George Grey's whalers

Part 1: Report on Kalbarri Site Inspection, 16 October 2005

Part 2: Report on the Site Survey and Excavation 23-27 January 2006



Drawn on Stone by Geo Barnard, from a Sketch by Fred*C Smith Esq* M&N Hanhart Lish Printers 64 Charlotte St Rathbone Fl. Picture of one of Grey's Whalers on the beach taken from Grey's Journals of Two Expeditions of Discovery in Northwest and Western Australia, During the Years 1837, 38 and 39

Edited by Jennifer Rodrigues

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Part 1
Report on Kalbarri Site Inspection,16 October 2005



'Attack of natives near Hanover Bay', from a sketch by Captain George Grey.

Acknowledgements

Thanks are due to Mr Mike McDonnell for accompanying a museum staff and assistant archaeologist to the site and providing information about his finds and metal detecting results. Mr McDonnell also showed the museum staff two other sites in close proximity, which contained remains of bones. In addition, Mr Ted King provided details of the finds and proffered other information that he felt could be related to certain features and artefacts discovered at the site. Mr Gary Finlay, the original finder, confirmed details of his earlier find. Ms Kelly Fleming, PhD candidate at University of Western Australia, assisted with the inspection. Research Chemist Ms Vicki Richards from the Department of Materials Conservation (Western Australian Museum), provided advice on the material identification and corrosion process of the lead fitting.

Abstract

Finders in Kalbarri, Western Australia, discovered lead shot as well as a lead fitting in the sand dunes of one of the local beaches. These were believed to be associated with the explorer George Grey who was wrecked in the vicinity in 1839. In October 2005, the site was inspected by a staff from the Department of Maritime Archaeology, Western Australian Museum, as a result of this discovery, which was reported to the Department. Two other sites, which contained bone fragments, were also recorded because these were in close proximity to the site where the archaeological finds were first discovered.

Introduction

A museum staff from the Department of Maritime Archaeology, Western Australian Museum, inspected a site in Kalbarri, Western Australia, on 16 October 2005. Three local residents from Kalbarri had recovered a large number of lead shot and a lead fitting between 1995 and 2005. The purpose of this inspection was to record the site, collect the artefacts from the finders, gather as much information as possible as well as obtain a GPS position of the site. The finds are of interest to the Museum because of their possible association with the George Grey expedition of 1839, although this has yet to be confirmed absolutely.

Historical background associated with the area

GREY AND HIS EXPLORATION OF THE NORTHWEST COAST

After a long delay of nearly five months, Grey was finally able to leave Fremantle on 17 February 1839 aboard the 302-ton American whaler Russel in order to continue on his exploration of the Western Australian coast including areas of the country lying behind it. He obtained three whaleboats for this task along with a party of 11 support staff, which included a surgeon. Grey's decision to procure three whaleboats was a precaution in the event an accident occurred which reduced the number of boats.

The main objectives of the expedition was to obtain information on the real state of north western Australia, its resources, and the course and direction of its rivers and mountain ranges. It was also to familiarise the natives with the British name and character, to search for and record all information regarding the natural productions of the country, and all details that might bear upon its capabilities for colonisation or the reverse; as well as to collect specimens of its natural history (Grey, 1841: 4). Grey also intended to continue his examination of the section of the coast left unvisited southward of his depot, as far as Gantheume Bay (Grey, 1841: 330).

Grey planned to land at a point northward of Shark Bay with a supply of provisions sufficient for five months. His intention was to establish a provision depot on an island

there so as to use that as a base point from which he and his team could carry out their operations of examining undiscovered areas of the bay (Grey, 1841: 329).

On 25 February, Grey and his team along with their boats, food and other supplies, were disembarked on Bernier Island in Shark Bay. By the early morning of the following day, the men had finished burying their stores. The weather was unfavourable as according to Grey, the winds were so strong that 'throughout the day it blew nearly a gale from the south-east' (Grey, 1841: 333).

From Bernier to Dorre Island

On 27 February, Grey decided he wanted to travel along the shore southward. His boat was launched safely but the second boat, the *Paul Pry*, in which the surgeon was to travel, was not so fortunate. As the men attempted to launch the boat, the water in the bay deepened rapidly from the steepness of the bank. The steersman, who was keeping hold the bow while the crew was launching, became frightened from the depth of water and the violence of the surf that he let go of his hold. The next surf threw the boat side-on to the beach. With half a ton of stores weighted in the boat and the wind increasing at this point, the boat was knocked to pieces in the span of two to three minutes. All the stores in the boat were lost and nothing but a few planks and some clothing were recovered. Although the loss of this boat was a heavy misfortune to the team, Grey had prepared himself for such an accident and still had two boats in his task. Grey anchored his boat in a little cove and put two men to keep watch on the boat. He then swam with the rest of his crew through the surf to render assistance to the other team. The third boat was not launched that day so Grey left his boat in the cove for the night.

The storm continued to worsen during the night but by about 10 am the following day, the wind died down and the men launched what now became their second of two boats left and within a few minutes, both boats were moving along side each other in the cove. With about half a ton of stores in each boat, and the wind and sea still providing less than favourable conditions for the journey, the men struggled on their south by east course. When it was nearly 3 pm, the boats reached the northern extremity of Dorre Island. The men found a convenient little harbour, which was sheltered from the wind by a reef. They left the boats at anchor there and stepped out onto the reef. After spending the rest of the day searching for water and exploring parts of the island, the men got ready to rest for the night.

At about 11 pm, one of the men who was keeping watch on the boats started crying out to Grey that the boats were in trouble due to a strong SE gale. Grey and some of his men swam to the boats and tried to keep them afloat by fastening them to a line from shore. As a result of the gale increasing in force and turning into what Grey described as a 'perfect hurricane', both boats were eventually brought ashore as it was decided they would be safer beached. The storm finally began to lull a little by about half past five the next morning. Shortly after that, the wind changed instantaneously from a SE direction to a NW direction and took the men by surprise. However, this storm finally lulled considerably at about 2 pm.

On 1 March, the men managed to find very little water and Grey suddenly found himself in a very different situation:

Yesterday, we had started in good boats, with strong men, plenty of provisions, everything in the best order; to-day I found myself in a very different position, all the stores we had with us, with the exception of the salt, were spoilt; our ammunition damaged; the chronometers down; and both boats so stoved and strained, as to be quite beyond our powers of repairing them effectually.

(Grey, 1841: 343)

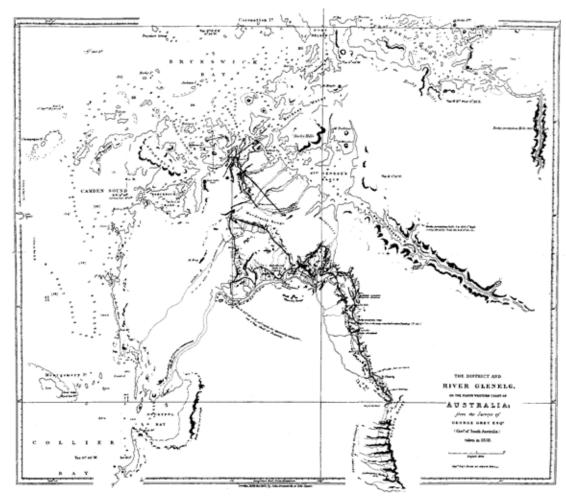


Figure 1. The district and River Glenelg on the north-west coast of Australia, from the surveys of Captain George Grey (Governor of South Australia) taken in 1838.

Grey felt that from want of water, they were compelled to head for the main land before returning to Bernier Island to replenish from their ample stores buried there. However, the boats first had to be rendered as seaworthy as possible before this could be done. Given the need for water, Grey felt that the men would have enough reason and drive to carry out the repair work as diligently as possible.

From Dorre Island to the Gascoyne

The men started working on the boats and carried on until the morning of Sunday, 3 March when the boats were finally ready. By late morning, the boats were launched and the men were happy at the prospect of soon having an abundant supply of water. However, the boats were very heavily laden and with hardly any wind, they started to feel extremely hot and tired and began to get disheartened from seeing no sign of any land. After some rest, the crew continued travelling until they discovered a river on 5 March. Grey came to name it the Gascoyne River, after his friend Captain Gascoyne. Grey and his men then spent the next several days exploring the parts of the Gascoyne, Point Whitmore, Babbage Island and Mangrove Point. Grey soon decided that they needed to return to Bernier Island in order to replenish their stores.

FROM THE GASCOYNE TO BERNIER ISLAND

On 20 March, Grey and his party left the Gascoyne for Bernier Island. When they landed

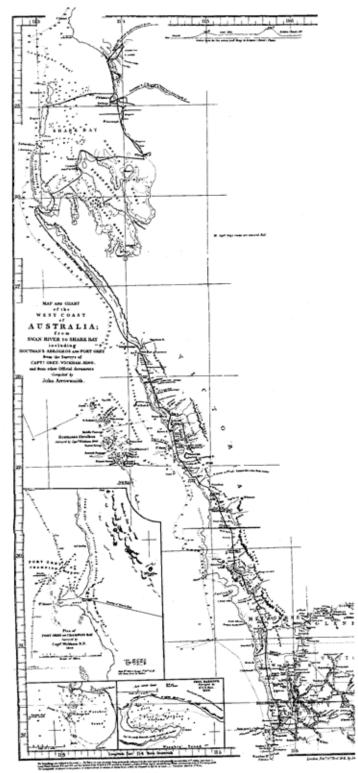


Figure 2. Map and Chart of the west coast of Australia from Swan River to Shark Bay, including Houtman Abrolhos and Port Grey, from the surveys of Captain Grey, Wickham, King and from other official documents.

on Bernier Island, Grey noticed that parts of the island appeared to have been physically altered. The men began to insist that were not on Bernier Island until they sighted Kok's Island, which confirmed that they were indeed on Bernier Island. The violent storms had

caused some disruption to the island and Grey began to worry about the condition in which his depot of stores might be. This turn to alarm when, upon nearing the site of the depot, Grey found staves of flour casks scattered amongst some rocks. They pressed on in the hope that these were the remains of casks which they had earlier used. Subsequently, they came across a cask of salt provisions washed high and dry above the high water mark. After some time, the men came to the site of the depot but it looked so different that they insisted it could not be the same spot. However, upon looking around, they saw another flour cask that had its lid forced open and was half empty. This convinced the men that this was their depot of provisions and one of them immediately took a spade and started to dig the ground vigorously. Subsequently, he proclaimed to Grey that all the provisions were indeed lost. With only one cask of salt provisions and half a cask of flour left Grey now realised that he had to decide on a plan for the safety of his party. After some thought, he send the men in search of provisions as well as to prepare the boats for sea. He eventually decided to continue on his explorations which would take them southwards towards Swan River, thereby approaching home.

On 22 March, the men made their way towards the mainland with the aim of landing at the northern mouth of the Gascoyne. They stayed there until they left on the 24th. After exploring more of the coasts and islands, the party finally departed Shark Bay travelling first through South Passage with the aim arriving in Gantheume Bay, which the mouth of the Murchison River.

LANDING AT GANTHEUME BAY

On 28 March, Grey and his men travelled along Perron Peninsula and made their way towards Dirk Hartog Island. The men eventually beached the boats in a little bay at the NW extremity of the island. The following few days, Grey surveyed a portion of the island and then continued on the course tracing the shore. This continued until 31 March and Grey realised that the character of the coast and unfavourable winds left him no way of landing the boat anywhere. He kept watch that night because of the dangerous position they were in and as soon as there was enough light to distinguish the coastline, Grey and his party sailed on. At about 10 am, they reached the northern extremity of Gantheume Bay. The crew were by now exhausted from their exertion of the last 56 hours, the whole time in which they were in danger, so Grey was determined to land in Gantheume Bay to search for water and allow the crew to rest.

The first boat, which Grey was in, started to search for the most suitable landing spot. They sailed the length of the bay searching for such a place and where fresh water might be obtained. A site was eventually chosen and with Grey at the steering oar, the first boat attempted to land through the heavy surf. Grey describes the next few moments as such:

I stood at the steer oar, I saw this was a heavier surf than we had ever yet been in. We were swept along at a terrific rate, and yet it appeared as if each following wave must engulph (engulf) us, so lofty were they, and so rapidly did they pour on. At length we reached the point where the waves broke; the breaker that we were on curled up in the air, lifting the boat with it, and when we had gained the summit, I looked down from a great height, not upon water, but upon a bare, sharp, black rock. For one second the boat hung upon the top of the wave; in the next, I felt the sensation of falling rapidly, then a tremendous shock and crash, which jerked me away amongst the rocks and breakers, and for the few following seconds I heard nothing but the din of waves, whilst I was rolling about amongst men, and a torn boat, oars, and water-kegs, in such a manner that I could not collect my senses.

(Grey, 1841: 411–12)

Unfortunately, the crew of the second boat had not seen the accident because high



Figure 3. Site of collapsed section where finds were recovered, looking east (Photo: Jen Rodrigues).



Figure 4. Cut within sand dune where Mr Finlay found lead shot, looking east (Photo: Jen Rodrigues).

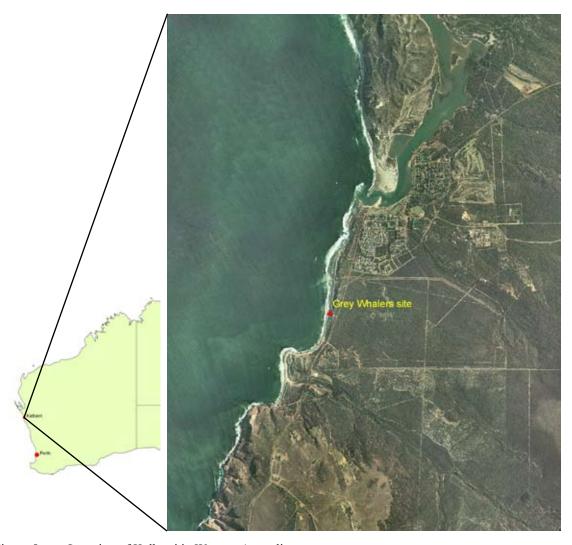


Figure 5. Location of Kalbarri in Western Australia.

waves had obscured their view. Seeing Grey's men haul their whaleboat ashore, the crew of the second boat assumed that conditions were suitable for landing. As a result, they also attempted to land but at a site slightly further south where it was less rocky. Grey tried unsuccessfully to warn the crew of the second boat and eventually, the second boat also became damaged when it struck the shore.

The expedition carpenters examined the boats and reported to Grey that they could not repair either of the boats. Grey, however, had already decided to abandon the boats as he considered it impossible to launch them through the heavy surf even if they could be repaired. Grey saw no alternative but to begin their long trek back to Perth.

Initial discovery of main site

The site was first discovered by prominent Kalbarri resident Mr Gary Finlay in 1995. Mr Finlay was walking along the beach when he noticed a track in the sand dune as if something had rolled down. On closer inspection, he discovered lead shot in the dune. Altogether, Mr Finlay recovered about 1.5 kg of shot. He then informed Shire officials of his discovery but was apparently advised that the find did not warrant further action and the matter lapsed.

Mr Finlay informed museum staff on the occasion of the 2005 inspection that when he discovered the shot *in situ*, there was sufficient evidence to suggest that they had been



Figure 6. Area where Mr McDonnell found more lead shot and a lead fitting in October 2005 (Photo: Jen Rodrigues).

kept in a 'sack' bag. The bag, however, had deteriorated over time but a portion of the musket shots in one side of the bag were still fused together, maintaining the shape of the bag that they were kept in. The other side, however, were more exposed to natural elements and became dislodged. When part of the dune collapsed from natural erosion, some of these shot from the more exposed side of the bag rolled down the dune leaving a track on the surface, which Mr Finlay noticed.

Mr King subsequently advised the Department of Maritime Archaeology, Western Australian Museum, about the finds. After discussions with all three finders, it was arranged that Messrs McDonnell and Finlay would report the finds and all would accompany a museum staff to inspect the site if possible.

During the inspection, Mr King, who joined the Museum's inspection after the team had arrived at the advised, advised that he had also previously recovered about half a dozen lead shot from the site, some of which he had given to two local students to show to their classmates and teachers.

Location of site

The general location of the site is between Blue Hole and the main township of Kalbarri, a compass point of about 45–50° NE of Blue Hole. The site is just NW of the car park, which can be accessed by vehicle from Red Bluff Beach Road. The turn off to the car park is the turn off immediately south of the Siphon Road turn off. Due north of the car park, an old marker pole can also be seen in the distance. The main site is cut into the first line of sand dunes on the beach above the high water mark. GPS recording places the site at 27°43.75167S

114°09.10333E

Due west of the site, a modern mooring chain can be seen stretching seaward from the



Figure 7. View main site, looking SW towards Blue Hole (Photo: Jen Rodrigues).



Figure 8. Pathway to beach accessed from car park, looking west (Photo: Jen Rodrigues).



Figure 9. Modern mooring chain, stretching seaward (Photo: Jen Rodrigues).



Figure 10. Close up view of chain links (Photo: Jen Rodrigues).

rocks. This is possibly associated with a Rock Lobster (cray) boat. Mr King informed the Museum staff that some 30 years ago, he knew of a cray boat that was set alight at this site and it is possible that the mooring chain is contemporary with that time. Contamination of the general area with fishing boat materials is to be expected as a result.

Artefacts recovered from the site (1995–2005)

The lead shot are generally of two different sizes. The average diameter of the larger shot is 10 mm while that of the smaller is 7 mm, suggesting a small calibre firearm. The size of the shot indicate that they are more likely to be birdshot rather than musket balls, as musket balls are larger and heavier. Musket balls from the *Zuytdorp* (1711), for instance, measure 14 mm in diameter and those from the *Sirius* (1790) are between 16.5 and 19mm (Stanbury, 1994: 83). Although some of the lead shot from Kalbarri are round,



Figure 11. Lead shot recovered in 1995, total weight: 1415.5 g (UNID 4603) (Photo: Jen Rodrigues).



Figure 12. Samples from UNID 4603, showing 'moulding' marks (Photo: Jen Rodrigues).

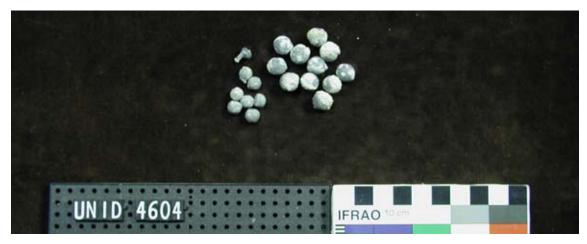


Figure 13. Shot recovered in October 2005, total weight: 74.2 g (Photo: Jen Rodrigues).



Figure 14. Samples from UNID 4604, showing evidence of sprues (Photo: Jen Rodrigues).

others show evidence of having been moulded. In addition, some of the shot have a small protrusion or lip. Some prison guards were farmers in the late 18th to mid 19th centuries were known to have carried similar to the ones discovered at Kalbarri. Paper cartridges from this period were also known to contain different sized shot contained within in order to make them more lethal.

The overall length of the lead fitting is 426 mm. Its width is 150 mm at its widest end and its thickness is 54 mm at its thickest end. The fitting is made primarily of lead although a large area of the surface is covered with iron rust. Along one its sides, striations can be seen running perpendicular along the length. It is not certain at this stage if the fitting is contemporary with the lead shot.

Other sites in close proximity

Two other sites were recorded, which contained bones. These sites are on the second line of dunes above the archaeological finds. The first of these two bones sites, referred to as 'Bones 1', is located roughly 45 m NNW of the car park. The following Australian Map Grid coordinates were taken for this site:

27°43.73719S

114°09.1328E



Figure 15. Striations along the edge of the lead fitting (UNID 4605) (Photo: Jen Rodrigues).



Figure 16. Lead fitting weighing approximately 10.5 kg (UNID 1605) (Photo: Jen Rodrigues).

The fragments of bones at this site appears charred although it is possible that the black colour is a result of rotting.

The second site is approximately 2–3 m south of Bones 1 site (closer to the car park) and contains a larger number of bone fragments that appear to have been exposed by natural elements. This site is almost directly above the main site of the archaeological finds. Mr McDonnell informed the museum staff that although he has walked through this area of vegetation many times in the past, he had never come across either of the bone sites until this week. He also reported that Mr Finlay had previously discovered a length of wooden stick from this site that had a kangaroo paw carved at either end. Mr Finlay gave the stick to members of an Aboriginal community whom he believed belonged to the area. However, due to an accident, the stick no longer exists having been left in a house that accidentally caught fire. The following Australian Map Grid position was taken for this site:

27°43.7652S 114°09.1279E

The two bones sites are on a flat surface surrounded by hard vegetation. However, both bones sites are situated within a sandy clearing (See Figs. 17-19) and appeared to have



Figure 17. Bones 1 site, looking west (Photo: Jen Rodrigues).



Figure 18. Bones 2 site, looking north (Photo: Jen Rodrigues).



Figure 19. Close up view of Bones 2 site, close up looking north (Photo: Jen Rodrigues).

been exposed by natural forces.

Both bone sites are marked with a pink flagging tap close to the ground and these are not visible from the car park or the nearest footpath. This was done in the event the bones become buried again by sand and it will enable staff to relocate both sites. The main site of interest, however, did not have any markers placed at or near it.

Registration of artefacts

The table below shows the artefact registration numbers, quantity and material identification. The prefix UNID has been used in the registration for now because there is no certainty as to the association of the materials.

REG. NO.	MNI	DESCRIPTION	MATERIAL	REMARKS
UNID 4603	363	Lead shot	Lead	Recovered by Mr Gary Finlay in 1995
UNID 4604	19	Lead shot	Lead	Recovered by Mr Mike McDonnell in October 2005
UNID 4605	1	Lead fitting	Lead interior but covered in iron	Recovered by Mr Gary Finlay
UNID 4606	5	Bone fragments, burnt?	corrosion Bone	Recovered by Jen Rodrigues in October 2005
UNID 4607	3	Bone fragments	Bone	Recovered by Jen Rodrigues in October 2005

Table 1. Artefact registration details.

Environment

The main site of interest is located on the first line of sand dunes from the beach above the high water mark. The vegetation starts above the first dune line. According to Mr McDonnell, the site was different 10 years ago at the time Mr Finlay discovered the first collection of lead shot. There was a more 'complete' cliff rather than a collapsed section as seen today, which is the result of natural forces. A straight vertical cut within the dune exposed the collection of lead shot, which Mr Finlay discovered in 1995. Mr McDonnell also advised museum staff that the site tended to become most exposed during the winter seasons.

This first line of sand dune is noticeably flat on top particularly above the site where the archaeological finds were discovered. The vegetation stretches upwards towards the second line of dunes, which is more compact and stable.

General information of area

The beach is popular with locals for taking walks and for visitors to stop at the car park to have a rest and enjoy the view. One footpath provides easy access to the beach as well as the site. It is, however, not a popular swimming beach because of the rocks and surf, which can prove dangerous.

Threats to the site

Mr McDonnell informed museum staff that some beach users had seen him using a metal detector, carrying out some digging and recovering artefacts. During the site inspection by museum staff, a few locals using the beach had seen the recording and inspecting of the site. Given that there was also press coverage of the discovery, it is thought that the site is under some threat of being interfered with even though it may have been undisturbed during the ten years since the initial discovery was made.

Natural elements are also a threat to the site given that the area is quite exposed to storms, surf and bottom surge. Natural erosion of the sand dunes is also a significant which could expose more of the site.

The Kalbarri site is currently being given adequate protection by Fisheries Officers patrolling the area as they have powers under the relevant shipwreck Acts.

Significance assessment

As already mentioned, the area is of historic significance because of its possible association with George Grey and his expedition team who landed there in 1839. Grey was known to have carried firearms, which included a double-barrelled gun and at least one rifle (Grey, 1841: 347 & 356). Grey also makes mention of some articles carried by members of the crew after their landing at Gantheume Bay. These included a small pocket chronometer, a pocket sextant, a large sextant, some small instruments which Grey carried and his gun. If the site is found to be associated with George Grey and his expedition team, it is considerably significant in regards to the early post-colonial exploration of Western Australia by Europeans.

Although the shot are known to have been commonly used by soldiers and farmers in the late 18th to mid 19th century period, the location of these finds on a beach seems to suggest a more likely association with a maritime aspect of Western Australia's history. Further archaeological investigations to identify what else, if anything, may still be left on Bernier Island should be carried out. However, given the weather conditions experienced by Grey and his men at the time, it is unlikely that anything may be found. In addition, the extent to which the *Paul Pry* was damaged suggests that very little, if any, will remain

of the boat including the stores it carried. It appears more likely that their belongings and stores may be located at Gantheume Bay. As more shot had still been found buried at the same site after a span of 10 years and metal detecting has indicated more metallic presence down to 2 m within the dunes, it is possible that more associated materials are still buried, which may confirm or dispute the significance of the site.

The two damaged whale-boats abandoned by Grey at Gantheume Bay in 1839 are also of considerable significance. While it is very unlikely that any timber will be found from the boats, Worsley *et al.* (2005: 143) claims that it is possible that a few metal fittings from the whale-boats could be found in the sand near where the boats were wrecked and abandoned.

Discussion

At this stage, the material evidence recovered from the sand dunes of Gantheume Bay does not confirm that the site is associated with George Grey and his expedition team who landed in the area in 1839. Research is still being carried out to identify the calibre, make and date of the firearm, which took these two sizes of lead shot. Research is also being carried out to determine the methods by which the shot were manufactured.

Recommendations

- 1. A close analysis of the shot recovered to date should reveal the significance of the materials and the site, which will determine whether an archaeological excavation should be carried out to investigate what materials may still be buried within the sand dunes at Gantheume Bay.
- 2. Further research and analysis needs to be undertaken to identify the lead fitting as well as the bone fragments.
- 3. Further archaeological investigations may need to be undertaken to investigate what the metallic objects (and any other materials) are that still remain buried within the deposit at Gantheume Bay.
- 4. Given that Grey and his men managed to bring their boats to shore at Gantheume Bay along with their stores and belongings, it is the most likely place that any historic material belonging to the men may still be found.
- 5. It is unlikely that any of the locations where Grey and his men explored will retain any stores or materials that belonged to the men because their task was to explore and chart the islands, coasts and other areas, and they were almost constantly on the move. However, the northern bay of Bernier Island where the men buried their 5-month supply of stores is worth inspecting as that is also where the *Paul Pry* was wrecked.

Administration and correspondence

Local finders Mr Mike McDonnell and Gary Finlay completed the Wreck Report form whilst Mr Ted King provided his personal contact details separately. The wreck report form and other relevant information are filed with by the Department of Maritime Archaeology, Western Australian Museum, under the following category:

MA3405: Wreck: Grey's Whaleboats (Kalbarri).

The finders had previously been in contact with Dr Michael McCarthy (Curator) and Mr Jeremy Green (Head of Department) from the Department of Maritime Archaeology, Western Australian Museum, to report the finds and arrange to accompany a museum staff to inspect the site.

News

Report: Gary Warner

A WA Museum officer will arrive at Kalbarri on Monday to investigate a find which could be of major historical significance.

resident Michael McDonald has reported finding a quantity of lead musket balls, which it is believed may have been lost by the Grey expedition of 1839.

Captain George Grey had been sent to explore the northern coastline and, while returning from the area now known as Carnarvon, the party's two

whaleboats were wrecked near Kalbarri. Capt Grey and his men subsequently walked all the way back to Perth.

Mr McDonald found more than 20 musket balls and a very old tiller block from a dingby when he went fossicking in an area described to him by fellow Kalbarri resident Gary Finlay. Mr Finlay had found a larger

quantity of musket balls 10 years ago but found there was little

interest in his discovery, "I found 70 or 80 balls in the sand, they were still in the shape of the bag that held them although the bag had rotted

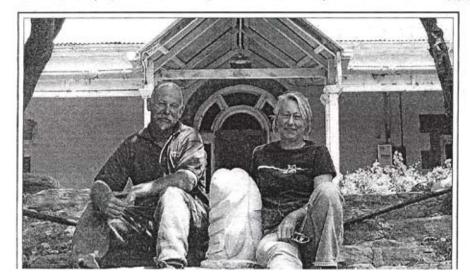
away," Mr Finlay said.
"Nobody at the museum seemed at all interested at the time, so I didn't mind telling Michael about where I had found the musket balls. Now the site is to be kept under wraps, so it's being taken seriously." WA Museum head of maritime

archaeology Jeremy Green said the Grey expedition is the most likely origin of the find.

He said it was too early to say whether the site would justify an archaeological dig but that it must be kept secure for evaluation.



Discovery: Musket balls and old tiller block found near Kalbarri.



Part 2

Report on the Site Survey and Excavation 23–27 January 2006



Jennifer Rodrigues, Ross Anderson, Richenda Prall and Corioli Souter.

ACKNOWLEDGEMENTS

Thanks are due to the following individuals for their technical support as well as valuable assistance and contribution in various ways.

FUGRO Australia

Mr Amit Eliyahu

Mr Gary Finlay

Mr Michael Gregg

Mr Ted King

Mr Mike McDonnell

Mr Sim Prall

Technical data

Site name: Grey's whale-boats Date of abandonment: 31 April 1839

Personnel: Jennifer Rodrigues (OIC)

Ross Anderson Richenda Prall Corioli Souter

Dates of test excavations: 23 January–27 January 2006

Approximate location: Between Blue Holes and Jacques (Jakes) Point, Kalbarri.

Directions to site

Drive south along Red Bluff Beach Road from Kalbarri township and go 500 m past the Siphon Road turn off. At the next turn off immediately south of Siphon Road, turn right (west) into the carpark. At the western boundary of the carpark is a narrow sandy footpath leading down to the beach. Head down the footpath and turn right (north) on the beach. Walk north, keeping the first line of sand dunes on the right (east). The site is located within the third blow out along the first line of sand dunes approximately 8-10 m from the path.

Differential GPS position of Stations

STN 1.27°43.6751225S 114°09.1935828E STN2. 27°43.6843905S 114°09.1947138E STN3. 27°43.6763307S 114°09.1851814E

Local survey marker

AJANA 2A. 27°43.6126185S 114°09.3083021E

GPS Datum: WGS 84

Lat. 27°43.677S Long. 114°09.182E

File No.: MA 34/05 File name: Grey's Whaleboats (Kalbarri)

Introduction

Following the inspection of an archaeological site in Kalbarri where 382 pieces of lead shot were recovered by three local residents, a team from the Western Australia Museum's Department of Maritime Archaeology were sent to carry out an archaeological investigation of the site. The aims of this expedition were to delimit the size of the site as well as investigate what other material lay buried within the deposit. Archival research and archaeological evidence suggests that the material is likely to be associated with the George Grey expedition of 1839.

Site description

The site is located along the first line of dune, within a blow-out. The fore dune is approximately 4 m in height from mean sea level and runs down to a sand beach that slopes to the water's edge. The beach overlays a mudstone reef platform, which has crevices and gullies, filled with pebbles and sand. Behind the fore-dune is a plateau rising to a secondary dune. The secondary dunes appear to be relatively stable and have a binding cover of vegetation including marram grass and coastal shrubs.

Administration

The site falls within a small section of the fore dune, which comes under the management of the Shire of Northampton, rather than CALM. Mr Garry Keefe (CEO, Shire of Northampton) and Mr Anthony Gollan (Deputy CEO, Shire of Northampton) were consulted about the



Figure 20. Aerial photograph showing site, Kalbarri and the Murchison River.



Figure 21. Looking at the site from sea.



Figure 22. Search and survey over reef.



Figure 23. Search and survey over reef.



Figure 24. Search and survey over reef.

fieldwork. The Shire granted permission for excavation on condition that the vegetation was carefully removed from the top layer and then the site re-vegetated after fieldwork was completed in accordance with CALM revegetation standards. Consultation was also made with local CALM rangers for the best method of revegetation.

Preliminary search and survey

The team, with the help of Mr Ted King and Mr Mike McDonnell, carried out a preliminary search and survey of the wider area surrounding the wale before any excavation commenced. Metal detecting was carried out over the main site and its immediate surroundings outside of the main blow-out site. The detector was swept over the areas systematically so that all ground in the blow-out and about a metre beyond its periphery were covered. Several of the blow-outs 100 m to the north and south of the site were also surveyed systematically with the metal detector including the beach areas in front and between these blow-outs. Few signals were registered in the main blow out site and five pieces of lead shot were found during this search and survey. Markers were placed at all points where signals were registered by the metal detector. The locations of these were subsequently measured with the Total Station and these targets were subsequently excavated. During excavations by the team, further metal detecting was carried out in random areas by a volunteer as far as 500 m to the north and south of the site including the beach areas and blow outs along the fore dune.

In addition, the Team carried out a search and survey of the reef area in front of the site and a further 200 m north and south. This was done over the last two days as conditions were too rough on the Friday with high surfs resulting in divers being thrown and cut on the reef (see Figs 22 & 23). Fortunately, the tide was low enough to expose the reef platform on the Saturday so that a more effective search could be carried out over a larger area (Fig. 24).



Figure 25. Site before excavations.

Site conditions

The steeply sloping fore dune consists of fine, dry sand that is affected by strong winds. While the general orientation and size of the foredunes appear stable, sand movement is caused by strong winds. Mr Mike McDonnell stated that the blow-out in the dune had more sand than when previously reported in October 2005, presumably as a result of sand gravitating downwards into the blow-out in response to natural forces. Thus, the excavation area was not ideally suited to precise excavation due to fine loose, mobile sand on a steep slope (See Figs 25 & 26).

These site conditions made excavation difficult due to the constant filling in of the trenches by fine, dry sand gravitating down the slope. Some success was had by wetting the dune and high side of the trench with buckets of seawater and fencing the higher side of the trench with wooden tomato stakes and marram grass. This allowed Trench 1 to be excavated to a depth of 1.6 m on the high side and 60 cm on the low side. However, it made the resulting thick, wet sand difficult to sieve as a result. Hot weather and strong southerly winds on Tuesday, Wednesday and Thursday made working conditions difficult due to the combination of heat and airborne particles of fine wind-blown sand.

At the completion of the Trench 1 excavation, while in the process of cleaning up the trench walls for final photography, the trench collapsed and sand spilling from higher up the dune slope filled the entire trench within minutes.

Metal detecting

In order to delimit the extent of the site as well as to establish the excavation area, a metal detector survey, using a Minelab XTerra 30 coil, was conducted in the swale out where the original lead shot were located. However, it was noted, based on an experiment, that its depth of detection range of a single lead shot was limited to a distance of approximately 7.5 cm from the search coil of the instrument. This meant that any metal detection conducted over a thick layer of vegetation in some areas might have resulted in missed targets buried



Figure 26. Metal detecting around the foredune.

below the sand surface if this was lying beyond 7.5 cm from the search coil.

Random metal detection was also undertaken in accessible areas of the fore and secondary dune systems approximately 500 m to the North and the South of the excavation area and on the beach. Only one significant anomaly was detected and this was in another swale just north of the site. The object turned out to be a railway tie which may have been used as ballast or cray weight. Aside from this, no other significant anomalies were detected although this survey should be considered as preliminary. Local residents have also undertaken random metal detection and it is not clear what has been discovered or recovered in the surrounding dune system.

At low tide, metal detection was carried out on the exposed reef line approximately 200 m to the North and the South of the excavation area. A considerable amount of ferrous concretion was located 200 m south of the excavation area up to a depth of 30 cm below the sand at the reef line. Whether this relates to Grey's expedition has not been determined. Waypoints for these targets were taken and can be found in Appendix 2. Further targets believed to be shot continue down the beach in a line from the shot collapsing down the slope.

Survey

On the previous visit by Rodrigues and Fleming (see Part 1), a GPS position was recorded. On this visit, a land survey was done of the area (the swale, fore dune, shape of blow-out site and reef line), as well as the position of the trench corners and loose artefact finds marked with the Total Station. In addition, the three survey station points surrounding the site were recorded using the DGPS. Visual transits were photographed and drawn and magnetic compass bearings taken to enable visual relocation of the site.

The survey was conducted utilizing an Omnistar DGPS System and a Leica Total Station (TCR305). The Omnistar DGPS signal was checked with a nearby known survey mark AJANA 2A (0.4 km away) to ensure that the equipment was working properly.

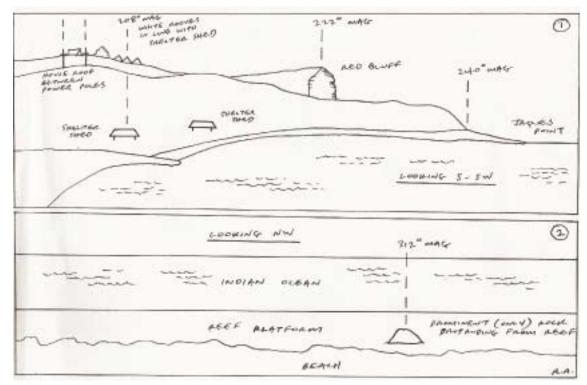


Figure 27. Visual transits of the site.

Three stations were set up around the site of the original lead shot find, two on top of the fore dune sand ridge and one at the base of the blow-out. These stations were fixed using the DGPS, and Station 1 (STN1) used as the primary datum with elevation set as zero. The four corners of Trench 1 and 2 were surveyed prior to excavation, as were the positions and depths of subsequent finds and spits within Trench 1. A pick-up survey of the fore dune system was completed where the excavation was conducted including the ridge and swales as well as the reef line. The table of coordinates is found in Appendix 1 and the results are illustrated in Figures 30–32.

Excavations

A decision was made to place the trenches where the most prominent signals were registered as well as based on information from the finders who had recovered lead shot from the site in 2005. It was decided that two trenches would be established and excavated over three days. These were labelled Trench 1 and 2. On the whole, the steepness of the slope and the loose sand posed numerous difficulties for the team who were faced with the problem of sand constantly gravitating downwards into the trench floors as well as the trench walls under threat of collapsing. As already explained, different measures were applied with limited success to try and stabilise the trench walls and minimise the difficulties.

TRENCH 1

Trench 1 was a 2 m x 2 m square located at the base of the fore-dune slope (Points DU3, DU4, DU5 and DU6, see Fig. 34). The vegetation covering part of Trench 1 was carefully removed and the top sand layer was sieved in order to trap the seeds for later revegetation. Trench 1 was excavated over two days and a total of 30 lead shot of two distinct sizes were recovered. No contamination was observed and the sand colour and texture was consistent through out the depth of the trench.



Figure 28. Recording with the DGPS.



Figure 29. Surveying with the Total Station.

The trench was excavated to a depth of 1.6 m on the high side and 60 cm on the low side. Marram grass and wooden planks were placed just above the western wall of the trench and pressed down as far as possible to shore the sides and stop sand from gravitating downwards into the trench. The sand just outside the western and southern walls were also occasionally made wet in order to compact it but at times this made

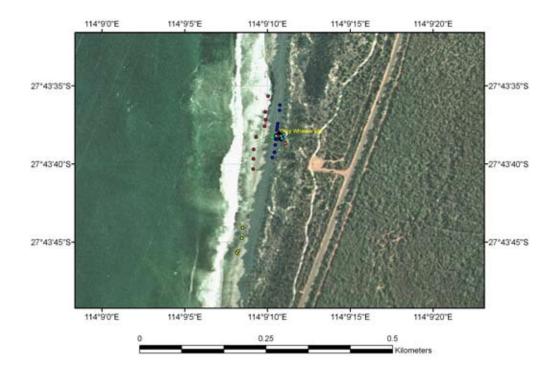


Figure 30. Survey points.

sieving very difficult. At the final spit, during clean up for photography, the western wall suddenly collapsed, filling the entire trench with sand before a final photograph could be taken. The trench was shut down as a result and staff begin excavations on Trench 2.

TRENCH 2

Trench 2, a 2 m x 1 m trench, was located higher up on the slope from Trench 1 and near the centre of the swale (Points DU59, DU60, DU61 and DU62, see Fig. 34). Vegetation was removed before excavations began. Trench 2 was excavated and periodically surveyed with the metal detector over one day. It was positioned awkwardly so that excavators had to be careful where they trod in trying to minimise sand movement within the blow out as well as into the trench. Wooden planks and stakes were used to shore the western wall to stop sand collapsing down into the trench but with limited success. No artefacts were recovered from this trench, as excavation had not reached an ideal depth where artefacts may still be buried. Metal detection was carried over the trench and its immediate surroundings before a decision was made to shut it down. No signals had been registered.

Post excavation

At the completion of the excavations, the team back-filled all sand that had been sieved and deposited just outside the blow-out. The seeds were reburied in the sand and the vegetation cover replanted as close as possible to the same positions.

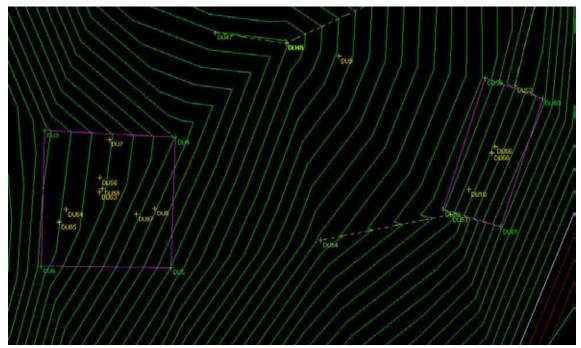


Figure 31. Total station coordinates showing Trench 1 and 2 within the blow-out.

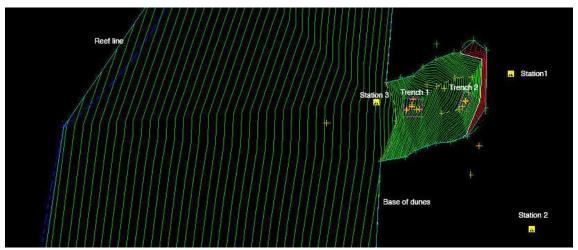


Figure 32. Total station coordinates showing the shape of the swale where the site was located.

Registration of artefacts

MATERIALS RECOVERED DURING SEARCH, SURVEY AND EXCAVATIONS

All the artefacts were registered in Kalbarri. Lead shot found in the same spit were registered together. A total of 41 artefacts were recovered on the surface or excavated by the WAM team. The finds were found both individually as well as in groups. A new registration prefix has been allocated to the site, this being KG referring to 'Kalbarri Grey' site. A total of 10 registration numbers (KG 4610 – KG 4619) were allocated to the artefacts and these have been entered into the Maritime Archaeology Artefact database. The table in Appendix IV details the artefact registration.

MATERIALS RECOVERED OUTSIDE OF EXCAVATIONS

KG 4617 (x2 lead shot), KG 4618 (x3 iron fragments), and KG 4619 (x1 copper nail) were recovered by Mr McDonnell sometime before the Museum expedition team arrived in late January. The lead shot and iron fragments were found at the site while the copper nail was found in the reef not far from the blow out. Mr McDonnell also advised that



Figure 33. Excavating Trench 1.



Figure 34. Trench 1, facing east.

someone was known to have collected 'two handfuls' of copper nails from the same area from where he recovered the one copper nail.

It is also worth noting that Mr Finlay advises that upon telling some local residents about his initial find, he was informed that others before him had found other kinds of archaeological material from the site although they refused to detail what these were.



Figure 35. Trench 1, facing south.

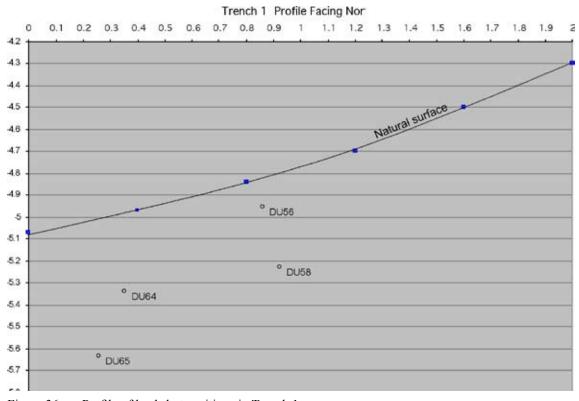


Figure 36. Profile of lead shot positions in Trench 1.

Given the fragility and potential exposure of the site following storms and other natural elements, it is not surprising if buried materials had become exposed and then removed by members of the public.



Figure 37. Sand fill in trench 1.



Figure 38. Tench 1 towards the left of image.



Figure 39. Trench 1, facing south.



Figure 40. The site after re-vegetation.

Photographs of finds



Figure 41. Lead shot, KG 4610.



Figure 42. Lead shot, KG 4611.



Figure 43. Lead shot, KG 4612.



Figure 44. Lead shot, KG 4613.



Figure 45. Lead shot, KG 4614.



Figure 46. Lead shot, KG 4617.



Figure 47. Lead shot, KG 4615.







Figure 49. Copper nail, KG 4619.



Figure 50. Iron fragments, KG 4618.

Artefact analysis

The majority of finds were recovered through sieving of sand from Trench 1 spits. The depth of each unit and positions of some of the isolated finds were recorded (see Appendix 1).

The lead shot comprised the majority of the finds. These were of two distinct sizes with the average diameter of the larger shot being about 10 mm and the smaller being approximately 7 mm. A large number of the smaller lead shot have mould marks and spruces. These finds are identical to the lead shot found on the previous site inspection (See Part 1). The first collection of lead shot was taken to Dr Leo Laden, an expert in early arms, who dated the shot to pre-1850. He also advised, however, that such shot were used commonly from long before the mid 19th century. He also explained the method of manufacture, which included the use of a mould. Lead would be poured into the mould, left to cool and then dropped whereupon the mould, which had its own cutter, would be used to cut the spruce. This process leaves mould marks as well as spruces that could often be seen on many of the shot, particularly the smaller ones.

The copper nail KG 4619, found by Mr McDonnell, is a fastening from either a carvel or lapstrake vessel (McCarthy, 2005: 54–56 & 63–85). The copper fastening is consistent with the era of Grey's whale-boats but it cannot be definitely confirmed as these copper fastenings have been in use up to modern times.

No other earlier or secondary European material culture or contamination prior to the above 19th century material was found.

Associated sites

Some iron fragments were collected from the area about 300 m south of the excavation site where a significant amount of iron concreted within rock was found through the use of the metal detector at low tide. Four iron and rock concretion samples were collected and

have been passed on to WAM Department of Materials Conservation for dating purposes and an analysis report. It is possible that this area is where Grey and his crew lost their two remaining whale-boats (Grey, 1841: 411–2; Ronan, 1997). No archaeological finds were located in this area during metal detecting but the large amount of iron concreted within the rock could possibly be contemporary with Grey's landing. It is hoped that the conservation report on the iron samples will provide some insight into this hypothesis. It should be noted, however, that modern cray boats are also known to have been wrecked and stranded in this area.

A search of the local archives at the Kalbarri Shire Office provided some material on Grey researched by avocational researchers. It is apparent that there may be additional sites associated with Grey in the Kalbarri area.

Assessment of site significance

(I) ARCHAEOLOGICAL AND HISTORICAL

George Grey was appointed Governor of South Australia in 1841 and, subsequently, in 1845, was appointed Governor of New Zealand where he served for 10 years (Russell, 2001: 3). Late in 1853, Grey departed to become Governor of the Cape Colony and High Commissioner for South Africa up until 1861 (Sinclair, 2005). He then returned to New Zealand and became Governor again from 1861 to 1868. From 1877 to 1879, he served as Premier of New Zealand. At this time, Grey was also one of three representatives chosen by Parliament to attend the Australian Federal Convention in Sydney in 1891 where he opposed New Zealand's federation with Australia. Sinclair (2005) describes Grey as being 'one of the most remarkable nineteenth century British colonial governors, and one of the remarkable people who have lived in New Zealand'. Given his widespread presence and influence interstate as well as overseas, Grey is a figure of historical and political significance in regards to the history of these places and countries. The finds from the Kalbarri site are significant in their association with George Grey's expedition and his voyage back to Perth.

(II) SCIENTIFIC

The site is located in the sand dune that should not be deliberately disturbed due to the fragility of coastal dunes and their vegetation. It does, however, have the potential to inform about the coastal dynamics within Gantheume Bay in the last 170 years and the site formation processes involved. Given that the 'bag' of lead shot initially discovered by Mr Gary Finlay in 1995 was located high on the slope (see Part 1), of the blow-out, the implication is that the height of the dune has not altered significantly in the last 170 years, is relatively stable, and lose shot has been collapsing down the slope. However, the western slope face of the dune has obviously been affected by natural elements given the number of blow-outs along it.

The bag was possibly buried not too deep from the surface and may have gravitated downward after the storm created the blow-out and eroded the sand, which eventually exposed the shot. Nevertheless, the 'bag' of lead shot was discovered sufficiently high to suggest that the height of the dune has not altered significantly. It is not known however, how much of the western face of the dune has eroded and collapsed over the years, given how loose the sand is. The current situation shows that the vegetation at the top level is holding the sand dunes in place to some degree.

(III) EDUCATIONAL

The site is significant in its potential to inform the public of the historical and political association interstate and overseas of at least one of Western Australia's early explorers. The themes here include the early exploration of the Western Australian coast and the difficulties faced by these explorers, the life and career of George Grey himself, the mapping of Australia's coastline, as well as the role of Aboriginal guides in European explorations in Western Australia. There is also significant tourism potential associated with this.

(IV) RECREATIONAL

Since the initial inspection of October 2005, the site has been protected by Fisheries officers because of its significance, as well as exposure, easy access and fragility. Whilst it would benefit the public to view the site and appreciate its historical significance, they need to be educated on the fragility of the environment and best conservation practice for

the vegetation and sand dune as well as the archaeological significance of the site which still has material buried within the dune. The site is automatically protected to some degree by the fact that the area is not a popular swimming or surfing beach given the dangers posed by the reef and rough surf.

(v) Cultural

The site is currently the only one discovered to date with archaeological finds thought to be associated with Grey, thereby, providing a direct and tangible link to this chapter of his journal.

Site identification comments

Grey provides sufficient descriptions in Volume II of his journals to suggest that he and his men landed in the area and stayed there for about one to two days in the Kalbarri-Wittecarra vicinity, in land from Gantheume Bay. He describes having walked along a stream where he discovers the Murchison estuary (Grey, 1841ii, Chapter I). On the second day after their wrecking, Grey describes how he attempted to convince his men to abandon some of the load they were carrying. Grey also noted that he still carried a gun at this point (Grey, 1841ii: 6). It is certain that he carried a store of shot for the purposes of hunting and/or protection, although he does not mention what type of gun it is. Indeed a bag of shot would prove a heavy load to carry all the way back to Perth on foot. He would have carried a gun and some shot but left excess stores behind.

The site is possibly one of many associated with Grey and his men. The site is quite likely only an isolated find with the lead shot being the only artefact assemblage. According to Grey's journals, it is likely that he and his men may have deposited or abandoned personal belongings and stores at different points as they walked southward back to Perth. Based on the variety and date of artefactual material so far recovered, artefact analysis, historical sources, Grey's journals and the site location, there is sufficient evidence to suggest that the site is most likely related to Sir George Grey and his expedition team.

However, there is an issue with the protection of the site as at present the exact extent of remains or location of further material, if any, is unconfirmed. Other theories have been put forward as to the possible provenance of the lead shot e.g.; 'Anyone could have lost a bag of shot'.

Nevertheless factors to consider are:

- The lead shot is 19th century (pre-1850) and therefore historic material;
- The combined quantity of all lead shot consisting of pistol shot and bird shot is more consistent with a reserve supply of ammunition rather than an individual or day's shooting party's needs, and abandonment of such heavy weight consistent with Grey's 'inducements' to his men to abandon unnecessary loads for the walk south to Perth (Grey, 1841, Vol. 2: 6);
- The known presence of further unexcavated historic material (lead shot) that remains buried in the dune and beach at the current site;
- Amateur historical research that supports this area of beach in Gantheume Bay as the most likely location for the beaching of Grey's whale-boats (Ronan, 1997);
- Grey's personal journal that narrates how the boats and supplies were hauled up onto the beach (Grey, 1841, Vol. 2: 1 & 2).

As mentioned above, these factors combined tend to suggest that the lead shot may well be related to Grey's whale-boats, and that the site should, therefore, be protected under the State *Maritime Archaeology Act 1973*. Grey described in his journal that the boats crashed on top of the reef. As the reef becomes exposed at low water, this places it is

in State waters. This means that the boats or the precise location of their wrecking, if ever discovered, should be protected under the State Act. The lead shot, therefore, being associated with the boats should be protected under the State Act.

LEGISLATIVE ISSUES

Under the State *Maritime Archaeology Act 1973* anything, which, in the opinion of the Director of the Western Australian Museum, was abandoned in the State before the year 1900 and derives from or was associated with any ship, whether or not a historic ship within the meaning of this Act, is vested in the Museum on behalf of the Crown.

Maritime archaeological sites are:

- (a) Any area in which the remains of an historic ship are known to be located;
- (b) Any area in which any relic is known to be located;
- (c) Where unrecovered relics associated with an historic ship are likely to be located; and
- (d) Any structure, campsite, fortification or other location of historic interest that is associated with, and was occupied or used by, persons presumed to have been in a historic ship.

Recommendations

- 1. That a recommendation is made through the Maritime Archaeology Advisory Committee (MAAC) that the site is recognised as a maritime archaeological site.
- 2. The finders are advised of this, and a media release is issued to local press advising of the Museum's site findings and protected status as soon as possible
- 3. At this point, no further archaeological investigations are recommended for the site even though more metallic artefacts remain buried based on the metal detecting survey. A signal was registered just outside of the western wall of Trench 1 (approximately at the -5.5 m elevation height according to Figure 36). This is assumed to be lead shot because of its location (it falls within the pattern of gravitated line of shot in Trench 1) and the strength of signal detected, which is consistent with the other lead shot. The site is fragile and material has already been exposed and uncovered naturally as well as deliberately. It is strongly recommended that the site be left undisturbed. It is further recommended, however, that Museum staff who might be in the vicinity monitor and check the site for natural erosion and exposure due to the fragile nature of the fore dune.
- 4. If Museum staff are in other areas where Grey and his men landed, explored, charted or walked (such as Dorre and Bernier Islands in Shark Bay and other locations in Gantheume Bay that might prove significant from research) for other purposes, that a visual search and survey in undertaken to determine if there are any evidence of Grey's presence either on land, lodged in reefs or deposited underwater.
- 5. For future excavations in sand dunes as steep and fragile as this site, it is advisable for a cofferdam to be built before any excavations take place, perhaps using sheets of aluminium or planks that could hold the sand back while excavations are carried with fewer difficulties. No doubt the weight of such materials should be considered as well as the difficulty in forcing such sheets to cut into the sand dune to form walls.

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Appendix I Survey data.

POINT	EASTING	NORTHING	ELEVATION	DESCRIPTION
DU1	219334.3173	6929674.038	0.049966	Station 2
DU2	219317.368	6929687.87	-6.089594	Station 3
DU3	219320.3802	6929688.313	-5.129906	NW Cnr Trench 1
DU4	219322.33	6929688.206	-4.494791	NE Cnr Trench 1
DU5	219322.2653	6929686.27	-4.098391	SE Cnr Trench 1
DU6	219320.3309	6929686.294	-5.062953	SW Cnr Trench 1
DU7	219321.3494	6929688.18	-4.739484	Target
DU8	219322.0247	6929687.149	-4.496629	Target
DU9	219324.7683	6929689.423	-3.777484	Target
DU10	219326.7099	6929687.433	-2.464006	Target
DU11	219279.5542	6929621.918	-9.528333	Ocean reef line S of excavation
DU12	219279.5487	6929642.04	-9.646451	Ocean reef line S of excavation
DU13	219279.6637	6929660.408	-9.887359	Ocean reef line S of excavation
DU14	219283.3064	6929685.192	-9.832462	Ocean reef line opposite excavation
DU15	219297.8571	6929706.593	-9.011313	Ocean reef line N of excavation
DU16	219299.2907	6929719.226	-9.132846	Ocean reef line N of excavation
DU17	219298.4234	6929734.914	-9.321033	Ocean reef line N of excavation
DU18	219302.5865	6929765.857	-9.269609	Ocean reef line N of excavation
DU19	219323.3605	6929749	-5.980698	Base of sand dune line N of excavation
DU20	219323.1714	6929738.668	-5.924399	Base of sand dune line N of excavation
DU21	219320.6818	6929712.454	-6.200716	Base of sand dune line N of excavation
DU22	219320.0002	6929706.082	-6.104041	Base of sand dune line N of excavation
DU23	219319.2649	6929699.797	-5.948664	Base of sand dune line N of excavation
DU24	219318.4735	6929689.966	-5.927883	Base of sand dune line N of excavation
DU25	219319.4707	6929685.865	-5.628279	Base of sand dune line at excavation
DU26	219317.8244	6929681.439	-6.013995	Base of sand dune line S of excavation
DU27	219317.2529	6929669.971	-5.882196	Base of sand dune line S of excavation
DU28	219316.1085	6929655.793	-5.81578	Base of sand dune line S of excavation
DU29	219312.6674	6929645.417	-6.128032	Base of sand dune line S of excavation
DU30	219327.679	6929679.995	-3.367482	Base of blow out S of excavation
DU31	219327.2755	6929684.186	-1.165699	Ridge of sand dune line S of excavation
DU32	219325.494	6929683.564	-1.614343	Ridge of sand dune line S of excavation

DU33	219323.9096	6929683.416	-2.190262	Ridge of sand dune line S of excavation
DU34	219322.9649	6929683.165	-2.598473	Ridge of sand dune line S of excavation
DU35	219321.688	6929682.636	-3.263859	Ridge of sand dune line S of excavation
DU36	219320.5312	6929681.906	-3.851778	Ridge of sand dune line S of excavation
DU37	219329.3575	6929687.273	-0.589712	Ridge of sand dune line at excavation
DU38	219329.4154	6929693.57	-0.781798	Ridge of sand dune line N of excavation
DU39	219327.9609	6929694.657	-1.099303	Ridge of sand dune line N of excavation
DU40	219326.5275	6929693.258	-1.275283	Ridge of sand dune line N of excavation
DU41	219325.8334	6929693.3	-1.48975	Ridge of sand dune line N of excavation
DU42	219323.9611	6929694.211	-2.477054	Ridge of sand dune line N of excavation
DU43	219323.9038	6929692.58	-2.873534	Ridge of sand dune line N of excavation
DU44	219322.4096	6929691.71	-3.147969	Ridge of sand dune line N of excavation
DU45	219321.3978	6929690.787	-3.765491	Ridge of sand dune line N of excavation
DU46	219320.0213	6929690.598	-4.52933	Ridge of sand dune line N of excavation
DU47	219322.9225	6929689.769	-3.906856	Base of sand ridge gully N of excavation
DU48	219323.9815	6929689.615	-3.91606	Base of sand ridge gully N of excavation
DU49	219323.9793	6929689.615	-3.917256	Base of sand ridge gully N of excavation
DU50	219325.9517	6929690.538	-3.120716	Base of sand ridge gully N of excavation
DU51	219327.8046	6929690.642	-2.298837	Base of sand ridge gully N of excavation
DU52	219327.3438	6929688.806	-2.299963	Base of sand ridge gully S of excavation
DU53	219326.4365	6929687.058	-2.638783	Base of sand ridge gully S of excavation
DU54	219324.4997	6929686.678	-3.073203	Base of sand ridge gully S of excavation
DU55	219311.9678	6929685.618	-7.392651	Lead shot
DU56	219321.2029	6929687.609	-4.891313	Lead shot Trench 1
DU57	219321.7483	6929687.068	-5.008431	Lead shot Trench 1
DU58	219321.2433	6929687.448	-5.139198	Lead shot Trench 1
DU59	219326.9493	6929689.093	-2.681028	NW Cnr Trench 2
DU60	219327.8128	6929688.789	-2.134177	NE Cnr Trench 2
DU61	219327.1841	6929686.874	-2.015267	SE Cnr Trench 2
DU62	219326.3202	6929687.133	-2.617769	SW Cnr Trench 2
DU63	219321.1975	6929687.395	-5.152998	Bottom Trench 1
DU64	219320.6962	6929687.137	-5.338653	Lead shot Trench 1
DU65	219320.5942	6929686.945	-5.554262	Lead shot Trench 1
DU66	219327.099	6929688.076	-2.738131	Trench 2 level
DU68	219327.053	6929687.976	-2.862766	Trench 2 final level
DU69	219328.5859	6929683.103	-2.387143	Target
STN3	219318	6929688	0	
STN1	219332	6929691	0.01	

Appendix 2

DGPS recordings.

STN	LAT	LONG	ANTENNA HT.
STASTION 1	27°43.6751225S	114°09.1935828E	188.5cm
STASTION 2	27°43.6843905S	114°09.1947138E	188cm
STASTION 3	27°43.6763307S	114°09.1851814E	188cm

Appendix 3Kalbarri artefact registration details from January 2006 expedition.

Reg no.	No	. Descrip.	Mat.	Diam. (Mm)	Finder	Site location	Survey no.
KG 4610	5	Lead shot	Lead	8.9, and 6.6	WAM	Excavation area - preliminary search	
KG 4611	14	Lead shot	Lead	10.2, and 6.7	WAM	Trench 1, Excavation area, by sieve	DU 56
KG 4612	1	Lead shot	Lead	9.9	WAM	Trench 1, Excavation area, by sieve	DU 57
KG 4613	4	Lead shot	Lead	9.9, and 6.6	WAM	Trench 1, Excavation area, by sieve	DU 58
KG 4614	8	Lead shot	Lead	10.7, and 6.9	WAM	Trench 1, Excavation area, by sieve	DU 64
KG 4615	1	Lead shot	Lead	6.9	WAM	Trench 1, Excavation area, by sieve	DU 65
KG 4616	2	Timber fragments	Wood	17.6; 11.6	WAM	Trench 1, Excavation area, by sieve	
KG 4617	2	Lead shot	Lead	6.9, and 7.2	Mr M.McDonnel	l By metal detection Jan 2006, sand dune	S
KG 4618	3	Iron fragments	Iron	29.4; 23,1; 26.9	Mr M.McDonnel	l By metal detection Jan 2006, sand dune	s
KG 4619	1	Nail	Copper	Length. 46.7	Mr M.McDonnel	l Under water, in front of excavation area Jan 2006	,

Appendix 4

Waypoints for targets 200m south of excavation site.

EASTING	NORTHING	POINT ID
114.15247684	-27.72976155	Iron Concretion in reef
114.15241018	-27.72998570	Concretion in reef
114.15249190	-27.72957241	Concretion in reef N e
114.15238897	-27.73002135	Concretion in reef S e