas. The sandy terrain of Cullen Point provides the ideal environment for GPR, as the sand is effectively "invisible" with respect to radar wave penetration (Conyers 2013). Energy passes with minimal attenuation, and reflections from burials and other objects are definable, once geological units are studied from the local exposures.

The number of potential burials identified with GPR in each mound represents a minimum number of potential burials, as highly decomposed burials, or those that do not have any cultural material associated with them, may not reflect radar energy and are therefore effectively invisible with geophysics. The GPR method detected between one and 27 burials within ten of the 13 mounds (except for Mounds 16–18) and surrounding areas. These burials include recent (probably mission-time) European-style burials with coffins and also traditional Aboriginal interments (e.g. wrapped burials). If the mounds contained cremated human remains, they remain invisible using the methods employed here (which may be the case for Mounds 16–18, which contain no GPR-defined burials).

Mounds 5–7 are clustered within a discrete area of approximately 2500 m^2, with a total of 56 potential burials identified with GPR across all three mounds. GPR data (collected within one grid) identified 44 potential burials within Mounds 5 and 6 and the area surrounding them (Figure 4). Many of these burials are clustered on the northern flanks of the two mounds, and about a quarter are in the level area between and around the mounds. No burials are located on the crest of the mounds, an interesting spatial occurrence that is replicated across nearly all the mounds examined in the study area to date. The majority of the 12 burials identified within Mound 7 are also clustered on the northern side.

Five burials were identified within Mound 12 (Figure 5) and three on the northern side of the mound, with the remaining two on the southern side. If there are burials located near the crest of the mound, they are obscured by animal burrows and the roots of the two large trees growing on this mound.

Mound 14 is located adjacent to the marked grave of a child, buried during the mission time, and subsequently fenced. Ethnohistorical accounts report that the father of the deceased child walked approximately 50 km over hot sand dunes to bury his son at the base of this mound during the mission time (Mapoon Elder A pers. comm. June 2015). Three reflection profiles characteristic of burials, including two European-style burials and one traditional burial, were identified within Mound 14, all clustered on the northern flank of the mound (Figure 6).

Mounds 16–18 are a discrete group of three mounds covering an area of approximately 2500 m^2, located 200 m to the east of Mounds 5–7. No burials were detected with GPR in these three mounds. These mounds are associated with nearby fighting and dancing grounds, bora grounds and the story place of a spirit being.

Mound A at Shadforth's Landing is the largest and highest of the four mounds in this group. This Mound was identified by Elders as a family burial place. A total of 11 burials, including one between Mounds A and B, were detected by GPR. Most of the burials cluster on the east and south-east portions of the mound, with only two burials identified on the western flank. A single burial was identified within the flat area to the east, between Mounds A and D. Several low-amplitude reflections on the flanks of the Mound A may represent older, traditional burials. However, a number of high-amplitude reflections towards the crest of the mound represent (mission-time) casket burials, some of which had void spaces detected by reflections from both the top and bottoms of the caskets (Conyers 2015).

Three burials were detected within Mound B, all in the northern portion of the mound. This mound is lower than Mound A and was heavily vegetated; therefore, detection of burials was made difficult by the multitude of tree roots creating reflections in the upper deposits. Mounds C and D are the lowest of the mounds investigated at between 0.5 and 1 m high, and are distinct from the other mounds, being elongate in shape rather than circular. A total of eight burials were identified within Mound C and one within Mound D (Figure 7).

Jack Brown's Mound is the second of those remembered by Elders as a burial site that had been used for a long time (Figure 1). Elders were unable to say how many burials had taken place there; however, the presence of mature frangipani trees and other grave goods such as a post-contact spear and coral fragments, suggest that the site was at least used during the mission time, but may have been used earlier. As with most of the mounds studied with GPR, tree roots and animal burrows created a complex of reflections in the upper layers, which may obscure additional burials. However, at least 27 potential burials were identified within Jack Brown's Mound and on the surrounding flat area. These burials represent both casket burials and a few of what are possibly older, traditional burials that may demonstrate continuity of site use pre- and post-contact. Excellent examples of mission-time burials are five, very ordered, equidistant casket burials (seen as high-amplitude reflections), orientated in an east–west

Figure 3. High-amplitude "barber pole" reflections from metal debris in upper deposits of Mound 12. [Colour figure can be viewed at wileyonlinelibrary.com]

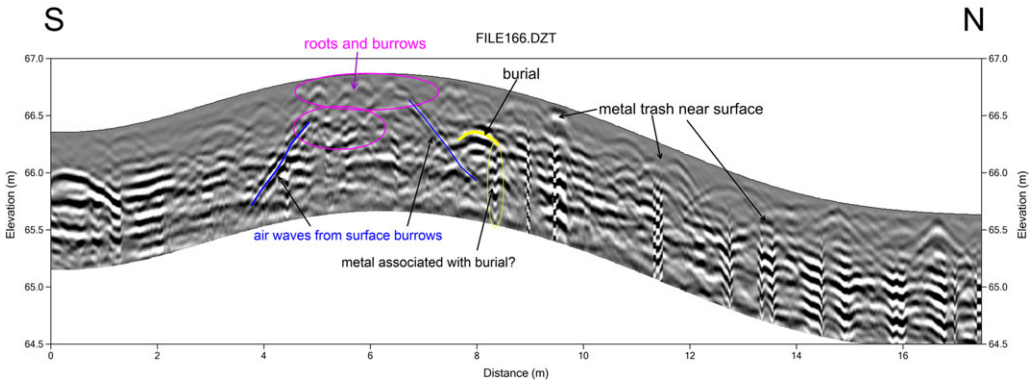
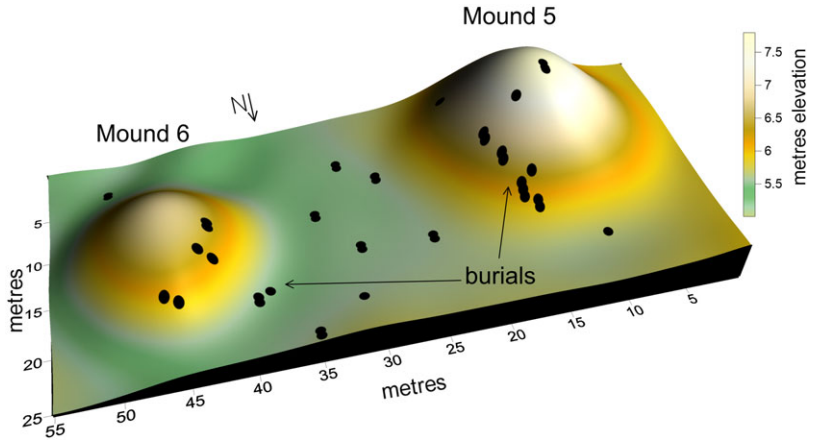


Figure 4. The 3D surface of the ground, with the locations of the burials at Mounds 5 and 6 (after Conyers *et al.* 2018: fig. 4). [Colour figure can be viewed at wileyonlinelibrary.com]



direction and interred at the same depth, located within the upper deposits on the crest of the mound (Figure 8). Many of the burials within this mound are orientated roughly east–west and may indicate that these burials are post-contact and were influenced by Christian traditions (Conyers 2015).

A direct comparison of the GPR maps and profiles with the magnetic readings collected in the same grids at Mounds 5, 6, 7, 12, 16, 17 and at Shadforth's Mounds C and D indicate that the burials have no magnetic signature (Conyers *et al.* 2018). This is not surprising, as human remains contain no ferrous materials and no remnant magnetism or magnetic susceptibility. Even cremated remains would not be detectable with magnetics, unless in association with iron burial items, which were not identified here. Instead, the magnetic mapping was suitable only for studying variations in the pre-mound ground surface, which had been selectively burned prior to mound construction (Conyers *et al.* 2018).

Other features within the mounds

Burials were not the only cultural features identified at the mound sites. Jack Brown's Mound, Mounds 5, 7, 16 and 17 and Shadforth's Mounds A, C and D appear to have been built on top of constructed/prepared surfaces/platforms or contain stratified buried surfaces, and in the case of Shadforth's Landing, have evidence of structural remains, possibly stone or coral footings.

At the base of the GPR profiles at Jack Brown's Mound, the horizontal bauxite bedrock layer is visible, which is easily distinguished by its high-amplitude, somewhat disorderly reflections created by the individual layers in that weathered rock formation (Figure 8) (Conyers 2015). In the middle of the mound proper, there is a layer that appears to be a constructed surface built upon what is a subtle rise in the bauxite bedrock. This horizon may be natural (such as the initial stages of sand dune formation), but its steeply sloping edges suggest otherwise.

GPR profiles from Mound 5 show a number of distinctive reflection features, which indicate that it was built over a hard-packed surface (Conyers *et al.* 2018). In this case, it was not built above the ground surface when in use. Instead, it appears to have been altered by compaction, and the surface contains many objects that are large enough to reflect radar energy (greater than about 20 cm in diameter). An amplitude map reveals a broad surface about 10 × 7 m in dimension located under the north flank of the mound (Figure 9). Mound 7 also has some interesting

Figure 5. A 3D slice through PBM 12, showing the locations of the two burials on the southern flank of the mound.

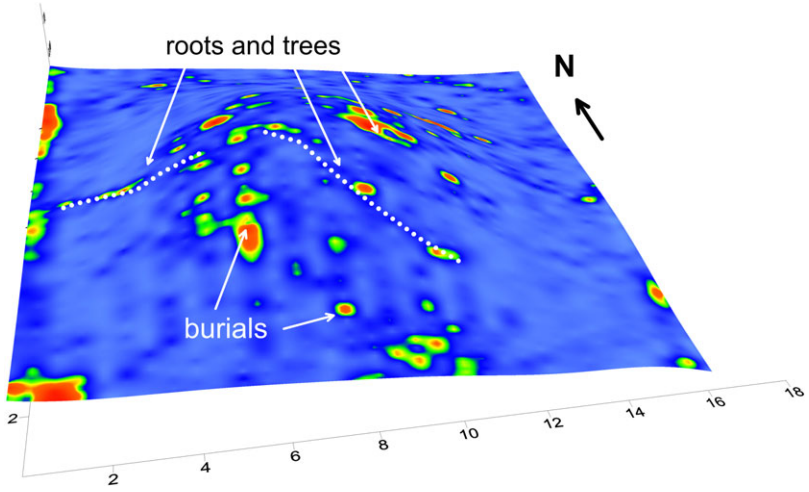
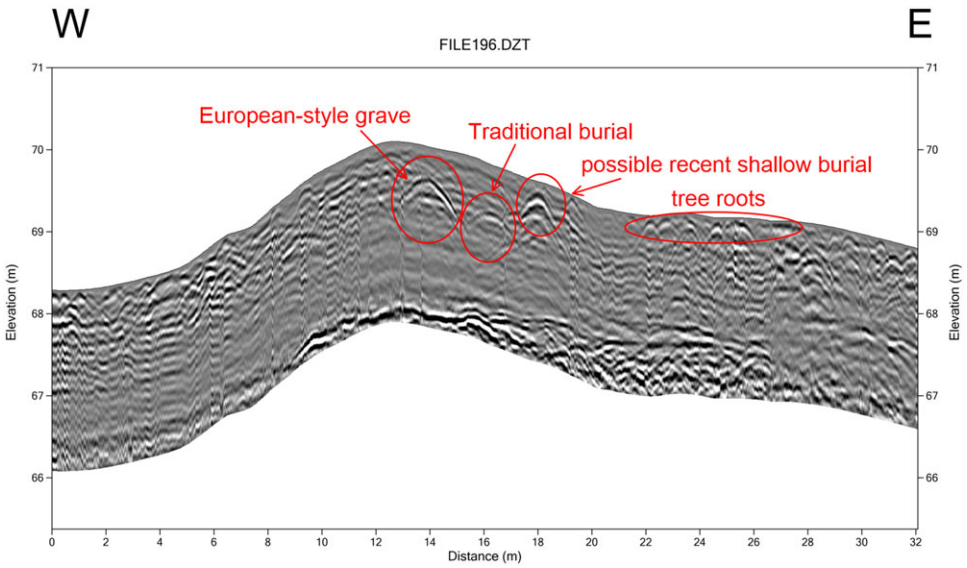


Figure 6. Representative GPR profiles from Mound 14, with high-amplitude reflections representing European-style burial coffins and a single potential traditional burial. [Colour figure can be viewed at wileyonlinelibrary.com]



internal surfaces, which appear to be stacked on each other on the north side of the mound. Those surfaces are built directly on what was the ancient natural ground surface (Figure 10).

The reflection profiles from Mound 17 show the ground surface as a distinct, flat area, upon which the mound was built (Figure 11). This pre-mound surface unit produced a high-amplitude reflected wave, consistent with the interpretation that it is either compacted or composed of some type of material that was imported here for paving/construction (or both) (Conyers *et al.* 2018). This feature is approximately 20–40 cm thick at the base of the mound fill and lies on top of the original ground surface. Some of the mound layers dip to the east, which is consistent with aeolian accretion. These aeolian units were perhaps deposited over this surface after it ceased to be used and maintained, but before it was converted to a burial mound. Other sedimentary units visible with GPR are more likely to be anthropogenic fill units that have parallel horizontal bedding planes. Whatever the origin of these fill units, the mound is predominantly a human construction, whereby large volumes of sediment were placed over the compact feature on the original ground surface. A GPR amplitude slice from 50 cm above the ancient ground surface shows the distinct square shape of the feature under Mound 17, and no surface whatever under Mound 18 (Figure 12).

It is notable that Mound 18 has no constructed feature below the mound fill. This mound (along with Mound 16, some 20 m to the south) has an abundance of highly fragmented shell, which may be related to the chenier in underlying deposits (cf. Mitchell 2017). In contrast, there is a distinct high-amplitude arc of materials under Mound 16, which could be a layer of midden material. The

Figure 7. The 3D surface at Shadforth's Mounds C and D, showing the locations of the burials and the outline of a structure discovered between the mounds.

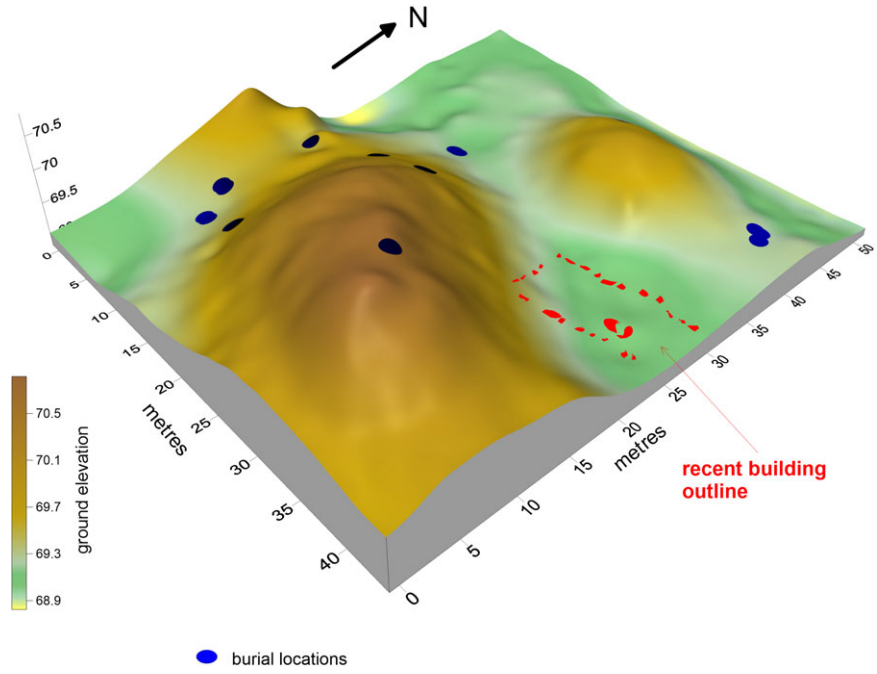
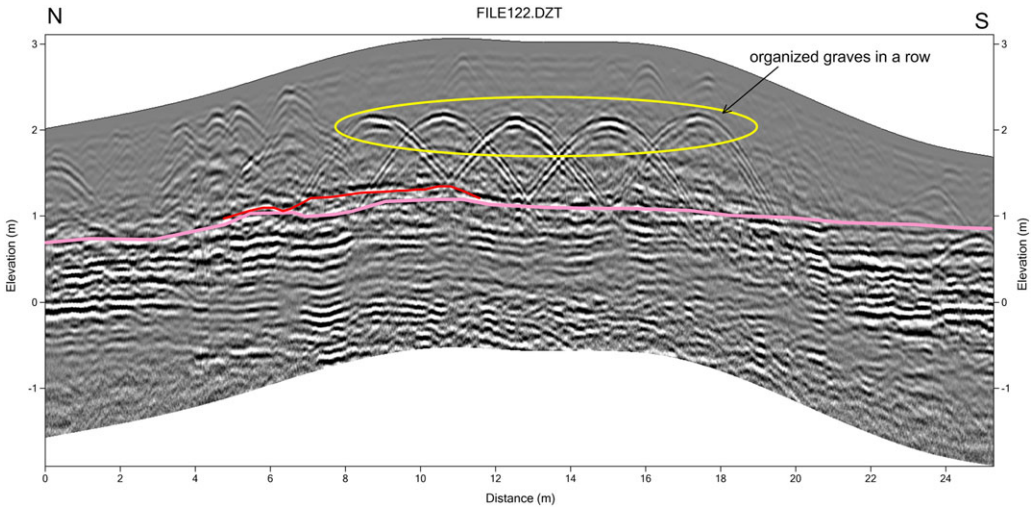


Figure 8. Five orderly casket burials at Jack Brown's Mound. [Colour figure can be viewed at wileyonlinelibrary.com]



high-amplitude surface under Mound 16 does not resemble the same type of flat, compacted layer visible below Mound 17, which is more square or rectangular in shape. Additionally, the corresponding positive magnetic readings from these layers in Mounds 16 and 17 indicate that they were subject to relatively intense burning (Conyers *et al.* 2018: 6). Whatever the original use of the sites, all three areas were ultimately converted to mounds when still unknown pre-mound activities ceased.

The topographically corrected reflection profiles at Shadforth's Mound A show the bauxite layer buried by ≥ 1.5 m of sand. There is no constructed surface on top of the bauxite here (as seen at Jack Brown's Mound), but the bauxite appears to have been a naturally high surface upon which the mound was built. When all the GPR reflection profiles within Mound C were analysed in a horizontal slice at the base of the mound fill, two roughly rectangular, buried, compact surfaces can be seen at the base of the mound (Figure 13). The buried surface in the north-west section of Mound C is far less distinct than that in the eastern section, but appears to be rectangular or square in shape, much like others visible in the area. Mound D also appears to have a similar pre-mound surface below it.

In addition to the features described above, the remains of a structure or building were identified between Mounds C and D at Shadforth's Landing (Figure 7). In the amplitude map, which displays reflections from the upper 40 cm of the

Figure 9. An amplitude map of Mounds 5 and 6, showing the radar reflection intensity of the ground surface before the mounds were constructed. Mound 6 shows a distinct hard surface under its north flank (after Conyers *et al.* 2018: fig. 4).

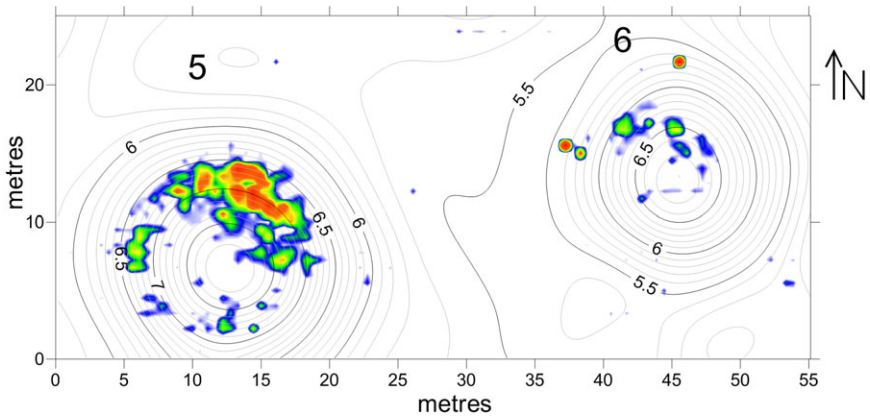


Figure 10. An amplitude map of the surfaces built on the ancient ground surface before Mound 7 was constructed. The modern topography is shown superimposed on this surface. [Colour figure can be viewed at wileyonlinelibrary.com]

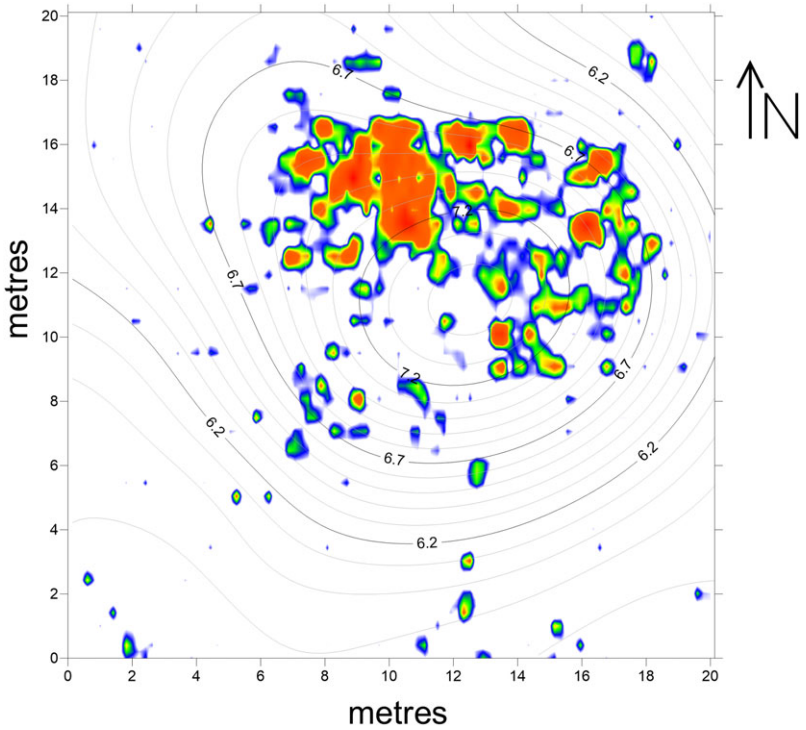


Figure 11. The GPR reflection profile across Mounds 17 and 18, showing the original ground surface. [Colour figure can be viewed at wileyonlinelibrary.com]

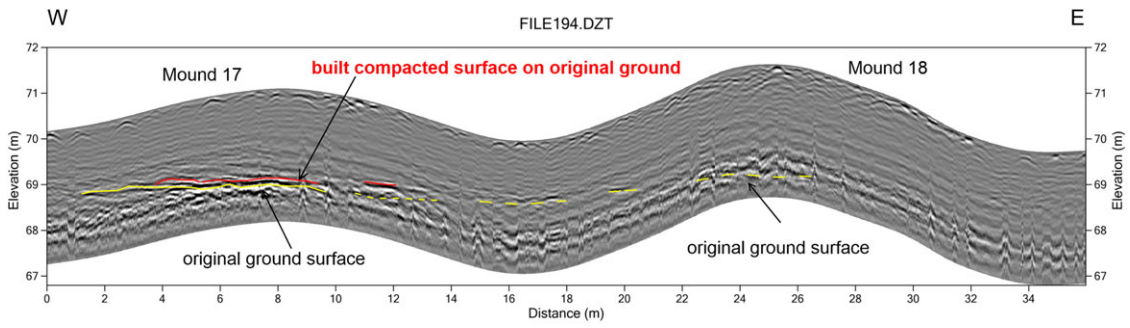
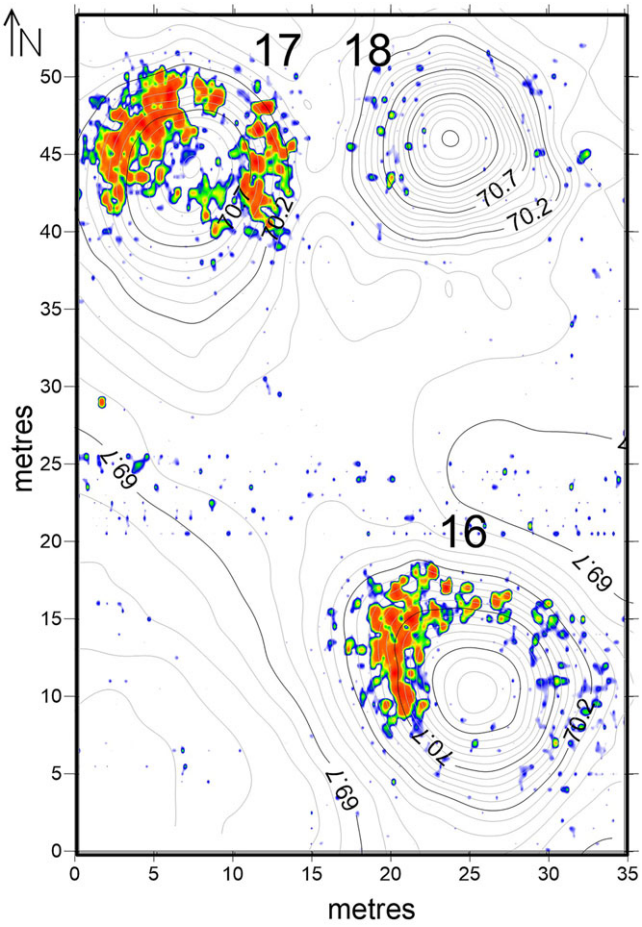


Figure 12. Reflection amplitudes from the materials directly on the ancient ground surface. Mound 17 has a distinct square feature below it, indicating that a prepared and compacted surface was located there prior to the mound building.



ground surface, the outline of a rectangular structure can be seen between the two mounds (Figure 7). The remains are about 10 m wide and 18 m long, making it the potential foundation or outline of a substantial structure. Oral history interviews have not identified its age, origin or function, and there was no evidence for it on the present ground surface (GHD & Virtus Heritage 2017; Virtus Heritage 2017). In the GPR profiles, individual items (probably stones) from this structural feature are visible as distinct reflections within the outline of the building foundation, with other less distinct features of interior construction.

DISCUSSION

A limitation of the GPR method is that the objects and features detected cannot be directly observed. For a number of important cultural and ethical reasons, no archaeological excavations are or will be permitted on the mounds, as they are culturally and environmentally sensitive features, which retain emotional, cultural and historical importance to the Traditional Owners and local residents. Therefore, the results of the GPR study cannot be verified through subsurface investigations, or a detailed analysis of the exact nature of the burials identified with GPR undertaken. Although this limits our ability to interpret the GPR data, geophysical models of known burials at other sites in Cullen Point (Sutton *et al.* 2013) were used to aid interpretation the GPR data with relative confidence.

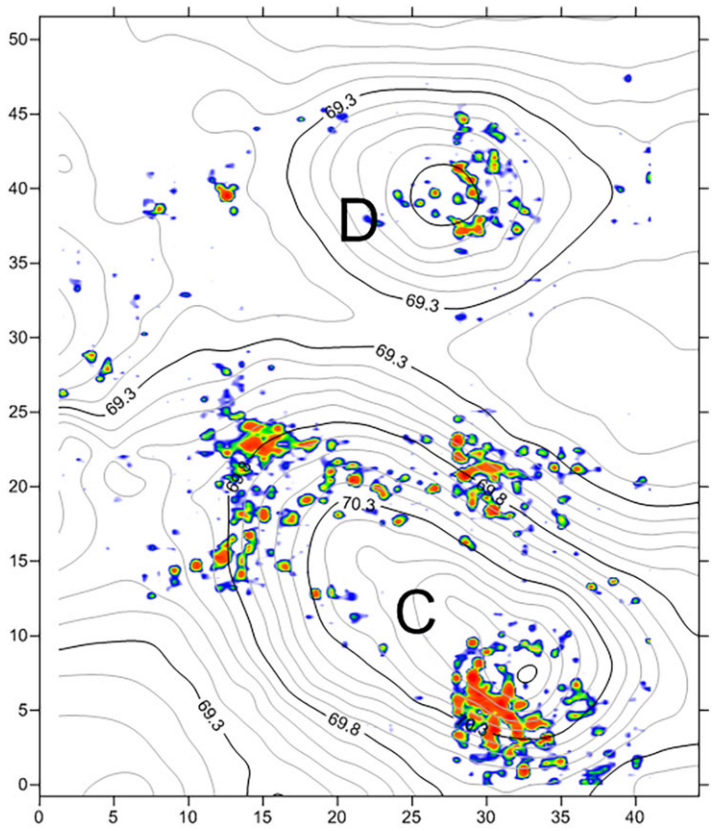
GPR survey of the Mapoon Mission Cemetery (Sutton *et al.* 2013), where burials were either marked or were found in ordered "European-style" rows, were used as models for how human interments appear in GPR reflection profiles and amplitude slice-maps. In that study, it was found that adult burials were distinctly visible, and differentiated from various other reflections, as distinct hyperbolic radar reflections, recorded in three parallel profiles spaced 50 cm apart (Sutton *et al.* 2013). Some burials detected with GPR at the Mapoon Mission Cemetery are confirmed by the presence of eroding human remains (Peter Sutton and Jason Jia pers. comm. 2017). Furthermore, human remains have been identified eroding from Mound 5 (Peter Sutton pers. comm. 2017).

The results presented here are based on geophysical images that are tied to the known (directly observed) geological units in the area. The lowest unit, visible with GPR as very-high-amplitude reflections, is the bauxite bedrock, overlain by windblown sand and capped by weak recent soil horizons. The mound construction material was derived from nearby sand of the same composition as the dune units, which is non-magnetic and electrically resistive. This medium is ideal for both GPR and magnetic mapping. With the basal bauxite unit distinct in all GPR reflection profiles as a high-amplitude reflection, the overlying sand (whether natural dune sand or mound-constructed sand) contains only subtle layering and does not confuse interpretations. As a result, all high-amplitude reflections visible with GPR are bauxite bedrock, tree roots, burials or other large objects that are probably of anthropogenic origin. This geological simplicity and the straightforward identification of units aids the interpretations presented here.

The GPR results indicate that the majority of the mounds studied here were used as burial places, with human interments defined by the same parameters as those in the Mapoon Mission Cemetery (Sutton *et al.* 2013). Given their proximity to Mounds 5, 6 and 7 and to other cultural sites, it is surprising that no burials were identified with GPR in Mounds 16, 17 or 18 (Conyers *et al.* 2018). Although no burials were detected within these mounds, it is possible that they contain only cremated remains or interments that have deteriorated, and therefore provide no contrast with the surrounding sediment that would reflect radar energy.

The presence of burials between mounds, such as those at Mounds 5 and 6, as well as within the flat areas surrounding the mounds, such as Jack Brown's Mound, indicates that burials are not restricted to mounds, but in these cases have a strong association with them. Additionally, there is evidence that families buried their

Figure 13. The deep rectangular features below Mounds C and D at the Shadforth's Landing site. [Colour figure can be viewed at wileyonlinelibrary.com]



deceased in non-mounded areas along the Cullen Point coast (Conyers 2015; Sutton *et al.* 2013; Virtus Heritage 2017). With those burials within mounds, there appears to be some sort of preference for burial in specific directions (i.e. east–west as seen with European-style burials), and also within certain areas of the mounds, particularly the northern side of mounds seen at Mounds 5, 6 and 7. Unlike other mounds examined, most of the burials in Shadforth's Mound C are clustered on the western flank, with one lone burial near its crest. It is unknown what the motivation for these burial location preferences may have been (e.g. ritual). The location of a constructed feature below the northern half of Mound 7, at the same location as many of the burials, may be coincidental or may potentially correlate in some way with activities that took place prior to the mound construction.

The evidence of constructed features associated within or underlying seven of the mounds allows for a provisional interpretation of how these features were used over time. The GPR and magnetics results indicate that there is some variation between these features, with relation to size, shape, compaction or construction and evidence for burning (Conyers *et al.* 2018). Surfaces or platforms were either paved or compacted and were built on sand dunes or subtle rises on the bedrock, perhaps because those features already provided a raised aspect in the surrounding landscape. It is suggested that these areas were later transformed into mounds by shifting sand from nearby areas. At Jack Brown's Mound, it is hypothesised that people constructed a flat surface on what was a small rise and the mound was subsequently built over this surface, followed by its use as a burial place. This may suggest a change in function over time. While the height of the mound suggests additional sand construction, no internal layering in the homogeneous sand is visible in the GPR reflection profiles.

The mound-building process may have occurred in stages, as can be seen at Shadforth's Mound C, where there is a flat surface within the mound. That surface indicates that it was used and modified before the mound had reached its ultimate height. Most of the burials visible with GPR are found in the upper 2 m of mound sediment, indicating that most, if not all, of the burial activity occurred later in the life history of these mounds. Our analysis indicates that human use of these sites may have changed over time, with their use as burial places being only one phase. McConnel (1936) noted that Wik people (from lands south of Mapoon) abandoned camps and areas used for cremation immediately after burial or cremation occurred. Perhaps evidence of episodic mortuary rituals of abandonment and reuse are being shown in the GPR data. Our analysis demonstrates that the Mapoon mounds are much more than simply burial places and, instead, illustrate a complex cultural landscape that has evolved over time.

An indication of this complexity is seen at the Shadforth's Landing, which includes mounds of various shapes and sizes containing burials, pre-mound constructed

platforms beneath three of these mounds and the remains of a structure in the upper deposits of the site. The pre-mound features indicate that Shadforth's Landing had a cultural significance that is not within the living memory of the Elders, who have retained memories of this area being used for burials. Additionally, it is unclear what the function of the remains of the structure between Mounds C and D might have been.

Thomson (1934) and McConnel (1936) record initiation and dancing enclosures, which are partially enclosed square and arc-shaped structures made of sticks, connected to dancing and bora grounds in Cullen Point and Janie Creek. Thomson (1934) stated that "the initiation ceremonies of the Tjuljundji tribe … were carried out on the *trenna* or sacred ceremonial ground, in the centre of which was constructed an enclosure called *mbaga*" and that "the *trenna* or sacred place was situated in the bush some distance away from the camp" (Thomson 1934: 227). Thomson also noted that "a *mbaga*, constructed during the period of my work, measured 26 ft. 6 in. by 9 ft. 2 in. in width. The side walls were 4 ft. 4 in. in height, and were constructed of bullrushes (*sic*) hung on a framework of saplings, the outside walls adorned with three lines of the white feathers of the sulphur-crested cockatoo (p1. XXVII, fig. 1). My informants stated that this *mbaga* was small and that in former times, when there were many young men to be initiated, much larger structures were built" (Thomson 1934: 227).

If stones or coral clasts were used to anchor the bulrush walls of such an enclosure, it is possible, given its rectangular shape and size (10 × 18 m), that the remains of the structure identified at Shadforth's Landing could be indicative of one of these dancing enclosures; particularly given Thomson's (1934: 227) informant's statement that, previously, these were built on a larger scale (compared to the 3 × 9 m example that Thomson witnessed). It is impossible to know exactly what the structure's function may have been, but given ethnohistorical evidence for ceremonial structures of similar size and shape, it is reasonable to hypothesise that the remains of the structure at Shadforth's Landing site may have had a ceremonial function.

Earth mounds elsewhere in northern Australia, including those used as burial places (e.g. Cribb 1986; Guse 2006; Woodroffe *et al.* 1988), are considered to have had more than one function (see Brockwell 2006) and it appears that the mounds at Mapoon are similar in that respect. One frequently argued function of many earth mounds in northern Australia is their use as "earth ovens" over a period of many years (e.g. Bourke 2000; Guse 2006; Meehan 1988, 1991; Peterson 1973). Analysis of the magnetics results from the Mapoon mounds indicates that there is evidence of pre-mound burning at some of these mounds associated with the subsurface features (Conyers *et al.* 2018). However, remains of earth ovens visible in Mapoon Lands have a different morphology to the mounds discussed here, being constructed of red ironstone and clay and found in swamp lands. The burned surfaces identified at the base of some mounds prior to building is the result of intense burning (Conyers *et al.* 2018) which *may* have been associated with cooking but may also have been the result of funeral pyres and hearths used for cremation and mummifying or "smoking" corpses (cf. McConnel 1936).

Although the Mapoon mounds probably had multiple functions over time (probably ceremonial, but also possibly utilitarian), they differ from other earth mounds in the western Cape York Peninsula region, in that their primary function appears to be mortuary. For example, excavation of mounds in Wathayan country, near Weipa, 80 km to the south of Mapoon, showed no evidence of human burials (Brockwell *et al.* 2017; Ó Foghlú 2017). Although possible, the lack of evidence for mortuary use is unlikely to be a result of sampling, given the size and number of test pits and mounds excavated (Brockwell *et al.* 2017; Ó Foghlú 2017). Our research indicates that the Wathayan mounds near Weipa (Brockwell *et al.* 2017; Ó Foghlú 2017; Ó Foghlú *et al.* 2016) are quite different in morphology and function from those found in Mapoon.

Peterson (1973) noted that earth mounds at Arafura Swamp, Arnhem Land, still in use at the time of his study, were found in clusters, with different mounds within a group serving different functions. For instance, one was used for cooking and one for camping (Peterson 1973: 177). Perhaps the different sizes, orientations and geometry of the subsurface features found in the Mapoon mounds demonstrate similar functional divisions. They may also reflect, as McConnel (1936) noted, episodes of cremation and interment and then abandonment for some time due, for example, to belief in ghosts, before they were revisited in time for a similar purpose. Peterson (1973) also noted that the mounds in Arnhem Land offered raised camping places, to provide relief from insects and to catch cooling breezes. Although this may have been a consideration in the early phases of mound development at Mapoon, the mounds here are generally smaller in area and steeper than other mounds described in the literature and it is unlikely that they were constructed for the main purpose of camping. Further, early photographs taken by the Moravian missionaries of camp sites at Cullen Point do not show use of the mounds as camping places (Moravian Archives 1893–1899).

The earlier functions of areas that went on to become the Mapoon mounds are likely to have been ceremonial and linked to group behaviour that necessitated the construction of a compact and/or raised platform. These activities could have been cremation ceremonies or other activities that in some cases required intense fires that have left a magnetic signature (Conyers 2018: 25). This hypothesis is supported by the elaborate ceremonies noted by the early missionary Rev. Hey for burials in the Mapoon Mission Cemetery and at Cullen Point during the initial periods of contact, during which traditional mortuary rituals were witnessed and recorded (McConnel 1936; Sutton 2015; Thomson 1934). It is also probable that specific mounds may have "belonged" to certain kinship groups and could therefore have acted as territorial markers; in the same way, Guse (2006) has

identified the burial of ancestors within mounds in the Daly River region of the Northern Territory. Constructions of this type, especially if they held the remains of ancestors, could have "strengthened estate ownership" of intra- and interrelated clan groups (Guse 2006: 107).

Given land-forming events at Cullen Point, which indicate that the sand dunes and barrier ridges are unlikely to date to more than 5000–6000 years BP, the Mapoon mounds can be no older than the middle-to-late Holocene. However, no absolute dates have been produced for the mounds themselves, so it is impossible to know when construction of these features began and whether their use was continuous – only that they were at least used in the mission-time period. Given the limited study of the broader archaeological landscape in Mapoon, further survey and excavation of archaeological sites within the area would be required before a debate could occur on how the mound sites might link to broader socio-economic changes seen during the middle-to-late Holocene in western Cape York Peninsula.

The connection of the Mapoon mounds to mission-time and current family homes also needs further research through additional interviews with Elders outside of Mapoon, now living in many other parts of Australia. Mound 14 contains a well-documented mission-time marked burial connected to a known child's grave and is adjacent to the same family's mission-time home. Mounds 5–7 are located within close proximity of the remains of a mission-time family home and a recently constructed home, suggesting that these features are possibly family burial grounds. Similarly, there are clusters of earth mounds present in contemporary family backyards (re-occupying mission-time family lots) at another seven locations, which may also have served as pre-mission-time family camping grounds (GHD & Virtus Heritage 2017). This evidence further documents the continuation of mortuary practices into mission time, where missionary control may not have had as strong a cultural impact as documented by early anthropologists (McConnel 1936; Roth 1906). Initial ethnohistory for these mounds has also shown that mission-time homes were often built on traditional family camping areas, suggesting that nearby mounds were possibly connected with families for a long time, which has continued to the present (GHD & Virtus Heritage 2017). Further investigation of this connection through oral history and archaeological survey is needed to fully understand the relationship of camps, mission-time house remains and current housing to these mounds and their use as burial areas and other possible functions.

CONCLUSIONS

Initial GPR investigations of 13 earth mounds in the Mapoon area suggest that the majority of these mounds were used as burial places during the mission time (1891–1963) and also possibly during the pre-contact period. GPR profiles indicate that all but three of the mounds contain burials, nearly all containing multiple burials. These burials appear to include both European-style coffin burials and traditional (probably bundle or partially interred) burials. Prepared or constructed subsurfaces or platforms were mapped at the base of seven mounds, including two of the three mounds (Mounds 17 and 16) that did not have any detected burials. It is unknown at this stage what these surfaces may have been used for; however, it is possible that they are related to burial practices such as the construction of smoking platforms or funeral pyres. It is also possible that these features are related to as yet unknown functions: if this is the case, it is possible that the mounds may have had several different functions over time. Based on the number of mounds that contain burials, it is probable that at least some, if not many, of the other similar mounds located in Mapoon may also have acted as burial places. The Mapoon mounds are located within a broader cultural landscape and interconnected to mission-time heritage and house remains.

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