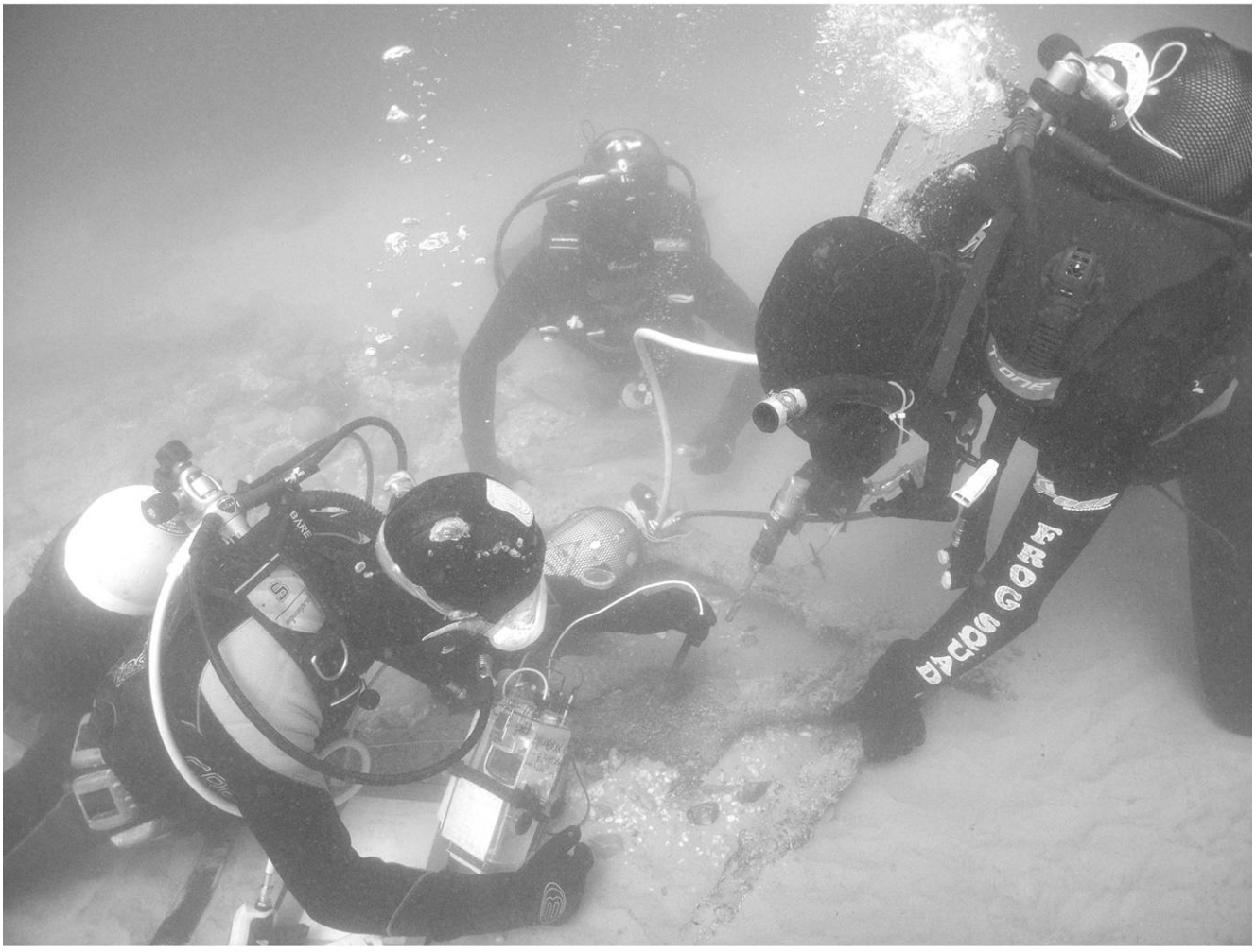
Nautical Archaeological Society

Report Course Part II

February 2011, Robben Island, Cape Town



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February 2011, Robben Island, Cape Town

Robin Adams, Mareille Arkesteijn, Thijs Coenen, Wayne Evans, Laurens Jansen, Ratanang Maremane, Eliot Mowa, Luvuyo Ndzuzo, Chris Ngivigivi, Sophie Winton, James Wood

Front Cover Photograph Carpenter, 2011

Table of Contents

Introduction

"During the late 1970's and early 80's large numbers of volunteer divers flocked to the site of the excavation of Henry VIII's warship the *Mary Rose* (1545) outside Portsmouth wanting to be involved. It was soon realized that most of these divers had very little or no underwater archeological experience and had to be trained from scratch before they could be used on the project. Recognizing the interest by sports and other divers in maritime archaeology, archaeologists from the project formulated a training program which provided these divers with a standard level of maritime archaeological knowledge and skills.

Shortly thereafter (1981) the non-profit Nautical Archaeological Society (NAS) was established in England, dedicated to the preservation of underwater cultural remains and maritime heritage, and composed of divers, archaeologists, conservationists, historians and other interested people throughout the world.

The primary goals of NAS are:

- The promotion of underwater archaeology education.
- Increasing the collaboration between the professionals and the public who want to be involved in maritime archaeology on a vocational level.
- Engendering awareness amongst divers and the public of the need to preserve and protect the underwater cultural heritage.

Interestingly NAS aims not only to teach divers to become involved in archaeology, but also to educate professionals about the value of working with the diving community." [1]

Bearing the above in mind SAHRA (South African Heritage Resources Agency) approached the Dutch Embassy in South Africa for aid to support a field school in South Africa using the NAS training modules, for students from around the world. In 2009 a mutual cultural heritage agreement was signed with the Dutch Program for Development Aid and was funded by the Dutch Government. The NAS Courses I and II on Robben Island in 2011 were the second training courses to be funded by this agreement and is in line with the 2001 United Nations Education Scientific and Cultural Organization (UNESCO) convention. At this convention member states adopted an international treaty that was in response to combat the increased looting and destruction of underwater cultural heritage sites.

Presenting the course at the Robben Island World Heritage Site is significant because the Island plays a role in the history of many different nations. Wrecks found in Table Bay around Robben Island may shed light on this history.

[1] NAS Introduction to Foreshore Archaeology 2011, 5

Robben Island was used in many ways over the centuries and the brief history below shows how important maritime wrecks can be in providing additional evidence to support oral or written history:

- "1488 – For the two centuries after Bartolomeus Dias first rounded the Cape, the Island was used as a pantry to feed sailors on passing ships, as a post box for their letters and occasionally as a prison for misbehaving sailors.

- 1653 to 1806 – During this time the Dutch ruled the Cape with a brief period of British rule (from 1795 to 1803). During Dutch rule the Island continued as a pantry but it became increasingly important as a prison mainly for Cape residents both black and white, for criminal sentences and for political prisoners from the East Indies. It was during this period that the Island's non-food resources were harvested i.e. the limestone and shells for lime burning and stone and slate for building.

- 1806 – Under British rule the Island was again used as a prison housing soldiers under sentences of transportation or banishment: Cape residents who were considered dangerous and political prisoners from the growing frontier. The Island was also occasionally used to house quarantine cases of smallpox and measles and a few insane people who could not be controlled by their families.

- 1846 – Robben Island was closed as a prison and prisoners sent to mainland prisons. In the old prison buildings the Colonial Government set up a hospital called the General Infirmary which was divided into three sections housing "chronic sick", "lunatics" and "lepers".

- 1891, 1921, and 1931 – These three Institutions closed down respectively.

- 1931 to 1939 – The Island stood empty after the lepers were removed from the Island.

- 1939 to 1945 – At the start of the Second World War troops were set there to guard the entrance to Table Bay.

- 1945 to 1946 – The Island Garrison was reduced to a Coastal Artillery School.

- 1946 to 1951 – The South African Marine Corps controlled the Island.

- 1951 to 1959 – The SA Navy took charge of the Island now known as SAS Robbeneiland.

- 1959 –The Island was taken over by the Prisons Department.

- 1961 to 1991 – The Island was a maximum security prison and a political prison housing those considered to be most threatening to the apartheid government."[2]

[2] Deacon 1996, 2

- 1991 – The last political prisoner was taken off the Island.
- 1991 to 1996 – The prison held common law prisoners.
- 1994 – Declared a National Monument and National Heritage Site.[3]

There are over 50 documented shipwrecks scattered around the Island.[4] It was the task of the course attendees to investigate the unnamed wreck off Robben Island known as the Barrel Wreck which was more exposed than it normally was due to marine climatic conditions. After arriving at the wreck site, course candidates were required to set up two base lines, survey the wreck, compile a sketch plan, undertake corrosion tests on both metal and wood remnants, and compile a written report of the Barrel Wreck for publication with all the groups' findings.

We would like to thank SAHRA, the Dutch Government, NAS, the professional presenters and the lecturers for providing the knowledge and techniques that will empower us to practice what we have learnt on this course on and to go out and educate other recreational divers on the importance of saving and preserving our underwater heritage sites so that we can all benefit from the history which lies below our seas. We can also now be more vigilant and aware of the cultural and heritage value of shipwrecks and inform the relevant authorities when we come across important sites.

[3] RIM Integrated Conservation Management Plan 2007-2012
[4] NAS II Robben Island Report 2010, 14 – 42

1. History and environment of the Barrel Wreck

1.1. History of Bloubergstrand, Table Bay

The first European to sail through Table Bay is generally believed to be the Portuguese explorer Barthelomeus Diaz. He passed by in 1488. For the Portuguese, Robben Island functioned as a pantry for some time but Table Bay didn't have any further interest to them. It was the Dutch V.O.C. commander Jan van Riebeeck who changed the face of the Table Bay. He advised the 'Heeren Zeventien' to establish a stopover in Table Bay at what is today Cape Town. In order to get ships to pass by safely, he installed signaling post along the shores at strategic points. Fires would be lit when vessels were in the area. In spite of all the efforts taken many ships found their last destination in the waters of Table Bay.

1.2. Location of the wreck

The wreckage known as 'Barrel Wreck' or 'Musket Wreck' is located approximately 200m of Dolphins Beach at Blouberg Strand, Table Bay, South Africa; opposite the Dolphin Beach Hotel[5] The wreckage is located between 4 and 7m below the surface. The GPS co-ordinates are 33.834434 E and 18.47866 S (WGS-84). In good conditions, the wreck is visible from the surface. Dolphins Beach is very popular with surfers, wind- and kite surfing occurs all year round.

1.3. Environmental settings

Table Bay is part of the Benguela upwelling system. The water movement in the Bay is primarily wind-driven, tides play a minor role. The water conditions change significantly between summer and winter.[6]

In summer, south-easterly winds result in currents that flow northwards in an anti-clockwise motion within the Bay. Upwelling cold water (9-13°C) invades the Bay from the Oudekraal upwelling centre, south of Table Bay, resulting in generally shoreward bottom flows. Water temperature increases rapidly to more than 20°C during relaxation phases of the upwelling cycle as water flows into Table Bay from the north and north-west. Upwelling and solar heating in summer leads to a stratified water column.[7]

In winter, north/north-westerly winds drive water towards the south, producing a slight clockwise motion. Winter seawater temperatures are more uniform than in summer and fall into the narrow range of 14-16°C, as there is no upwelling of cold water and strong mixing of water columns during storms.[8] Typical wind driven surface current velocities are between 20-30cm/s. Bottom current velocities reach less than 5 cm/s. Recent studies showed comparatively short resident times for surface sediments in Table Bay, suggesting that the main driver for sediment turnover are episodic winter storms that probably flush the waters of

[5] NAS II Robben Island Report 2010,53
[6] Lwandle, 2006
[7] Schoeman, 2006
[8] Schoeman, 2006

the Bay. Salinity in Table Bay appears to be quite uniform and ranges between 34.7 and 35.3 ppt. Two rivers, the Diep and Salt Rivers, flow into Table Bay, lowering the salinity in the vicinity of the discharge area.[9]

Table Bay is anchored by rocky headlands at Mouille Point in the south and Blouberg in the north. The maximum water depth in the centre of the Bay is approximately 35m, increasing to 70-80m outside of a line between Mouille Point and the western shores of Robben Island. The seabed is mainly covered by thin layers of sand but has areas of partly exposed bedrock. Fine sand is generally confined to the eastern near-shore region between Blouberg and the Harbour. However, a tongue of fine sediments extends from the near-shore zone seaward to a depth of approximately 25m between Table View and Rietvlei. Smaller pockets of fine sand are found at the Bay entrance and on the eastern shore of Robben Island. Medium coarse sand covers the remaining areas of Table Bay. The major sources of sand in Table Bay are seasonal inputs from the Diep and Salt Rivers and local erosion of Malmesburry shale. There is no substantial sediment supply to the Bay from longshore transport from the south. Sediment is transported out of Table Bay by local waves.[10]

The shoreline of Table Bay from Blouberg to Mouille Point consists of 3km of rocky shore, 13 km of sandy beach (between Table Bay and Blouberg) and 4 km of artificial shore protection and breakwaters comprising the Port of Cape Town.[11]

1.4. History of site

The wreck has already been known to local divers for some time. In the 1980's it was extensively dived on by Charlie Shapiro. He raised several objects including wood stocks, brass trigger guards, side plates and butt plates of flintlock muskets.[12]

[9] Schoeman, 2006
[10] Jones, Dalgliesh & Schoeman, 2007
[11] Lwandle, 2006
[12] NAS II Robben Island Report 2010

2. **Methods**

Firstly, the methods used in this course will be described, and secondly the daily procedures that were followed. Detailed daily weather information can be found in Appendix I: Dive Logs.

2.1. Methodology

Salvage divers have been diving on this wreck since the 1980's so the location of the wreck is known since at least that period. The wreck is visible from above water and on Google maps. Still we first had to fix its position by taking visual transects and GPS (Global Positioning Systems) coordinates.
The next step was setting the baselines. The baselines had to be placed along the two sides of the wreck, due to the relief structure of the wreck. The third step was to make a sketch of the wreck. This shows the layout of the site and what objects can be found on and in the area of the wreck. From this sketch you can work out a plan for trilateration which requires fixed measuring points on the wreck. Thereafter, we placed about 50 detail points on the wreck. These detail points were measured using trilateration and this information was transferred onto the site plan. Once the basic outline of the wreck was complete, more detailed areas were added.

As part of the NAS III course, conservation specialists Vicky Richards and Jon Carpenter of the Western Australia Museum came over and taught us about conservation of shipwrecks and artifacts from shipwrecks. This course consisted of lectures and practical training on the Barrel Wreck.

We tested the condition of the wreck through measuring: the pH, thickness and rate of corrosion on ferrous metals and the integrity of the wood. Sediment samples were taken in order to understand the burial environment and wood samples were taken by the conservators to Australia in order to identify the origin of the timbers.

When the whole wreck is measured and drawn, it can be used to properly plan further research. It also serves as a base from which to formulate a wreck management and conservation plan.

2.2. Daily procedures

<u>Sunday 30-1</u>

Arrival of all the participants in the evening.

<u>Monday 31-1</u>

Excursion on the Island to the MSP, Sobukwe House etc. in the morning for the team members that never been to Robben Island before.

Divide teams (Team 1: Robin, James, Mareille, Luvuyo and Laurens, Team 2: Wayne, Chris, Ratanang, Sophie and Thijs), assign team leaders (Laurens for team 1 and Thijs for team 2) and plan the work for the coming week.

Lectures in the afternoon.

Elliot arrived, but he was not going to dive on Tuesday, only from Wednesday on.

Tuesday 1-2

Work: We started at 9:00 o'clock at the harbour, but we had to wait a long time for the boat. When it arrived we started at the Barrel Wreck near Dolphin Beach, Table Bay. But there was a lot of wind, resulting in rough seas and a lot of current. First Jonathan, Vanessa, Sean and Nic went in to set out the baselines. When they came up, it was clear that there was a lot of current, so it was tough to swim to the wreck. At the wreck it was supposed to be good enough to work. But because of the bad conditions, only one buddy pair at the time went down. Mareille and James went down first, guided by A.J. They had so many difficulties going down, that the dive was cancelled.

We went back to Murray Harbour for lunch, and afterwards we went to a wreck near Robben Island, out of the wind. We went down in buddy pairs to just look for wreckage on the seabed. There was a lot of kelp and current so it was difficult to dive, but nice visibility and a nice dive.

The whole day was a bit chaotic, too many people on the boat and gear lying around.

Wednesday 2-2

Work: First we set out for the wreck site at Robben Island, because the conditions at the Barrel Wreck site were just as bad as the day before. We had to go down in buddy pairs and sketch whatever we encountered. The conditions there were pretty good (calm sea, reasonable visibility), but because of the kelp and current it was very difficult to sketch the parts, let alone create a map. After the dive we went back to the harbour.

After lunch we decided to go to the Barrel Wreck, because the conditions improved. We divided our team in two buddy pairs (Sophie and Thijs, and Ratanang and Chris, with Wayne taking pictures/video transect) to draw the wreck from the N-Line. The other team did the same for the S-line. Still a rough sea, so we went down in buddy pairs along the anchor line to start sketching the wreck. At the wreck the current wasn't so bad, so Sophie and Thijs sketched the wreck from the N-line, at the back. Because of some confusion, Ratanang and Chris went the wrong way, and could only sketch a small part.

That night Mareille compiled the sketches, with the help of the video transect. At the debriefing we decided that the next day we would continue sketching and setting out measuring points. Other tasks (filling in the dive logs/site report forms/etc.) were assigned.

Thursday 3-2

Work: We set out at 8:00 for the Barrel Wreck, to continue sketching it and setting out measuring points. Ratanang couldn't come, but Elliot (from Namibia) was added to our team. So we changed buddy pairs, Chris and Thijs, and Sophie and Elliot. We started to put in measuring points from the N-Line. Elliot and Chris were drawing, and Sophie and Thijs put in the detail points. That didn't work so well, because Chris's drawing wasn't clear. Putting in the points was also difficult, because on some points it wasn´t possible to put a measuring point. After lunch we changed tactics, and put the 2 buddy pairs together. Elliot and Thijs were drawing, and Sophie and Chris put the remaining points in (between N6 and N3). That worked better, besides the fact that in the end Elliot and Thijs lost Sophie and Chris, so we finished drawing and went back.

Friday 4-2

Work: Team 1: Drawing 4m sections from the cross lines, N1-S1 and N2-S3 and additional measuring (some points only had one measurement)

Team 2: Drawing 4m sections from the cross lines, N4-S4 and N6-S6 and additional measuring (some points only had one measurement)

Saturday 5-2

No Robin, so Ratanang, Sophie and Luvuyo created one team.

Mareille and Wayne did detail drawings, measured and took photographs of the anchor and planking.

James and Laurens did detail drawings and measuring and took photos of the keel.

Chris, Elliot and Thijs measured the distances between baseline points N1-N2, N2-N3, etc. and did the same for the S-line and one cross line.

In the afternoon, started drawing again, but because the baselines were not completely straight and in the middle section there were no diagonal cross lines, the two lines couldn't be tied together. After 3 hours of work we found that out.

When trying to put the measurements in Site Recorder the first try didn't give very good results, it was scrambled (because we did not fix one point), then we wanted to fix one point with the GPS-measurements, but we couldn't work out how to put the GPS-coordinates in. Next time we need someone with experience to help and more cross lines to fix the two baselines.

Sunday 6-2

Day off

Monday 7-2

In situ conservation Lectures by Vicky Richards in the morning. In the afternoon, there was an explanation about the equipment (underwater drill, taking different measurements on pH and taking sediment samples) and discussions at different land wreck sites about conservation strategy.

Tuesday 8-2

Work: Diving in the morning, trying to work with the equipment and try to take some measurements. Only one dive each team. Second team to go down with the drill had difficulties with the drill (it wasn't working properly, and then they ran out of air for the drill).

Furthermore the diagonal cross lines N2-S3, S2-N3, N3-S4, S3-N4 need to be measured.

In the afternoon lectures

In the evening copying all underwater forms to regular paper

Wednesday 9-2

Work: Diving in the morning, different teams performed different tasks

Ratanang, Chris, Elliot, Wayne and Thijs: put in extra detail points on the wreck to connect both baselines. From each detail point, they took four measurements, two on each baseline. First dive, three points placed; second dive, two placed and measured from one existing point (17, close to the S-line) to the N-line. At every point, the height was measured with dive computers (accuracy 0.10 meter) from each point and all baseline points, so no need for keeping the tape measure horizontal. Using Pythagoras the exact distance can be calculated.

Other teams practiced with drilling and measuring, and measured more detail points on the wreck and the distance between the engraved numbers on the keel at the stern site.

Revealing topside of the anchor and measuring length of it.

More photos of the wreck were taken.

In the afternoon calculating distances between the baseline connecting points. Using Site recorder and plotting on paper, the measurements in order to create a site map.

Thursday 10-2

Work: Two dives each team.

Chris, Elliot, Wayne and Thijs more measuring from N-line (N1-N4) to outline of wreck.

Mareille and James did detail drawings and measuring of the barrels in the centre of the wreck.

Laurens, Luvuyo and Sophie did more measuring from S-line (S6-S3) to outline of wreck, first put in points, then measured them from S5, second dive measure those points to S3-3-6

Last day of diving. In the afternoon and evening worked on report and site drawing.

3. The wreck

3.1. Site Map

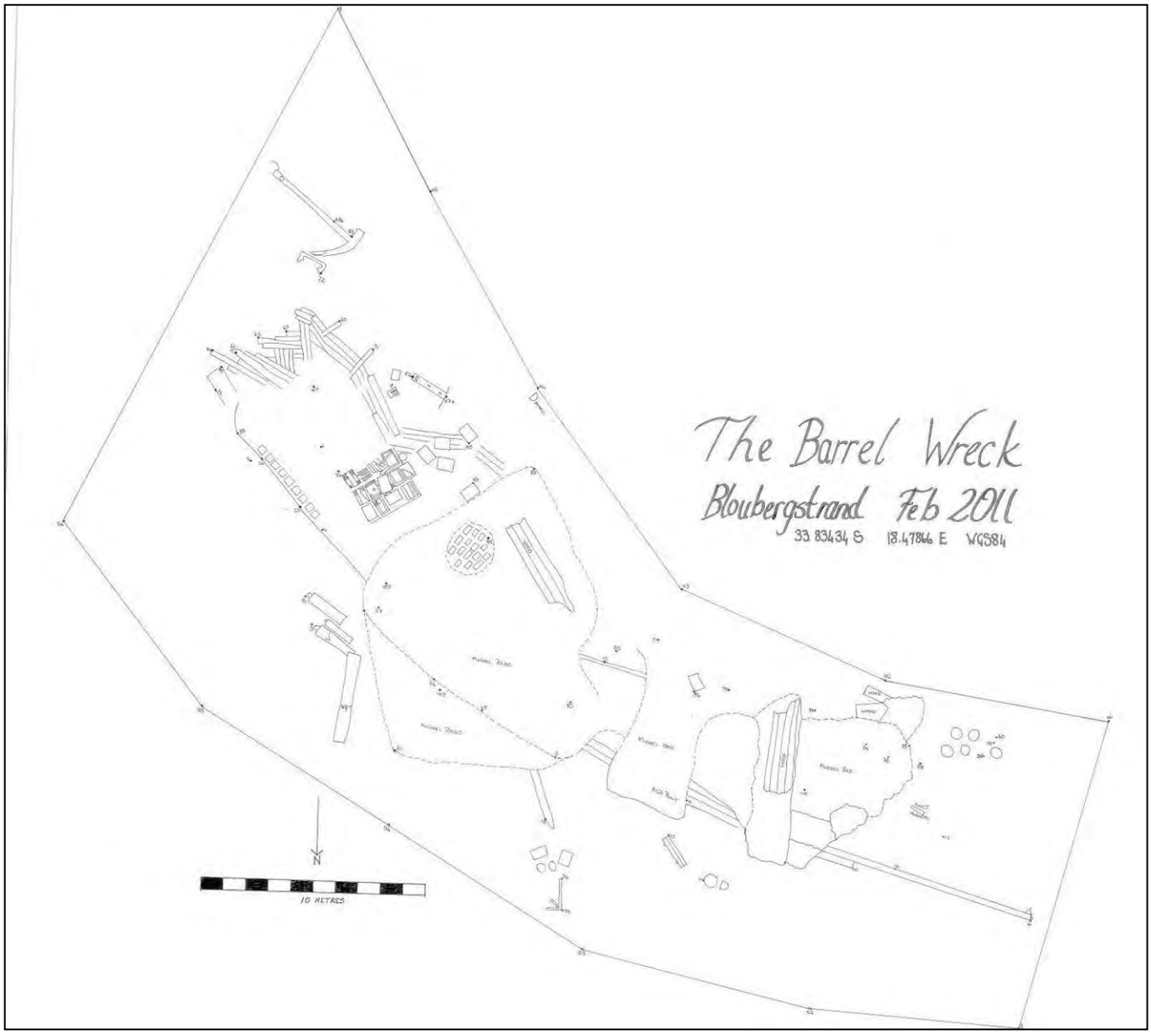


Fig. 1. Site plan of the Barrel Wreck (Arkesteijn & Coenen).

3.2. Construction of the wreck

The remains of the wreck being studied are that of a vessel that seems to be primarily constructed of wood. The length of the remaining structure is about 45 meters and about 12 meters wide.
The wooden planking which probably belonged to the hull is in four main layers. The outer layer is approximately 2 cm thick and may act as a sacrificial layer, this is followed by the outer hull plank, the frames and the inner ceiling. A small section of the bow had 5 mm thick metal sheathing, possibly lead. The rest has been removed by salvors. This is a good clue as to the date of the vessel, as copper was generally used in vessels after 1780.[13]

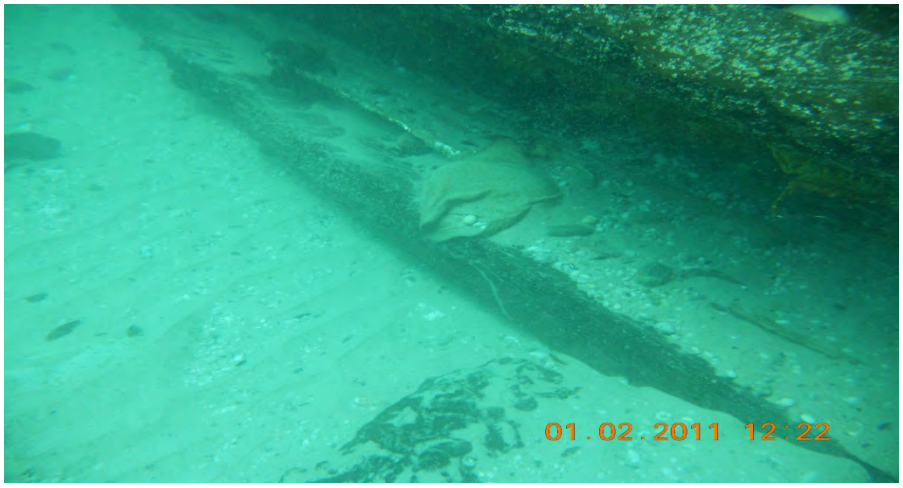


Fig. 2. Section of wreck showing hull planking (Photo: Maitland 2011).

The main outer hull planking is also about 2cm thick. Between the outer and inner planking are frames approximately 35 centimeters square.

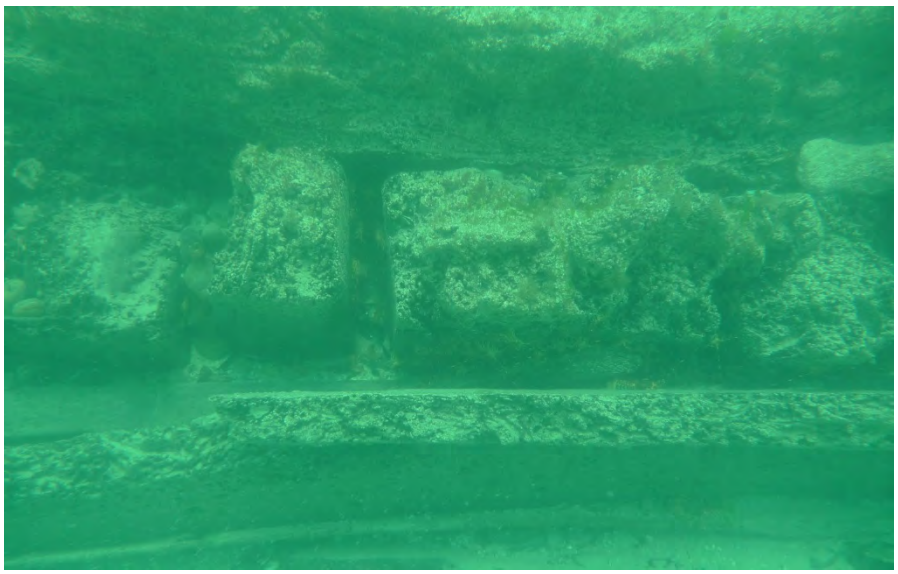


Fig. 3. Cross section of hull showing outer planking, frames and hull ceiling. (Photo: Jeffery 2011).

[13] Harris 1993, 100

A large section of the keel or keelson was also surveyed, this part was about 9,2 meters in length and approximately 37 cm in thickness and width.

The keel had the numbers 21, 23 and 27 carved into it. These numbers could possibly indicate where the frames would have been connected. The distance between 23 and 27 was 4,2 m.

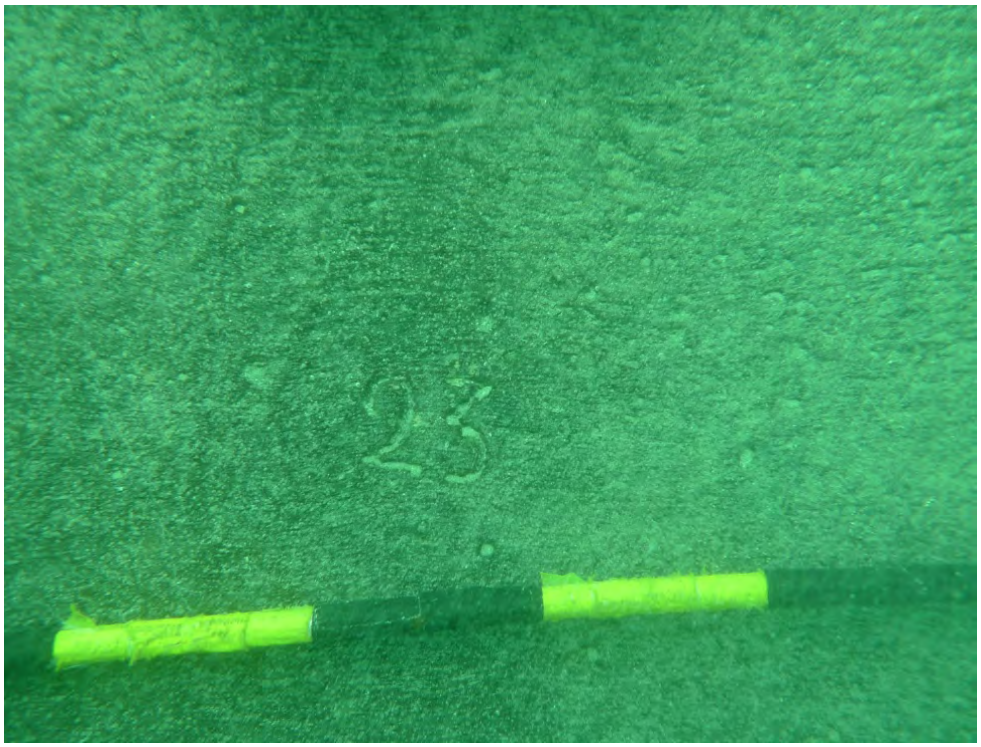


Fig. 4. Number inscribed on keel. (Photo: Jeffery 2011).

3.3. Cargo

3.3.1. Barrels

In seafaring Europe all kinds of bulk goods were carried in barrels from nails to gold coins. Crates and bags were used as well although, these proved cumbersome to handle and were easily penetrated by vermin such as rats. As a result, barrels were preferred instead.

Barrels where used for many purposes; including transporting peppercorns, pitch, paint, cement etc.[14] During the 2011 field survey, a black sticky substance (possibly tar) in one of the barrels was sampled. It is most likely that these barrels are used for transporting tar.

Tar was a widely used commodity in the 19th century. The production and trade in tar was a major contributor in the economies of Northern Europe and Colonial America. One of the

[14] NAS II Robben Island Report 2010, 55

uses of tar was to preserve wooden vessels against rot.[15] The markings found on one of the barrels were probably for identification purposes (Fig. 7).

Fig. 5. In-situ barrel. A bung hole is visible in the middle of the barrel. (Photo: Sharfman: 2011).

Fig. 6. In-situ barrel with markings on the lid. (Photo: Evans 2011).

[15] Wikipedia 2010

3.3.2. Muskets

Muskets were widely used in Europe, famous for their roles in many different wars. Muskets as weapons could have served many purposes on board ships, varying from defense against pirates to trade, particularly in Africa which was an important market for muskets in the 18th and 19th and the early 20th centuries.[16]

According to the 2010 Robben Island NAS II Report, the Barrel Wreck muskets salvaged in the 1980's revealed some interesting possibilities. Some of these parts were restored by the salvors and cobbled together to make complete muskets. Unfortunately the parts used for this purpose came from different muskets so that unmatched parts now form new muskets. Only 3 of the conserved muskets were still in the original state they were found in. Besides the restored and original muskets there were also muskets that weren't restored or conserved. Despite the incorrect restoration and bad conservation, these muskets also give some information.[17] The muskets we discovered this year were situated on the west side of the wreck (Fig. 7) near the bow.

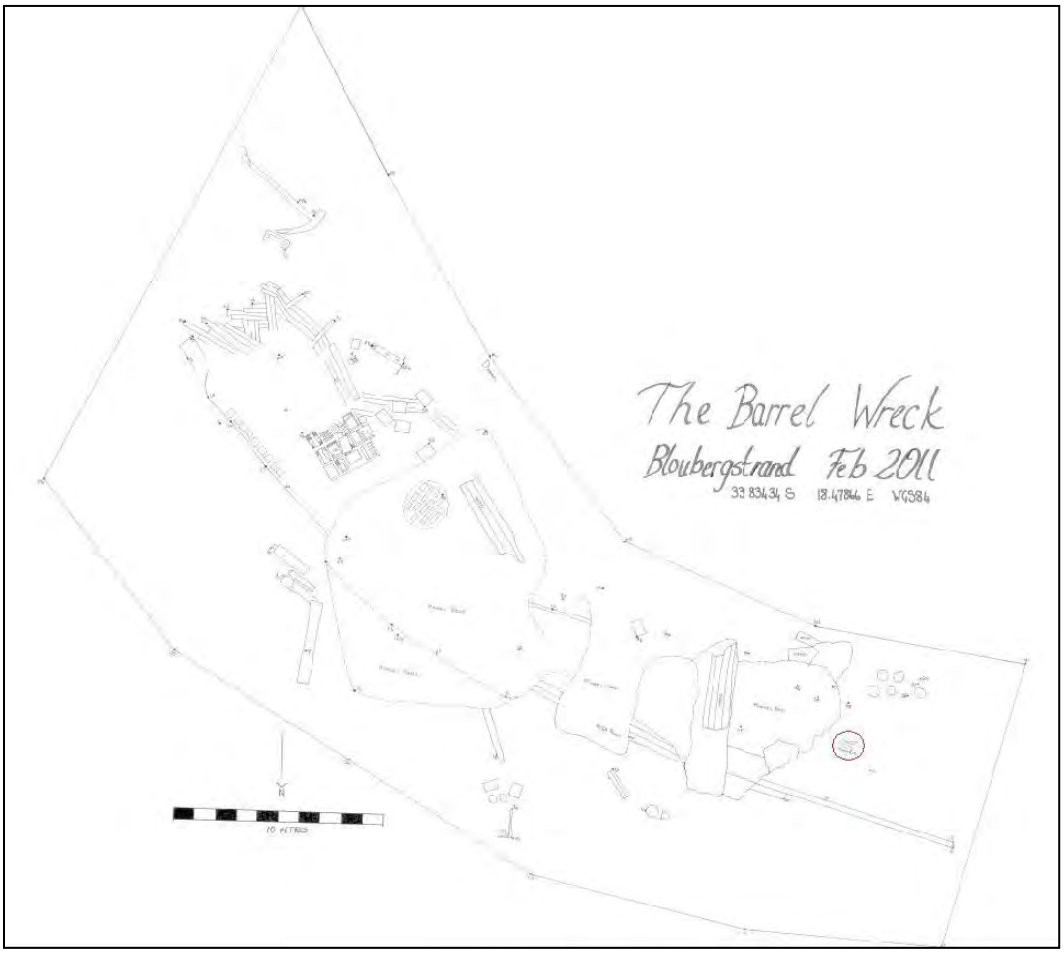


Fig. 7. Site plan of the Barrel Wreck. The red circle shows the location of the muskets (Arkesteijn 2011.)

[16] Britannica 2011
[17] NAS II Robben Island Report 2010, 53

The stocks of two muskets, partially buried by the sand, were recorded. On one of the stocks an engraved brass butt plate was visible. These engravings may consist of the regiment name and number, the company name or number and the number of the soldier that used it or the weapon number.[18]

The engravings on the brass butt plate of one of the muskets we recorded are KÖIR ÖLC N54. The KOIR engravings were probably the initials of the KOI Regiment. Possibly the OLC engravings were the initials of the OL Company. N54 may be the weapon issued number. The dotted engravings YN on top of the KÖIR ÖLCN54 may be the initials of the soldier that used the weapon (Fig. 9). According to M. Willemsen (weapon specialist of the Army Museum, Delft) this weapon might be of German origin because of the umlaut mark. Further investigation is necessary.

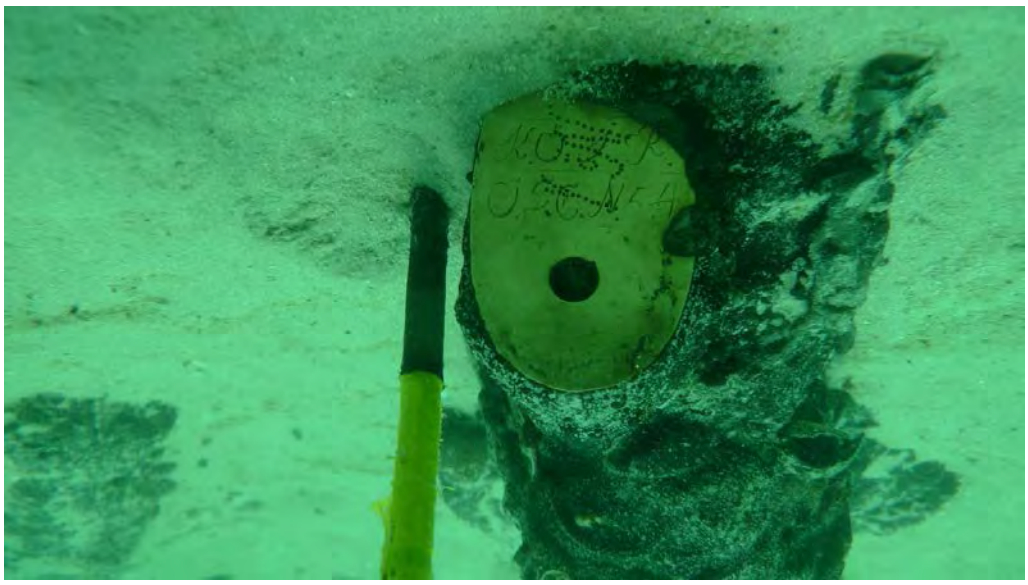


Fig. 8. Engraving on the brass butt plate of recorded, partially covered musket stock. (Photo: Jeffery 2011).

The muskets recovered in the1980s also had brass plates on them. These plates had other engravings namely, K:A:R: - GB:C:1 – N:3, they were also written in a different font. There are at least 2 regiments that used this abbreviation. The King's African Rifles 1902-1960 and the King's American Regiment 1776 – 1783. Further research is necessary to be sure of the right regiment these weapons belonged to.[19]

3.3.3. Glass

Up to the 16th century, window glass or flat glass was generally cut from large discs of crown glass. Larger sheets of glass were made by blowing large cylinders which were cut open and flattened, then cut into panes. Most window glass in the early 19th century was made using the cylinder method.[20] The 'cylinders' were 6 to 8 feet (1.8 to 2.4 m) long and 10 to 14 inches

[18] NAS II Robben Island Report 2010, 53
[19] NAS II Robben Island Report 2010, 55
[20] Wikipedia 2010

(250 to 360 mm) in diameter, limiting the width that panes of glass could be cut, and resulting in windows divided by transoms into rectangular panels.[21]

The Barrel Wreck`s glass appear to have been carried in bulky sheets, as can be seen on Fig. 10 the glass was ca. 60 cm in length and the sheets were placed next to each other.

The first glass manufacturer in South Africa was Furman Glass situated in Cape Town in 1896.[22] Before that year glass was imported from other countries especially from European countries.

The glass on the Barrel Wreck gives us an insight about trade and commerce between Europe and Africa particularly with European settlements around the Cape of Good Hope. With the growing number of Europeans around the Cape, more settlements were needed and so were building materials. During this time some raw materials were directly shipped from Europe.[23] Thus it is highly possible that the Barrel Wreck`s glass was shipped for trade to the Cape settlement.

Further recording and excavation is highly recommended to continuously update and fill the vacuum of information and to shed more light this rich heritage entails.

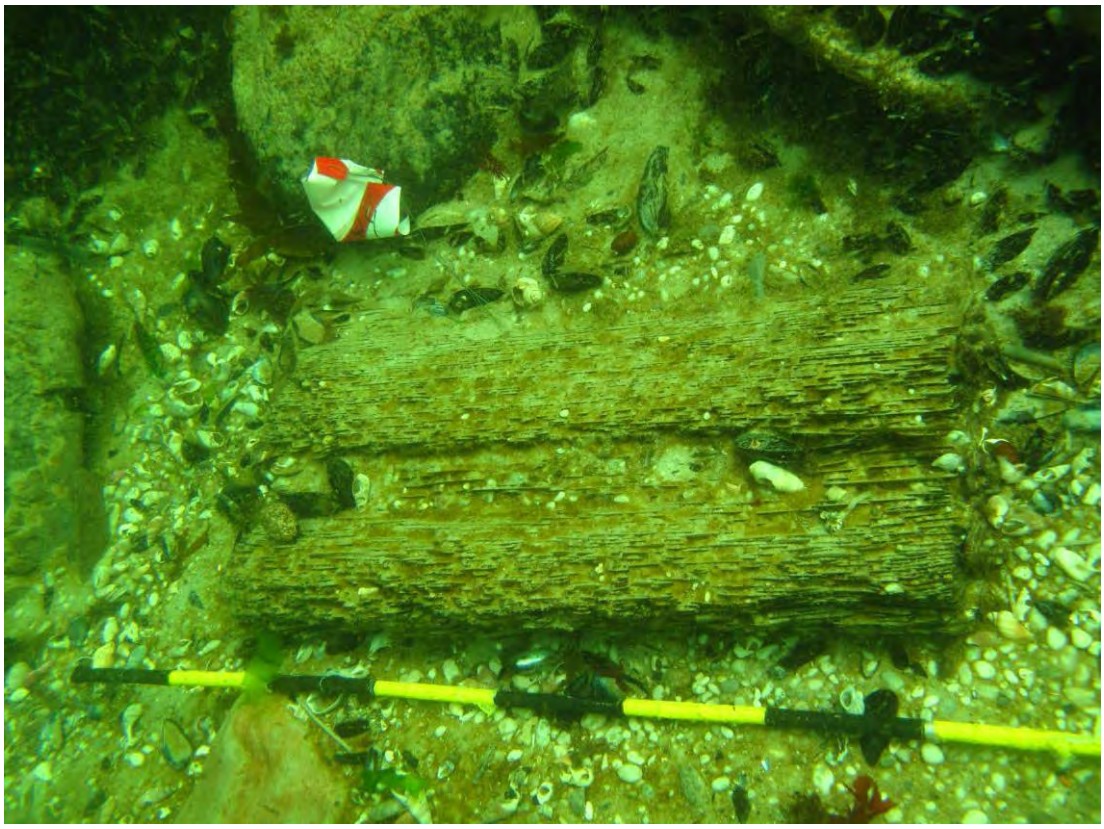


Fig. 9. Picture showing the glass sheets conglomerated together (10cm scale). (Photo: Evans 2011).

[21] Wikipedia 2010
[22] NAS II Robben Island Report 2010, 53
[23] Elphick & Gillomee 1989, 45

3.4. Anchor and guns

Besides the partially intact wooden vessel, also an anchor, guns and other ship fittings were found.

Fig. 10. Three guns found on the "Barrel wreck" (Photo: Carpenter 2011).

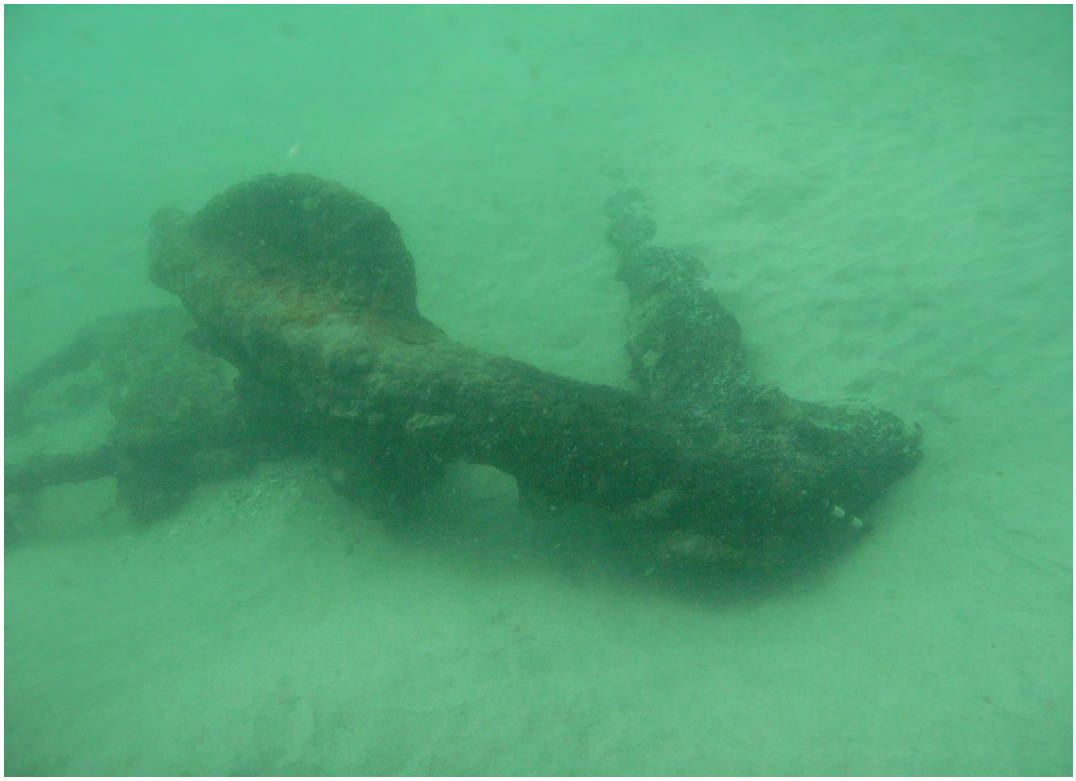


Fig. 11. Visible part of the anchor (Photo: Carpenter 2011).

The anchor is located on the south-eastern side of the site, near the N5 datum point. The guns are situated at the north-eastern side of the site, near the datum points S4 and S5. During the survey, detail drawings of the of the guns and the anchor were made and measurements taken (Appendix V).

4. Deterioration and conservation of the Barrel Wreck

4.1. On-site conservation survey

During the on-site conservation survey, measurements and samples were taken from different parts of the wreck site. The analyses of these measurements is in Appendix IX. The following methodologies were employed.

The integrity of the wood was measured using a small sharpened metal rod with notched measurements. Using uniform force the sharp end is pushed into various samples and the depth recorded the deeper the measurement, the more deteriorated the wood.

The integrity of the metal artifacts for i.e. the guns and anchor was assessed using PH measurements and corrosion potential. PH measurements were obtained by drilling a hole through the concretion and the corrosion layer. The PH level is measured immediately after drilling next to the uncorroded metal. The lower the PH, the more the object is corroding. Thereafter the platinum electrode is placed in the same hole to measure the corrosion potential. For this test good electrical contact with the surface is important. These results are later entered into a pourbaix diagram. The thickness of the concretion and the corrosion was measured. This can tell us about the dynamics of the wreck site. The hole was afterwards filled with Pratleys Putty to prevent further carrion.

Fig. 12. Hole drilled into gun to measure corrosion levels (Photo: Carpenter 2011).

Sediment samples were taken from the wreck site. This samples tells us about the micro-biological activity and oxygen levels in sediments the wreck is buried in.

These samples were taken by hammering a transparent tube into the sediment. A stopper is put into the top end, this creates a vacuum and prevents the sediments from falling out. After the removal a stopper is placed into the bottom end. The sediment sample is removed to the boat and documented.

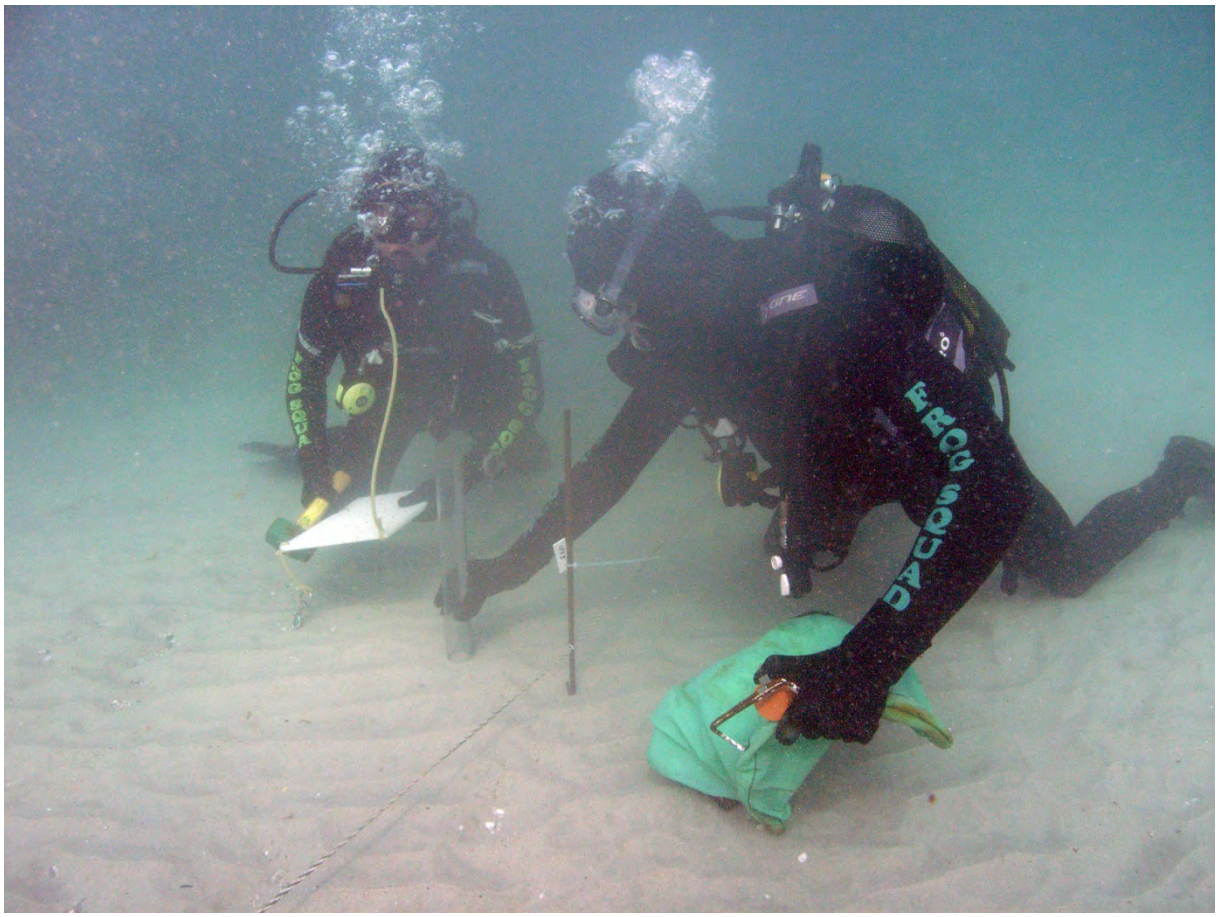


Fig. 13. Students taking sediment samples to gain information about micro-biological activity in the seabed. (photo: Carpenter 2011).

5. Conclusion

5.1. Identity of the wreck

The survey and search of the wreck did unfortunately not reveal any unique identifiers that could be used to positively name the vessel. No findings, however excluded her from the list of possible vessels that she could be according to the historical accounts. The findings of interest that collectively have a bearing on her identity and are still *in-situ* include:

1.1 Three (possibly four) cannon
1.2 The anchor
1.3 Muskets (concreted)
1.4 Two different types of wooden barrels, some large containing what appears to be tar, and some smaller ones.
1.5 Window glass as cargo
1.6 Lead ingots ("Bread" shaped) as cargo
1.7 Lead sheathing

The existence of artifacts previously recovered by others from the site that have a bearing on her identity include[24]:

1.8 Muskets which were removed by salvors in the 1980's and which have been viewed by Maritime Archeologist Vanessa Maitland. These give an earliest possible date as 1779 due to the S-shaped side plates which post date 1779.
1.9 Lead ingots (square) stamped with the word "Wanlock" (possibly Welsh – needs further research).

Thus the identity of the wreck remains confined to a list of six possible vessels as follows[25]:

1. *The Maria (*British 1825)
2. *The Oste (*German 1859)
3. *The Rover(* Cape 1863)
4. *The Rubens (*British 1865)
5. *The Juno (*German 1874)
6. *The Knysna Belle (* Cape 1876)

[24] Maitland, pers. comm. 2011
[25] Maitland, pers. comm. 2011

5.2. Methodological lessons learned

The trilateration exercise went smoothly, except for one problem that was encountered which the survey team had to deal with. This had to do with the fact that the baselines were not set out in a straight line from end to end, and "zigzagged" slightly instead of following a straight line from N1 to N6, and S1 to S6. This resulted in extra measurement having to be taken from further points on the wreck to certain of the Baseline points – in order to align the baseline properly. This problem could be addressed in future by using thin wire instead of rope as the baseline, and taking care to ensure that the baselines are set as straight as possible. The wire would be easier to pull tight into a straight line and would not be as affected by the pull of the current.

5.3. Conservation and management plan

There are artifacts at risk (pulleys, muskets, guns and possibly some of the wooden barrels) that are in danger of removal by souvenir hunters. These could be conserved by:

1. Removing them to a controlled environment such as an approved museum, or;

2. by a process of reburial.

There is also a long term risk to the condition of the site by sand scouring. This could also be mitigated by reburial, but would be a labour and time intensive activity.

5.4. Recommendations for the Barrel Wreck

The Barrel Wreck provides an ideal training environment for NAS students as it is situated outside in shallow waters on a flat sandy bottom, free from kelp and other organisms that may impede non-disturbance survey work. The small sharks, mussels and crayfish that the group encountered did not pose any problems, except the mussel beds obscure the parts of the wreck surface they are growing on. For these reasons, the wreck should continue to be used for training exercises, which will have the added benefit of monitoring the wreck on a regular basis.

The wreck is situated in a highly dynamic environment where sediment transport is seasonal. In the winter, sediment from nearby rivers is deposited and during the summer months, wave action removes this sediment, scouring and exposing the wreck. By conducting regular surveys, the site plan that the group has created this year can be added to if more of the wreck is exposed and the effects of abrasion monitored. Further surveying could inform on which parts of the wreck are most at risk of degradation and may include conservation measures such as reburying or covering those areas. A preservation or management plan should be developed for this site.

Since the identity of the wreck is still unknown and the associated artefacts such as the muskets, guns and anchors pose some interesting research questions, further investigations are recommended. The wreck has been extensively dived on by the local salvager Charlie Shapiro, who recovered and restored a number of artefacts, including the wood stocks, barrel trigger guards and side and back plates of flintlock muskets.[26] This unfortunately means the archaeological context of these artefacts is lost and shows that this wreck is vulnerable to salvage operations if not properly monitored. Since the site lies in shallow water and is easily accessible to local divers, disturbance of the site is possible and there is the risk of smaller artefacts being removed as souvenirs. For these reasons, it is recommended that the remains of the muskets that were discovered during this year's survey should be removed and conserved in the proper way. Analysis of these musket remains may also be key for the identification of the vessel. If it is deemed necessary to answer particular academic research questions, an excavation permit could be applied for and more extensive surveying and excavation conducted. This could be carried out in conjunction with NAS students.

[26] Maitland, pers. comm. 2011

References

Deacon, H. (ed). 1996. *The Island: A History of Robben Island 1488 - 1990*. Cape Town. David Philip Publishers.

Elphick, R. & H. Giliomee 1989. *The shaping of South African society, 1652-1840*. Maskew Miller Longman.

Feinberg, H, M & M. Johnson 1982. *The International Journal of African Historical Studies*, Boston University African Studies Centre 15, (3) pp. 435-453.

Harris, L.B. 1993. *Seaport Table Bay – An Archaeological and Historical Perspective*. ECU Research Report No. 8, pp. 100.

Jones, S., C. Dalgliesh & B. Schoeman 2007. *Environmental Impact Report, SRK Consulting.*

Lwandle 2006. *Journal of South African Studies*.

Nautical Archaeological Society, 2011. *Introduction to Foreshore Archaeology – Course Notes*. pp. 5

Nautical Archaeological Society (NAS) II *Robben Island Report 2010*.

Robben Island Museum *Integrated Conservation Management Plan 2007-2012*

Russell-Wood.A.J.1998. *The Portuguese Empire 1415-1808*: *A world on the move*. The Johns Hopkins University Press: London.

Schoeman, B. 2006. Dock *Berth Deepening Project: Intergrated Marine impact Assessment Study, CSIR Report nr. CSIR/NRE/ECO/ER2006/DRAFT*.

Internet references

Encyclopedia Britannica Musket 2011.
http//www.britannica.com/ebchecked/topic/399353/musket.

Wikipedia Barrel 2010. Wikipedia the free Encyclopedia.
http://en.wikipedia.org/wiki/barrel.

Wikipedia Glass 2010. Wikipedia the free encyclopedia.
http//:en.wikipedia.org/wiki/Glass

Personal Communication

Willemsen, M. 2011	Weapon specialist (Army Museum, Delft).
Maitland, V. 2011	Maritime Archaeologist (self employed).

Figures

Appendices

Appendix I: Dive logs

	Dive Logs for Robben Island NAS Jan-Feb 2011					
	Date		**1-Feb-11**	**Diving Day 1**		**Tuesday**
	Name of Site		**Rangatira**			
	Vessel Name		**Wreck Sentinel/Frogfish**			
	Contractor		**Frogsquad**			
	Weather conditions		**SE 2m swell, choppy sea**			
	Wind (knots)		**50**			
	Viz		**8m**			
	Water temp (degrees celsius)		**10**			
	Dive # 01					
Dive #	**Name**	**Time In**	**Air In**	**Time out**	**Air out**	
1	Jon	12h05	210	12h57	30	
1	Chris	15h36	220	16h16	70	
1	Mareille	13h13	210	13h20	170	
1	Shawn	12h05	210	12h39	40	
1	Thys	15h36	230	16h00	150	
1	laurens	15h45	200	16h11	130	
1	Robin	15h27	180	16h12	70	
1	Vanessa	12h05	210	12h48	20	
1	Wayne	15h32	200	15h58	100	
1	Sophie	15h36	210	16h00	110	
1	Ratanang	15h30	220	16h12	100	
1	James	13h15	210	13h25	110	
1	Nick	12h05	200	12h44	30	
1	Luvuyo	15h33	220	16h02	30	
2	Mareille	15h37	170	16h11	100	
2	James	15h32	150	15h58	50	

	Dive Logs for Robben Island NAS Jan-Feb 2011					
	Date		**2-Feb-11**	**Diving Day 2**		**Wednesday**
	Name of Site		**Rangatira**			
	Vessel Name		**Wreck Sentinel/Frogfish**			
	Contractor		**Frogsquad**			
	Weather conditions		**SE 2m swell, choppy sea**			
	Wind (knots)		**25**			
	Viz		**8m**			
	Water temp (degrees celsius)		**10**			
	Dive # 2					
Dive #	**Name**	**Time In**	**Air In**	**Time out**	**Air out**	
1	Jon	**Did not dive**	**DND**	**DND**	**DND**	
1	Chris	10h38	230	11h21	90	
1	Mareille	09h08	200	09h49	130	
1	Shawn	10h38	210	11h28	60	
1	Thys	10h38	220	11h21	100	
1	laurens	09h08	190	09h45	110	
1	Robin	09h08	190	10h06	110	
1	Vanessa	**Did not dive**	**DND**	**DND**	**DND**	
1	Wayne	10h38	210	11h28	130	
1	Sophie	10h38	220	11h21	130	
1	Ratanang	10h38	210	11h21	120	
1	James	09h08	205	09h45	120	
1	Nick	10h38	220	11h28	80	
1	Luvuyo	09h08	220	10h06	50	

	Dive Logs for Robben Island NAS Jan-Feb 2011					
	Date		**2-Feb-11**	**Diving Day 2**		**Wednesday**
	Name of Site		**Barrel Wreck - 7/8m**			
	Vessel Name		**Wreck Sentinel/Frogfish**			
	Contractor		**Frogsquad**			
	Weather conditions		**SE 2m swell, choppy sea**			
	Wind (knots)		**25**			
	Viz		**6m**			
	Water temp (degrees celsius)		**10**			
	Dive # 3					
Dive #	**Name**	**Time In**	**Air In**	**Time out**	**Air out**	
2	Jon	14h41	230	15h21	50	
2	Chris	15h04	110	15h30	70	
2	Mareille	15h03	130	15h23	60	
2	Shawn	15h18	200	15h58	90	
2	Thys	15h04	230	15h29	110	
2	laurens	15h00	110	15h16	50	
2	Robin	15h03	110	15h22	30	
2	Vanessa	15h18	190	15h52	50	
2	Wayne	15h04	210	15h30	100	
2	Sophie	15h04	140	15h29	50	
2	Ratanang	15h04	120	15h30	30	
2	James	15h00	130	15h16	90	
2	Nick	14h38	220	15h21	100	
2	Luvuyo	15h03	250	15h25	100	

	Dive Logs for Robben Island NAS Jan-Feb 2011					
	Date		**3-Feb-11**	**Diving Day 3**		**Thursday**
	Name of Site		**Barrel Wreck - 7/8m**			
	Vessel Name		**Wreck Sentinel/Frogfish**			
	Contractor		**Frogsquad**			
	Weather conditions		**Sea: Calm**			
	Wind (knots)		**Westerly 5kn**			
	Viz	**3-4m**				
	Water temp (degrees celsius) 12.3					
	Dive #	**4**				
Dive #	**Name**	**Time In**	**Air In**	**Time out**	**Air out**	
1	Jon	09h46	200	10h34	50	
1	Chris	11h04	180	11h44	100	
1	Mareille	11h12	210	11h48	80	
1	Shawn	10h49	180	11h38	50	
1	Thys	11h04	180	11h44	70	
1	laurens	11h14	180	11h57	70	
1	Robin	11h12	210	11h48	100	
1	Vanessa	10h49	180	11h39	50	
1	Wayne	11h04	210	11h53	50	
1	Sophie	11h04	210	11h43	120	
1	Ratanang	**DND**	**DND**	**DND**	**DND**	
1	James	11h14	210	11h57	110	
1	Nick	09h46	200	10h34	40	
1	Luvuyo	11h12	230	11h48	90	
1	Elliot	11h04	180	11h43	70	

	Dive Logs for Robben Island NAS Jan-Feb 2011					
	Date		**3-Feb-11**	**Diving Day 3**		**Thursday**
	Name of Site		**Barrel Wreck - 7/8m**			
	Vessel Name		**Wreck Sentinel/Frogfish**			
	Contractor		**Frogsquad**			
	Weather conditions					
	Wind (knots) Westerly 5kn					
	Viz 3-4m					
	Water temp (degrees celsius) 12.3					
	Dive #	**5**				
Dive #	**Name**	**Time In**	**Air In**	**Time out**	**Air out**	
2	Jon	**DND**	**DND**	**DND**	**DND**	
2	Chris	14h29	200	15h04	90	
2	Mareille	14h39	200	15h22	70	
2	Shawn	14h24	180	15h10	50	
2	Thys	14h25	210	15h09	100	
2	laurens	14h49	150	15h28	60	
2	Robin	14h35	200	15h22	70	
2	Vanessa	14h24	200	15h11	50	
2	Wayne	14h39	160	15h50	50	
2	Sophie	14h25	130	15h04	50	
2	Ratanang	DND				
2	James	14h49	150	15h28	50	
2	Nick	**DND**	**DND**	**DND**	**DND**	
2	Luvuyo	14h37	210	15h22	70	
2	Elliot	14h27	200	15h09	50	

	Dive Logs for Robben Island NAS Jan-Feb 2011					
	Date		**4-Feb-11**	**Diving Day 4**		**Friday**
	Name of Site		**Barrel Wreck - 7/8m**			
	Vessel Name		**Wreck Sentinel/Frogfish**			
	Contractor		**Frogsquad**			
	Weather conditions		**Sea: Calm**			
	Wind (knots)		**SE 10knts**			
	Viz	**5m**				
	Water temp (degrees celsius) 13.2					
	Dive #	**6**				
Dive #	**Name**	**Time In**	**Air In**	**Time out**	**Air out**	
1	Jon	10h08	210	10h38	100	
1	Chris	10h25	200	10h58	100	
1	Mareille	10h42	200	11h19	80	
1	Shawn	10h06	200	10h55	70	
1	Thys	10h32	210	11h20	80	
1	laurens	10h46	200	11h15	110	
1	Robin	10h40	200	11h19	100	
1	Vanessa	10h06	190	10h55	60	
1	Wayne	10h25	180	10h58	60	
1	Sophie	10h32	200	11h08	120	
1	Ratanang	10h25	200	10h58	100	
1	James	10h47	200	11h15	150	
1	Nick	**DND**	**DND**	**DND**	**DND**	
1	Luvuyo	10h43	210	11h19	100	
1	Elliot	10h32	200	11h20	50	

	Dive Logs for Robben Island NAS Jan-Feb 2011					
	Date		**4-Feb-11**	**Diving Day 4**		**Friday**
	Name of Site		**Barrel Wreck - 7/8m**			
	Vessel Name		**Wreck Sentinel/Frogfish**			
	Contractor		**Frogsquad**			
	Weather conditions		**Sea: Calm**			
	Wind (knots)		**SE 10knts**			
	Viz	**5m**				
	Water temp (degrees celsius) 13.2					
	Dive #	**7**				
Dive #	**Name**	**Time In**	**Air In**	**Time out**	**Air out**	
2	Jon	**DND**	**DND**	**DND**	**DND**	
2	Chris	12h06	210	12h25	120	
2	Mareille	12h30	220	13h07	90	
2	Shawn	11h54	200	12h56	40	
2	Thys	12h19	210	13h07	100	
2	laurens	12h39	200	13h01	130	
2	Robin	12h27	210	13h07	130	
2	Vanessa	**DND**	**DND**	**DND**	**DND**	
2	Wayne	12h09	190	12h48	90	
2	Sophie	DND				
2	Ratanang	12h06	100	12h24	70	
2	James	12h37	150	12h50	100	
2	Nick	**DND**	**DND**	**DND**	**DND**	
2	Luvuyo	12h25	230	13h07	90	
2	Elliot	12h20	200	13h07	70	

	Dive Logs for Robben Island NAS Jan-Feb 2011					
	Date		**5-Feb-11**	**Diving Day 5**		**Saturday**
	Name of Site		**Barrel Wreck - 7/8m**			
	Vessel Name		**Wreck Sentinel/Frogfish**			
	Contractor		**Frogsquad**			
	Weather conditions		**Sea: Calm**			
	Wind (knots)		**SE 10knts**			
	Viz	**2m**				
	Water temp (degrees celsius) 13					
	Dive #	**8**				
Dive #	**Name**	**Time In**	**Air In**	**Time out**	**Air out**	
1	Jon	**DND**	**DND**	**DND**	**DND**	
1	Chris	10h38	210	11h25	100	
1	Mareille	10h29	200	11h22	60	
1	Shawn	**DND**	**DND**	**DND**	**DND**	
1	Thys	10h41	210	11h25	50	
1	laurens	10h41	200	11h22	100	
1	Robin	**DND**	**DND**	**DND**	**DND**	
1	Vanessa	**DND**	**DND**	**DND**	**DND**	
1	Wayne	10h28	180	11h22	50	
1	Sophie	**DND**	**DND**	**DND**	**DND**	
1	Ratanang	**DND**	**DND**	**DND**	**DND**	
1	James	10h39	210	11h12	110	
1	Nick	10h11	210	10h53	100	
1	Luvuyo	**DND**	**DND**	**DND**	**DND**	
1	Elliot	10h40	210	11h25	90	

	Dive Logs for Robben Island NAS Jan-Feb 2011					
	Date		**5-Feb-11**	**Diving Day 5**		**Saturday**
	Name of Site		**Barrel Wreck - 7/8m**			
	Vessel Name		**Wreck Sentinel/Frogfish**			
	Contractor		**Frogsquad**			
	Weather conditions		**Sea: Calm**			
	Wind (knots)		**SE 10knts**			
	Viz	**2m**				
	Water temp (degrees celsius) 13					
	Dive #	**9**				
Dive #	**Name**	**Time In**	**Air In**	**Time out**	**Air out**	
2	Jon	**DND**	**DND**	**DND**	**DND**	
2	Chris	12h37	210	13h00	130	
2	Mareille	12h32	210	13h18	60	
2	Shawn	**DND**	**DND**	**DND**	**DND**	
2	Thys	12h35	210	13h00	150	
2	laurens	12h40	200	13h22	80	
2	Robin	**DND**	**DND**	**DND**	**DND**	
2	Vanessa	**DND**	**DND**	**DND**	**DND**	
2	Wayne	12h30	190	13h18	60	
2	Sophie	DND	DND	DND	DND	
2	Ratanang	DND	DND	DND	DND	
2	James	12h38	210	13h22	90	
2	Nick	**DND**	**DND**	**DND**	**DND**	
2	Luvuyo	**DND**	**DND**	**DND**	**DND**	
2	Elliot	12h39	200	13h00	140	

	Dive Logs for Robben Island NAS Jan-Feb 2011					
	Date		**8-Feb-11**	**Diving Day 6**		**Tuesday**
	Name of Site		**Barrel Wreck - 7/8m**			
	Vessel Name		**Wreck Sentinel/Frogfish**			
	Contractor		**Frogsquad**			
	Weather conditions		**Sea: calm**			
	Wind (knots)		**SE 5 knts**			
	Viz		**5m**			
	Water temp (degrees celsius)		**13.5**			
	Dive #	**10**				
Dive #	**Name**	**Time In**	**Air In**	**Time out**	**Air out**	
1	Jon	**DND**	**DND**	**DND**	**DND**	
1	Chris	9h50	200	10h18	110	
1	Mareille	11h14	200	11h37	110	
1	Shawn	9h48	200	10h29	100	
1	Thys	9h50	210	10h33	90	
1	laurens	11h06	180	11h29	110	
1	Robin	11h14	210	11h37	100	
1	Vanessa	9h48	200	10h29	80	
1	Wayne	9h48	180	10h18	50	
1	Sophie	11h14	200	11h37	110	
1	Ratanang	9h50	210	10h18	130	
1	James	**DND**	**DND**	**DND**	**DND**	
1	Nick	**DND**	**DND**	**DND**	**DND**	
1	Luvuyo	11h06	230	11h29	120	
1	Elliot	9h48	210	10h33	50	
1	John(Aus)	10h15	200	10h43	40	
1	Bill	11h08	200	11h55	60	
1	Vicki	10h15	200	11h15	50	

	Dive Logs for Robben Island NAS Jan-Feb 2011					
	Date		**8-Feb-11**	**Diving Day 6**		**Tuesday**
	Name of Site		**Barrel Wreck - 7/8m**			
	Vessel Name		**Wreck Sentinel/Frogfish**			
	Contractor		**Frogsquad**			
	Weather conditions		**Sea: calm**			
	Wind (knots)		**SE 5 knts**			
	Viz		**5m**			
	Water temp (degrees celsius)		**13.5**			
	Dive #	**11**				
Dive #	**Name**	**Time In**	**Air In**	**Time out**	**Air out**	
2	Jon	**DND**	**DND**	**DND**	**DND**	
2	Chris	**DND**	**DND**	**DND**	**DND**	
2	Mareille	**DND**	**DND**	**DND**	**DND**	
2	Shawn	11h06	200	100	11h34	
2	Thys	**DND**	**DND**	**DND**	**DND**	
2	laurens	**DND**	**DND**	**DND**	**DND**	
2	Robin	**DND**	**DND**	**DND**	**DND**	
2	Vanessa	**DND**	**DND**	**DND**	**DND**	
2	Wayne	**DND**	**DND**	**DND**	**DND**	
2	Sophie	**DND**	**DND**	**DND**	**DND**	
2	Ratanang	**DND**	**DND**	**DND**	**DND**	
2	James	**DND**	**DND**	**DND**	**DND**	
2	Nick	**DND**	**DND**	**DND**	**DND**	
2	Luvuyo	**DND**	**DND**	**DND**	**DND**	
2	Elliot	**DND**	**DND**	**DND**	**DND**	
2	John(Aus)	**DND**	**DND**	**DND**	**DND**	
2	Bill	**DND**	**DND**	**DND**	**DND**	
2	Vicki	**DND**	**DND**	**DND**	**DND**	

	Dive Logs for Robben Island NAS Jan-Feb 2011					
	Date		**9-Feb-11**	**Diving Day 7**		**Wednesday**
	Name of Site		**Barrel Wreck - 7/8m**			
	Vessel Name		**Wreck Sentinel/Frogfish**			
	Contractor		**Frogsquad**			
	Weather conditions		**Sea: flat, calm**			
	Wind (knots)		**5knts SE**			
	Viz		**5m**			
	Water temp (degrees celsius)		**12.6**			
	Dive #	**12**				
Dive #	**Name**	**Time In**	**Air In**	**Time out**	**Air out**	
1	Jon	10h42	210	11h35	30	
1	Chris	10h10	200	11h05	50	
1	Mareille	10h41	200	11h09	100	
1	Shawn	10h15	200	11h09	50	
1	Thys	10h20	220	11h05	50	
1	laurens	10h27	210	10h56	70	
1	Robin	10h41	220	11h09	110	
1	Vanessa	10h42	200	11h28	40	
1	Wayne	10h10	180	11h05	50	
1	Sophie	10h41	200	11h09	120	
1	Ratanang	10h21	200	11h05	90	
1	James	**DND**	**DND**	**DND**	**DND**	
1	Nick	10h42	200	11h39	30	
1	Luvuyo	10h27	220	10h56	50	
1	Elliot	10h18	210	11h05	50	
1	John(Aus)	10h27	200	11h15	50	
1	Bill	DND	DND	DND	DND	
1	Vicki	DND	DND	DND	DND	

	Dive Logs for Robben Island NAS Jan-Feb 2011					
	Date		**9-Feb-11**	**Diving Day 7**		**Wednesday**
	Name of Site		**Barrel Wreck - 7/8m**			
	Vessel Name		**Wreck Sentinel/Frogfish**			
	Contractor		**Frogsquad**			
	Weather conditions		**Sea: flat, calm**			
	Wind (knots)		**5knts SE**			
	Viz		**5m**			
	Water temp (degrees celsius)		**12.6**			
	Dive #	**13**				
Dive #	**Name**	**Time In**	**Air In**	**Time out**	**Air out**	
2	Jon	12h41	200	13h17	100	
2	Chris	12h10	210	12h54	100	
2	Mareille	12h22	220	13h00	80	
2	Shawn	12h22	200	13h02	70	
2	Thys	12h10	220	12h54	60	
2	laurens	12h02	190	12h29	80	
2	Robin	12h22	200	13h00	60	
2	Vanessa	12h23	200	13h14	50	
2	Wayne	12h16	200	12h54	110	
2	Sophie	**DND**	**DND**	**DND**	**DND**	
2	Ratanang	12h10	210	12h54	90	
2	James	**DND**	**DND**	**DND**	**DND**	
2	Nick	**DND**	**DND**	**DND**	**DND**	
2	Luvuyo	12h02	220	12h29	40	
2	Elliot	12h18	210	12h54	70	
2	John(Aus)	12h48	200	13h40	60	
2	Bill	12h20	200	13h13	50	
2	Vicki	**DND**	**DND**	**DND**	**DND**	
3	Laurens	12h48	200	13h40	70	

	Dive Logs for Robben Island NAS Jan-Feb 2011					
	Date		**10-Feb-11**	**Diving Day 8**		**Thursday**
	Name of Site		**Barrel Wreck - 7/8m**			
	Vessel Name		**Wreck Sentinel/Frogfish**			
	Contractor		**Frogsquad**			
	Weather conditions		**Sea: flat, calm**			
	Wind (knots)		**5knts SE**			
	Viz		**3m**			
	Water temp (degrees celsius)		**13**			
	Dive #	**14**				
Dive #	**Name**	**Time In**	**Air In**	**Time out**	**Air out**	
1	Jon	**DND**	**DND**	**DND**	**DND**	
1	Chris	10h10	210	10h57	80	
1	Mareille	10h05	200	10h44	80	
1	Shawn	10h05	200	11h09	80	
1	Thys	10h10	210	11h11	70	
1	laurens	10h20	190	11h13	100	
1	Robin	**DND**	**DND**	**DND**	**DND**	
1	Vanessa	10h04	200	10h56	50	
1	Wayne	10h10	200	11h11	50	
1	Sophie	10h20	200	11h13	80	
1	Ratanang	**DND**	**DND**	**DND**	**DND**	
1	James	10h05	200	10h44	110	
1	Nick	10h14	200	11h08	60	
1	Luvuyo	10h20	210	11h13	50	
1	Elliot	10h10	200	10h55	50	
1	John(Aus)	10h43	200	11h28	100	
1	Bill	12h02	200	13h00	60	
1	Vicki	10h43	200	11h28	70	

	Dive Logs for Robben Island NAS Jan-Feb 2011					
	Date		**10-Feb-11**	**Diving Day 8**		**Thursday**
	Name of Site		**Barrel Wreck - 7/8m**			
	Vessel Name		**Wreck Sentinel/Frogfish**			
	Contractor		**Frogsquad**			
	Weather conditions		**Sea: flat, calm**			
	Wind (knots)		**5knts SE**			
	Viz		**3m**			
	Water temp (degrees celsius)		**13**			
	Dive #	**14**				
Dive #	**Name**	**Time In**	**Air In**	**Time out**	**Air out**	
2	Jon	**DND**	**DND**	**DND**	**DND**	
2	Chris	12h08	200	12h40	120	
2	Mareille	11h57	200	12h25	120	
2	Shawn	11h57	200	12h25	140	
2	Thys	12h08	200	12h40	150	
2	laurens	12h17	190	13h16	50	
2	Robin	DND	DND	DND	DND	
2	Vanessa	12h44	200	13h24	100	
2	Wayne	12h08	190	13h04	40	
2	Sophie	12h17	200	12h54	130	
2	Ratanang	**DND**	**DND**	**DND**	**DND**	
2	James	11h57	200	12h25	150	
2	Nick	**DND**	**DND**	**DND**	**DND**	
2	Luvuyo	**DND**	**DND**	**DND**	**DND**	
2	Elliot	12h08	210	12h40	90	
2	John(Aus)	12h38	200	13h26	70	
2	Bill	**DND**	**DND**	**DND**	**DND**	
2	Vicki	12h38	210	13h28	60	

Appendix II: Measurements

Measurements from N-line to detail points on site

Measurement point	N1	N2	N3	N4	N5	N6
51	19.7	9.8				
52			10.5	5.55		
53				4	11.4	
54	10.3	3.1				
55	9.2	3.2				
56	18.4	8.6				
57			3.9	4.8		
58	5.7	5.5				
59	5.2	5.6				
60	5.1	5.4				
61					7.7	13.4
62					9.8	15
63					5.7	11.9
64					11.8	16.2
65					7.1	14
66					11.2	15.9
67a				5.6	8.3	
67b				4.2	9.4	
68					4	10.2
68b					4.5	9.5
69					8.9	14.6
70		14.1	7.1			
71				7.6	7.6	
72					6.1	11.8
74				9,7	13.2	
78		3.3	11.95			
85		11.9	4.3			
87			8.6	3.6		
88			8.9	7.15		
90		6.89	5			
98		3.68	13.2			
99		3.55	8.19			

Measurements from S-line to detail points on site

Measurement point	S1	S2	S3	S4	S5	S6
1				19.15		13.9
2					13.2	10.8
3				11.8	8.1	14.3
4					11.5	13.5
5			8.65	8		
6				10.9		
7a		12	2.1			25.9
7b		12.45	3.3			
7c				8.2		
8				12.8	8.7	14
9					6.3	15
10			6			
11		10.7	8.1	16.7		
12		19		15		
13		12.4	8.4	14.1		
16	9.9	9				
17		10.1	14.9			
18			7.9	9.1		
19	6.9	12.5				
20		8.6	14.5			
21				3.3	8.9	
23					9.7	10.5
24			13.7	6.75	14.43	
25					15.15	9.75
26					11.4	9.2
27				9.7	9	
36					14.13	8.9
38					12.4	8.7
48				9.6	8.45	
49				6.55	12.8	
Measurement point	S1	S2	S3	S4	S5	S6

GPS measurements from the corners of the baselines

GPS corners baseline		Longitude	Latitude
	176	33.83434	18.47866
	177	33.83420	18.47819

	178	33.83408	18.47812
	179	33.83412	18.47866

Baseline connection measurements

Baseline connection measurements					
103	S4 6.61	S5 10.66	N4 14.24	N3 11.77	
104	S3 13.20	S1 15.10	N2 5.63	N3 7.05	
107	N4 9.88	N5 9.70	S6 12.68	S5 15.01	
17	N1 8.28	N2 7.18	N3 15.97	S2 9.10	S3 12.90
109	N4 11.12	N5 17.61	S5 9.27	S4 11.04	
110	S2 9.87	S3 12.28	N2 6.12	N3 14.39	

Measurements between control points on S and N baseline

Section	**Length**
N1-S1	14.25
N1-S2	19.3
N1-N2	10.05
N2-S1	21.95
N2-S2	16.05
N2-N3	9.97
N3-S3	19.2
N3-N4	10.93
N4-S4	21.07
N4-N5	10.03
N5-S5	25.07
N5-N6	9.24
N5-S6	21.7
N6-S6	25.75
N6-S5	31.8
S6-S5	10.33
S5-S4	9.98
S4-S3	9.64
S3-S2	10.47
S2-S1	9.46

Appendix III: Submerged Site Inspection Form

SUBMERGED SITE INSPECTION FORM

Site Name :	"Barrel Wreck", Dolphin Beach, Bloubergstrand, Cape Town, South Africa				
Date of Inspection :	01 – 10 February 2011				
Personnel :	Luvuyo Ndzuzo **Officer In Charge**				
	Laurens Jansen				
	Mareille Arkesteyn				
	Robin Adams				
	James Wood				
	Sophie Winton				
	Ratanang Maremane				
	Chris Ngivigivi				
	Eliot...				
	Thijs Coenen				
	Wayne Evans				
Recorder's name:	Mareille and Sophie **Date 01 – 10 February 2011**				
Approximate Location :	300 meters west off Dolphin Beach, about 5.4 nautical miles east south east of Robben Island				
Chart No :	-	**Latitude**	33^50'03.0''S	**Longitude**	018^28' 42.5''E
Datum used in GPS :	WGS 84				
Site number :	-				
Tidal information :	On 10 February 2011: low tide – 00:15 (0.5m) & 12:48 (0.6m); high tide – 06:31 (1.5m) & 18:46 (1.3m).				
Compass Bearing :	Cape Town Harbour Breakwater			223^ (4.6 nautical	
	Robben Island Harbour			317^ (5.4 nautical	
	Dolphin Beach			97^ (330 meters)	
Sextant Angles :	None taken				
Visual Transits :					
1 Dolphin Beach Hotel, Bloubergstrand					

2	Table Mountain	
3		

Access route:	
Leaving Robben Island, we travelled east south east to the Dolphin Beach near Bloubergstrand. Travel time was on average 15 – 20 minutes, depending on weather.	
Sketch map showing access to site : -	
Scan in sketch: -	

Site Photographs :	yes
Wayne Evans	
Description of Site :	
Shallow, sandy bottom – 6 to 7 meters Wreck orientation is west-east, almost perpendicular to the beach. The bow faces the beach. The site is exposed and can be subject to strong currents. Visibility averages between 3 and 5 meters, though deteriorates rapidly with current. Colonies of crayfish inhabit the wreck and mussel beds cover much of the surface. The keel is clearly visibly on the western side of the site; a lot of wood planking and barrels can be seen on the shore side of the site.	

Plan of Site : Show any Distances, Bearings & Large Artefacts.

Scan in sketch:-

Approx Scale :-

Site Features Keys :

Anchor between N5 and N6 (the south east corner of the site)

Exposed barrels

Cannons near S4 (mid-ship on the northern side)

Keel exposed, starting at S1 (north west corner of the wreck)

Conditions on Site :	
Rough seas and strong current when south easterly wind blows, calm during north-westerly winds.	
Material Raised :	
None – non-disturbance survey	
Identification Comments :	
Exposed barrels and cannons identify this site.	
Recommendations :	**Include information on any values of the site**
Good training site for NAS students as the site is shallow and the wreck is in good condition. Further academic studies should be conducted to determine the identity of the wreck and conservation measures implemented. Muskets and other small/fragile/vulnerable artifacts should be removed to prevent them being stolen.	

Appendix IV: Baseline measurements

Measurement point	N1	N2	N3	N4	N5	N6
51	19.7	9.8				
52			10.5	5.55		
53				4	11.4	
54	10.3	3.1				
55	9.2	3.2				
56	18.4	8.6				
57			3.9	4.8		
58	5.7	5.5				
59	5.2	5.6				
60	5.1	5.4				
61					7.7	13.4
62					9.8	15
63					5.7	11.9
64					11.8	16.2
65					7.1	14
66					11.2	15.9
67a				5.6	8.3	
67b				4.2	9.4	
68					4	10.2
68b					4.5	9.5
69					8.9	14.6
70		14.1	7.1			
71				7.6	7.6	
72					6.1	11.8
74				9,7	13.2	
78		3.3	11.95			
85		11.9	4.3			
87			8.6	3.6		
88			8.9	7.15		
90		6.89	5			
98		3.68	13.2			
99		3.55	8.19			

Measurement point	S1	S2	S3	S4	S5	S6
1				17,5		11,9
2					11,2	8,8
3				9,8	6,1	12,3
4					9,5	11,5
5			8.65	8		
6				10.9		
7a		12	2.1			25.9
7b		12.45	3.3			
7c				8.2		
8				10,8	6,7	12
9					6.3	15
10			6			
11		10.7	8.1	16.7		
12		18.00	13.00	15		
13						
16	8,90	7.00				
17		10.1	14.9			
18			5,96	7		
19	4,90	10,5				
20		6,60	12,5			
21				3.3	8.9	
23					9.7	10.5
24			13.7	6.75	14.43	
25					15.15	9.75
26					11.4	9.2
27				9.7	9	
36					14.13	8.9
38					12.4	8.7
48				9.6	8.45	
49				6.55	12.8	
Measurement point	S1	S2	S3	S4	S5	S6

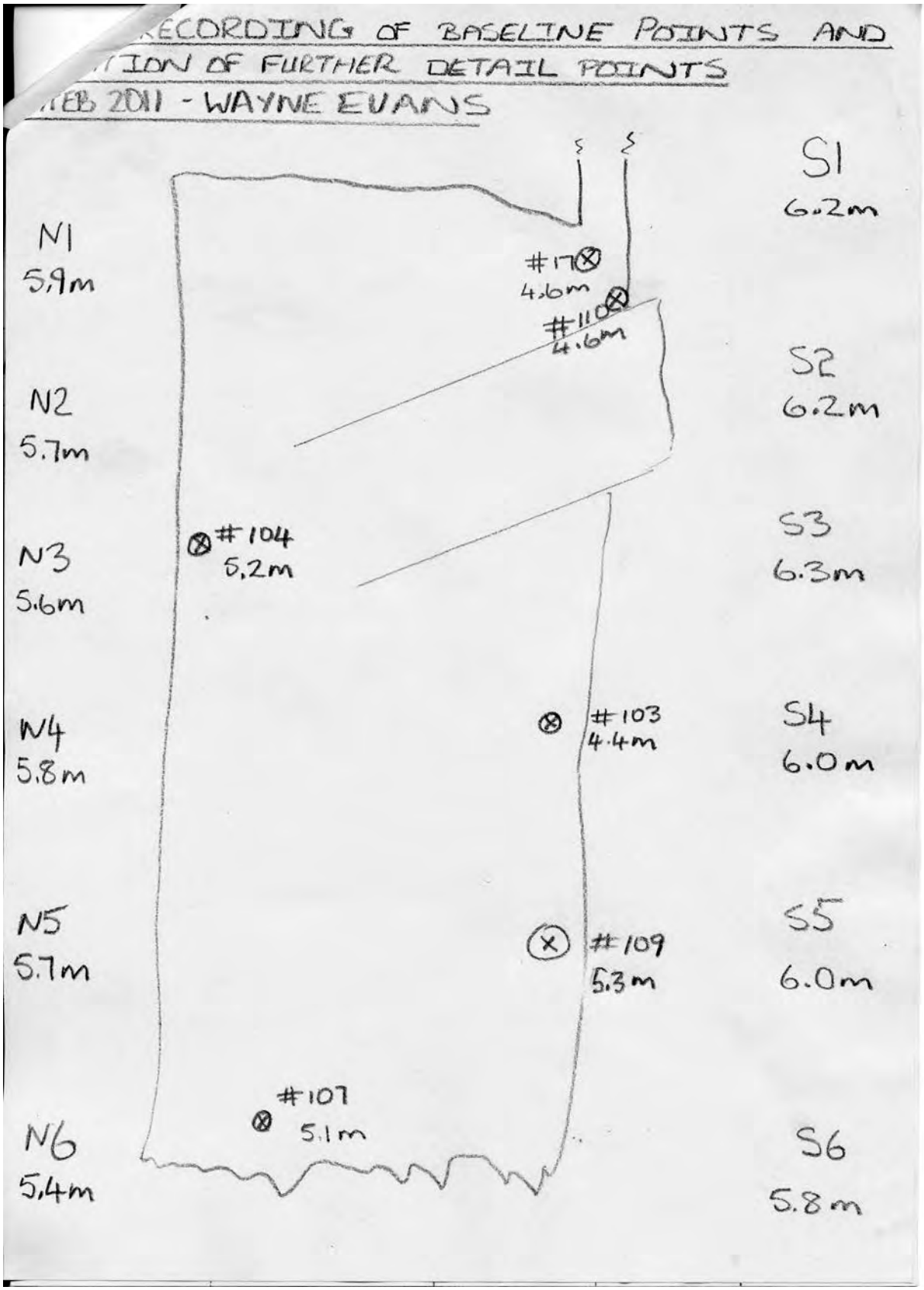
—	9/2/2011	This?		
103	S4 6,61	S5 10,66	N4 14,24	N3 11,77
~~104~~	S3 13,26	S1 15,10	N2 5,63	N3 7,05
107	N4 9,88	N5 9,76	S6 12,68	S5 15,01
17a	N1 8,28	N2 7,18	N3 15,97	S2 9,10
109	N4 11,12	N5 17,61	S5 9,27	S4 11,04
110a	S2 9,87	S3 12,28	N2 6,12	N3 14,39

S3 12,90

Baseline connection measurements

calculated = correct

page (3)


RECORDING OF BASELINE POINTS AND
TION OF FURTHER DETAIL POINTS
EB 2011 - WAYNE EVANS
S1
6.2m
N1
5.9m
#17
4.6m
#110
4.6m
S2
6.2m
N2
5.7m
#104
5.2m
S3
6.3m
N3
5.6m
#103
4.4m
S4
6.0m
N4
5.8m
#109
5.3m
S5
6.0m
N5
5.7m
#107
5.1m
N6
5.4m
S6
5.8m

seline connection points (1) Thijs 9/2/2011

AT ANGLE, NEED TO BE CORRECTED

SEE PAGE (2) FOR that

					depth
103	S4 6,79	S5 10,78	N4 14,31	N3 11,83	4,40
104	S3 13,25	S1 15,12	N2 5,65	N3 7,06	5,2
107	N4 9,90	N5 9,72	S6 12,70	S5 15,04	5,10
17	N1 8,39	N2 7,26	N3 16		4,60
109	N4 11,13	N5 17,62	S5 9,30	S4 11,08	5,30
110	S2 10	S3 12,40	N2 6,22	N3 14,42	4,60

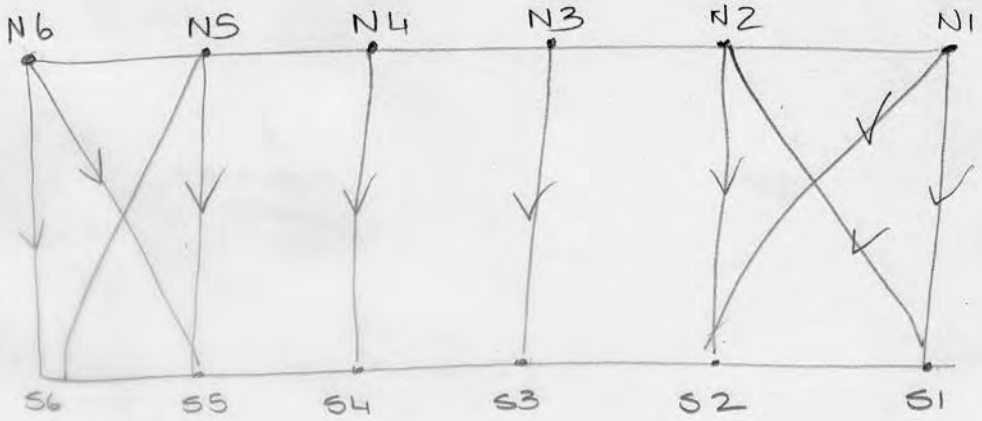
Depth of baseline points

N1 5,90
N2 5,70
N3 5,60
N4 5,80
N5 5,70
N6 5,40

S1 6,20
S2 6,280
S3 6,30
S4 6,0
S5 6,0
S6 5,80

BASELINE FIXING MEASUREMENTS.

SHAWN & VANESSA.



N1 – S1 = 14,25

N1 – S2 = 19,30

S1 – N2 = 21,59

N2 – S2 = 16,05.

N6 – S6 = 25,75

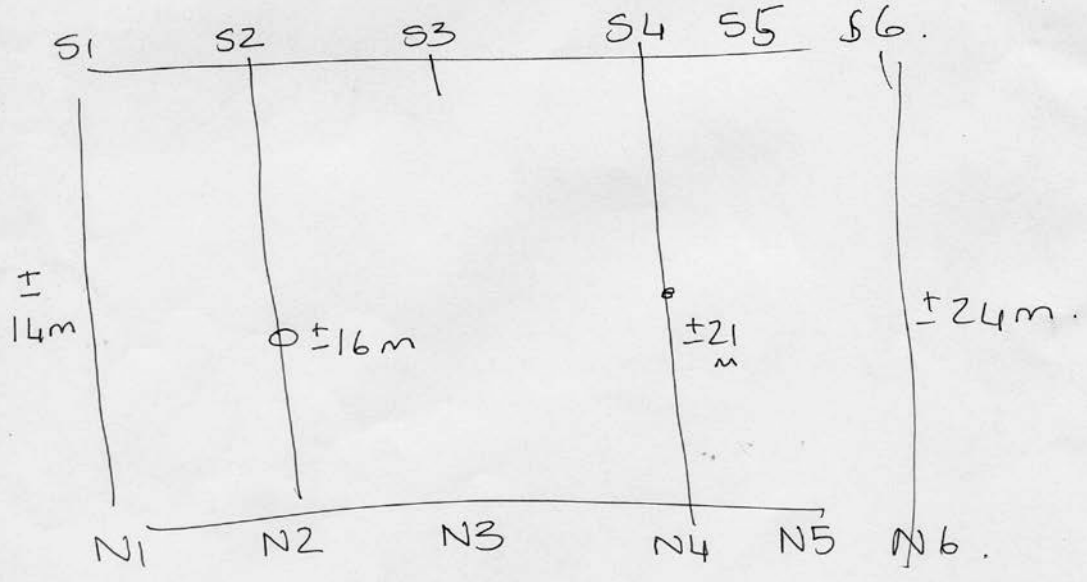
N6 – S5 = 31,80

N5 – S6 = 21,70.

S5 – N5 = 25,07

N4 – S4 = 21,07

N3 – S3 – 19,20


S1
S2
S3
S4
S5
S6.
±14m
±16m
±21m
±24m.
N1
N2
N3
N4
N5
N6.

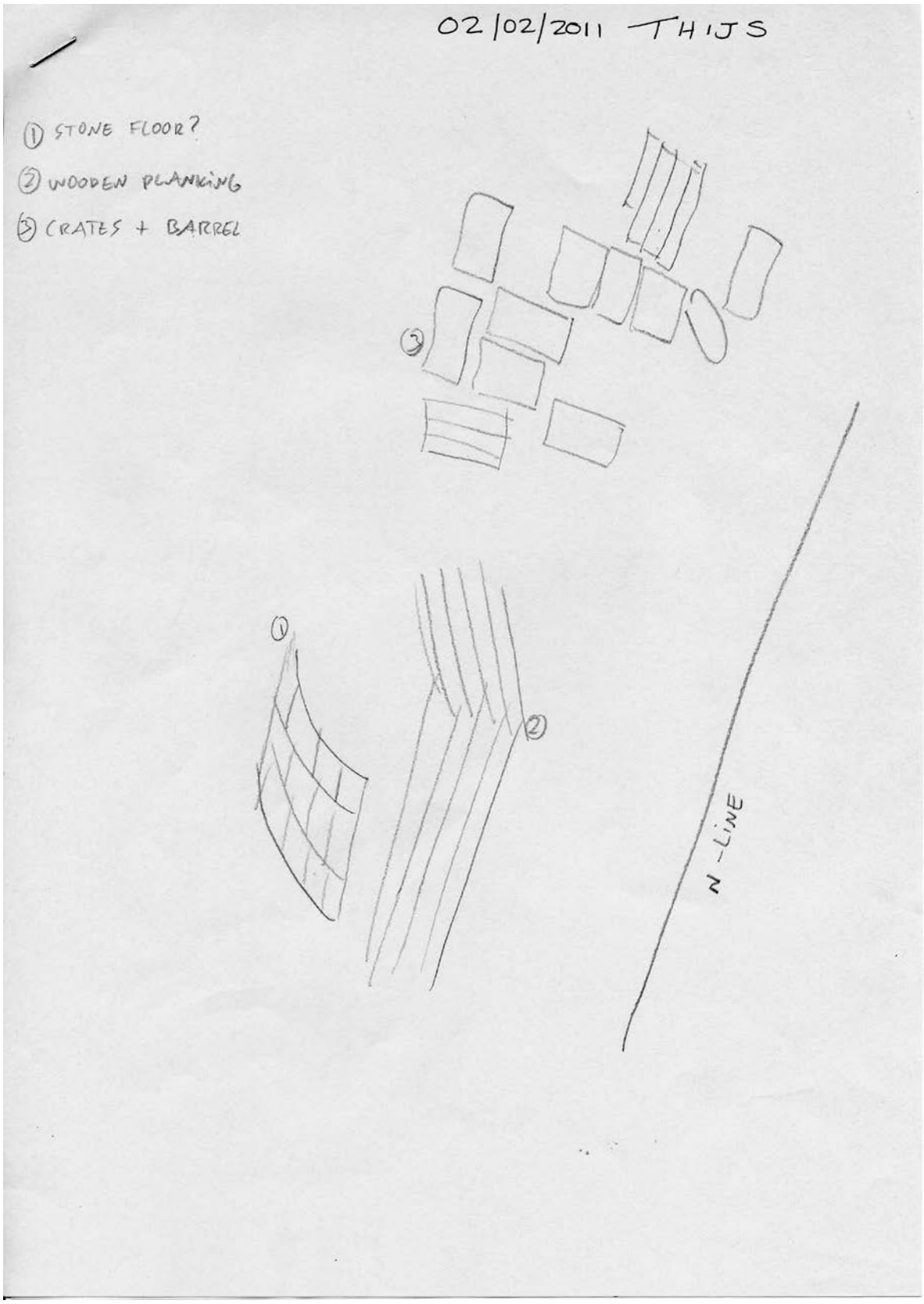
05[redacted]-02-2011

THIJS.

MEASUREMENTS FROM
S1-S2-S3-S4-S5-S6 & N5-S6
N1-N2-N3-N4-N5-N6
BASELINE CONTROL POINTS

N1-N2	10,05
N2-N3	9,97
N3-N4	10,93
N4-N5	10,03
N5-N6	9,24
N5-S6	21,70
S6-S5	10,33
S5-S4	9,98
S4-S3	9,64
S3-S2 ✓	10,47 ✓
S2-S1	9,96

Appendix V: Basic & Detail drawings



~~Vaneesa~~

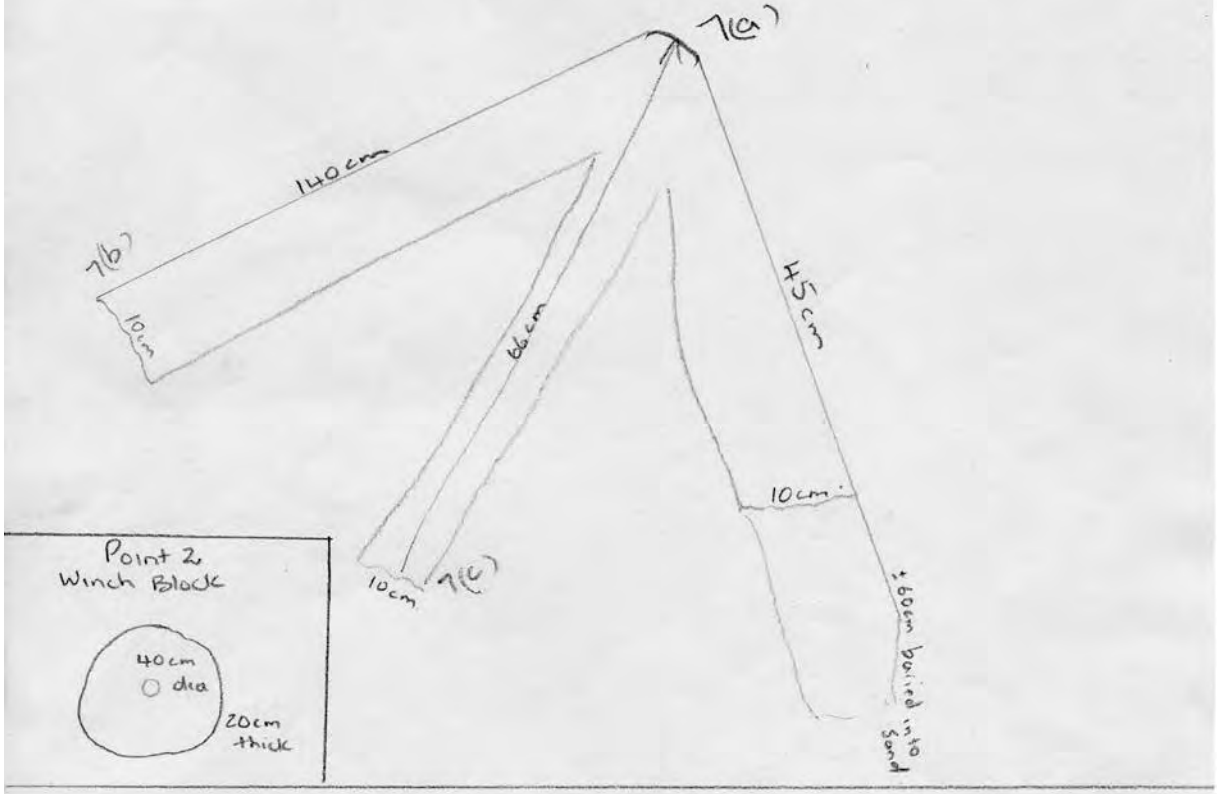
'Brick area'

10-02-2011

ANCHOR -S3 D.POINT 7.

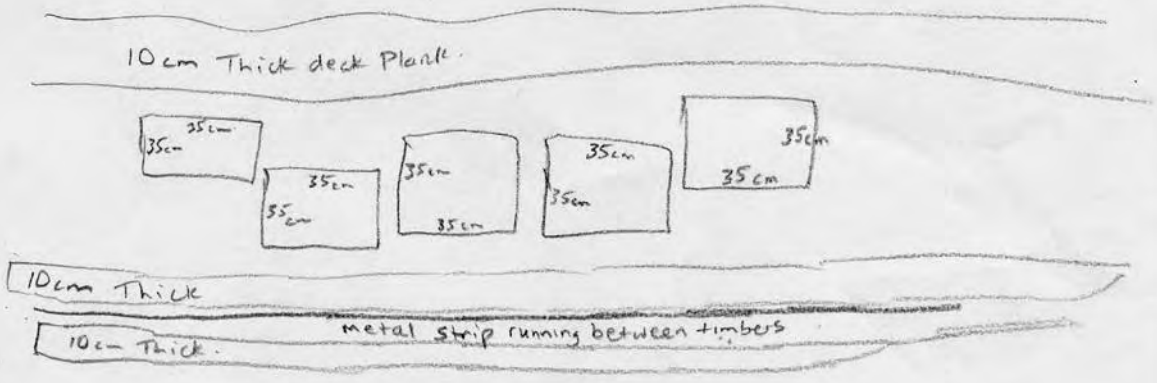
05/02/2011
James

Done

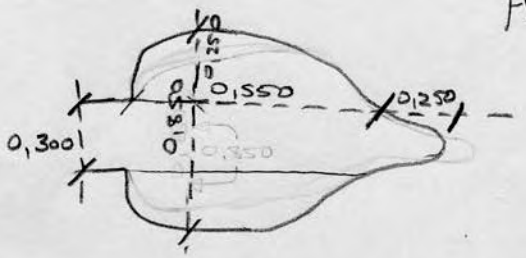


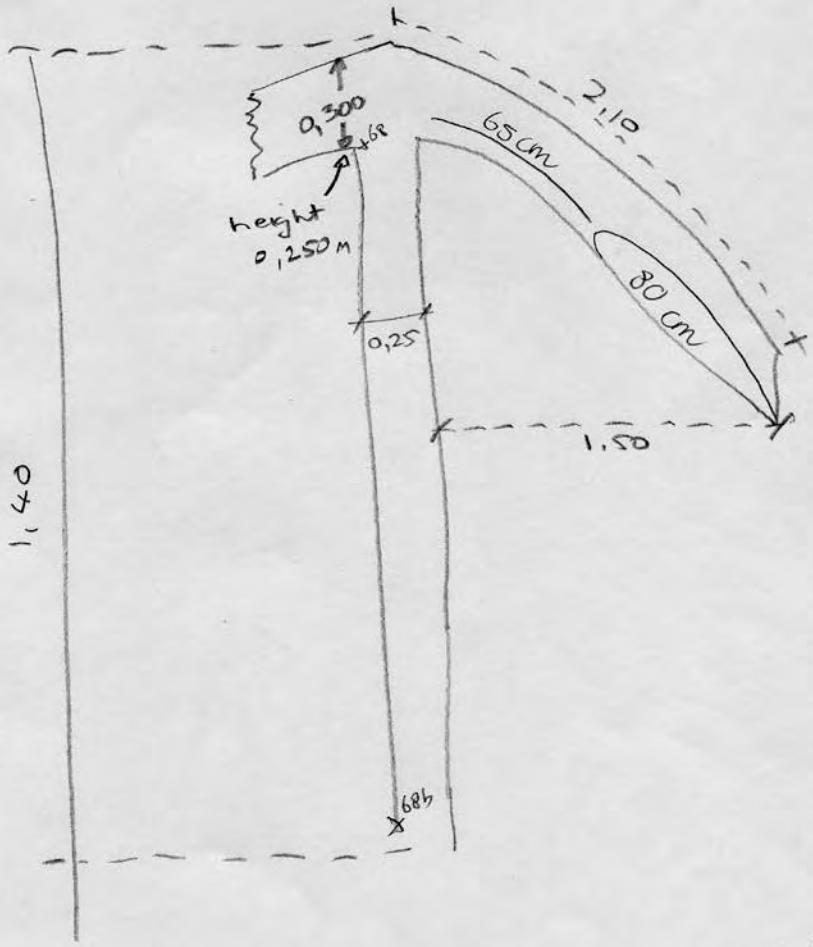
Point 7c

This point forms a cave like structure on the wreck



Anchor





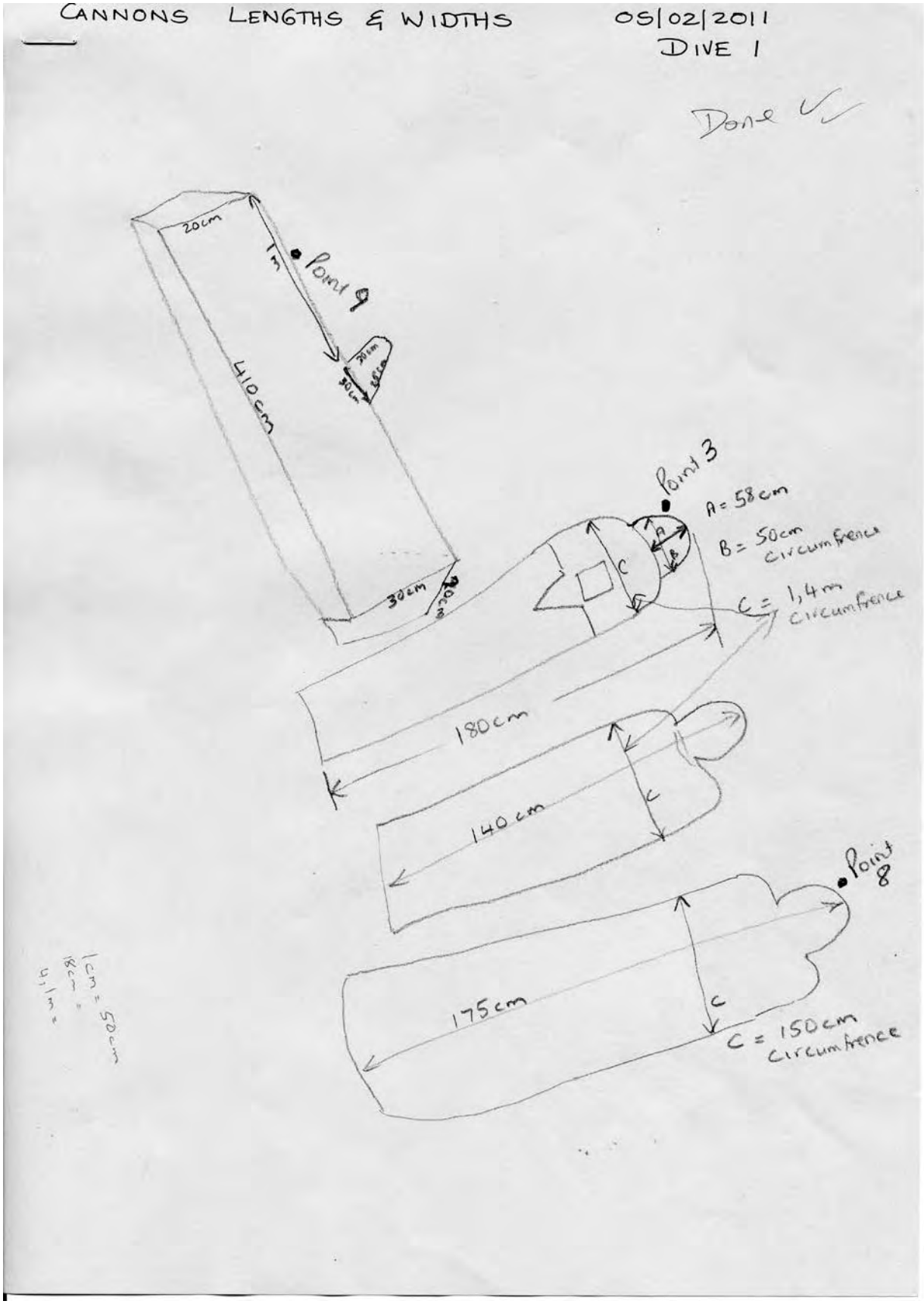
5/2/2011

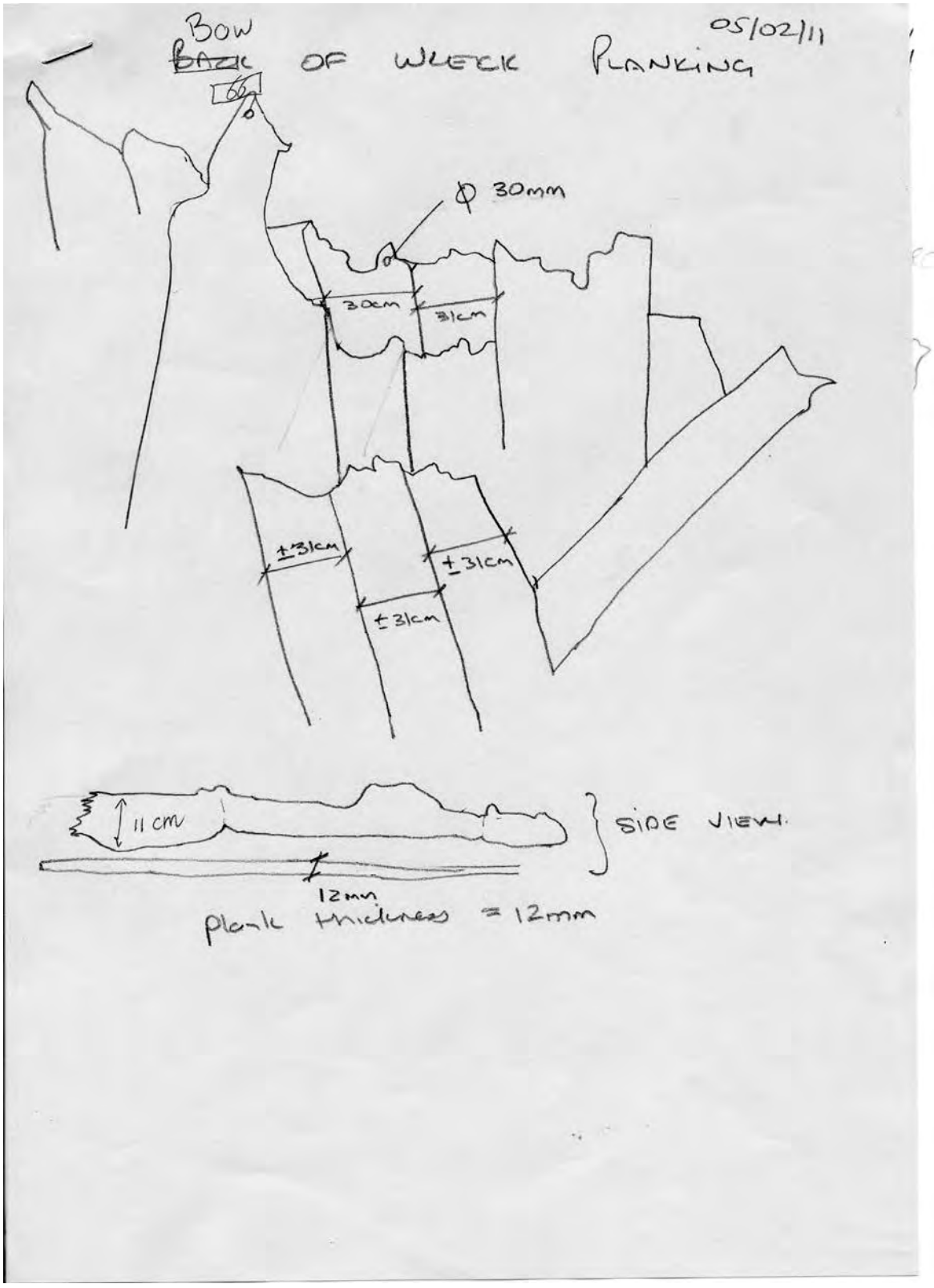
Wayne + Mireille

CANNONS LENGTHS & WIDTHS 05/02/2011

DIVE 1

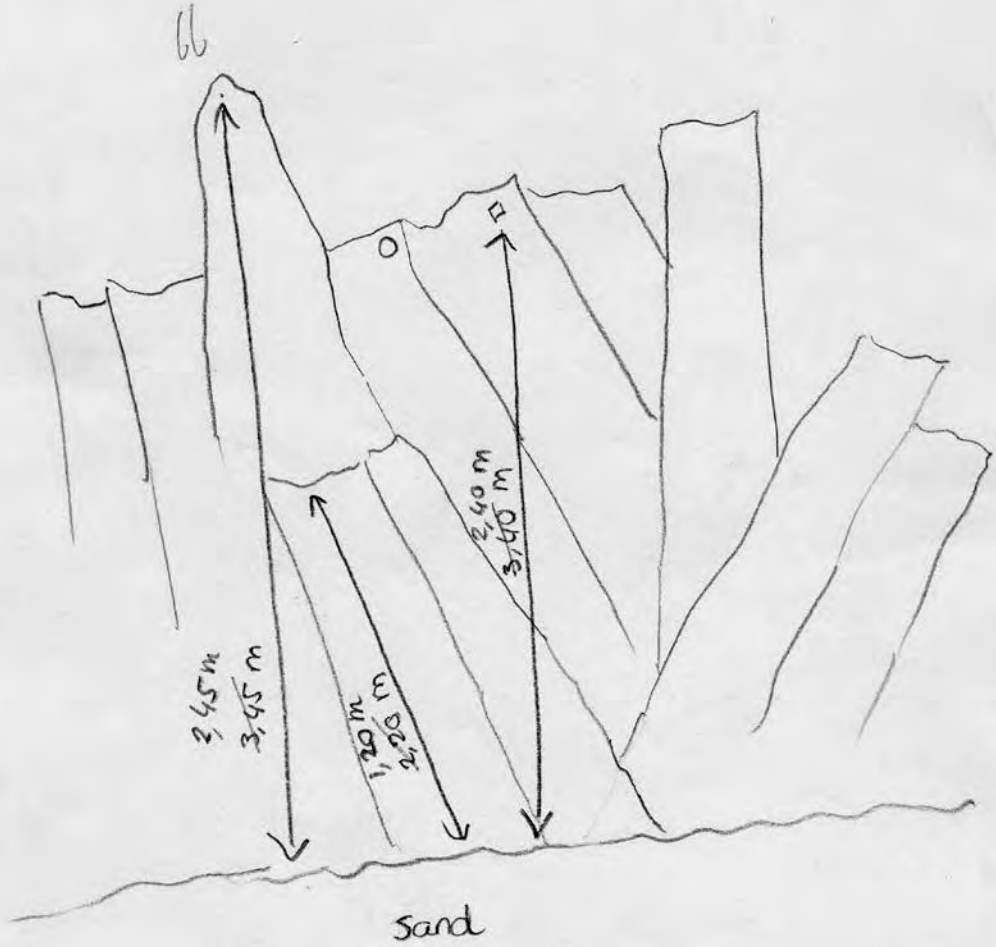
Done ✓




BOW
05/02/11
BASIC OF WRECK PLANKING
66
Φ 30mm
30cm
31cm
±31cm
±31cm
±31cm
11 cm
SIDE VIEW
12mm
plank thickness = 12mm

9/2/11 planking bow Mareille + Robin + Shawn

from S6 to keel on bow end → 9 m
part with lead on it. measured from 1 m so → 8 m



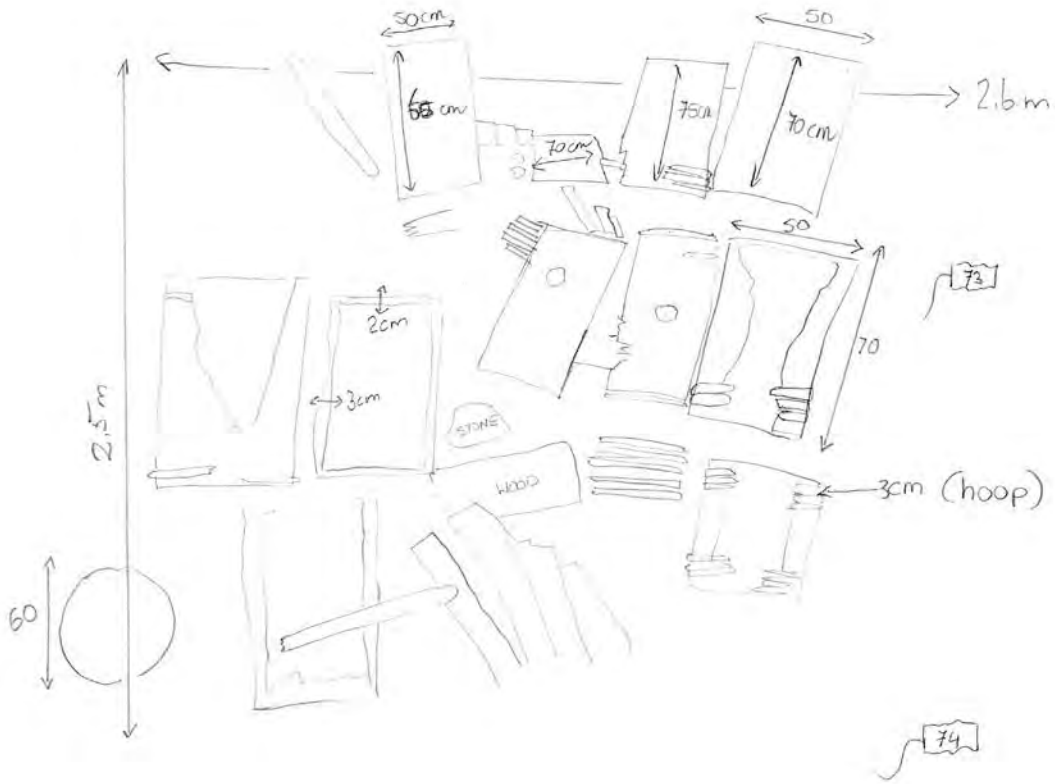
distance between numbers 23 and 27
on keel near $S_1 - S_2$

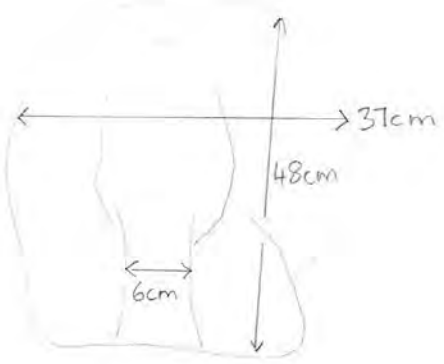
23 ←→ 27
4,20 m
3,20 m

DETAIL DRAWING OF SITE OF CARGO BARREL

10/01/2011 - JAMES, SHALOM, MARIELLE

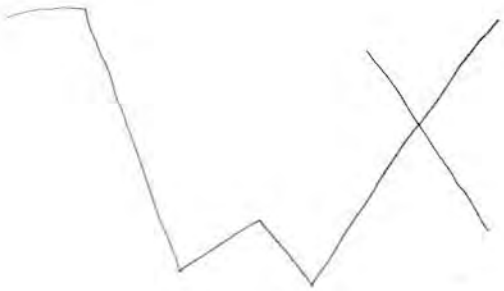
Dereck





TOP VIEW OF WOODEN PULLEY COVER

CARVED MARKINGS ON BARREL LID



Approximate actual size. relative to each other.

Wayne Evans

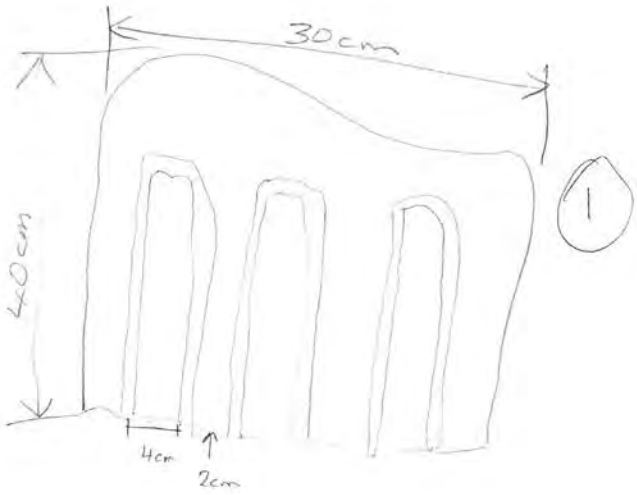
10/2/2011 ~~Mariella~~ Sean James

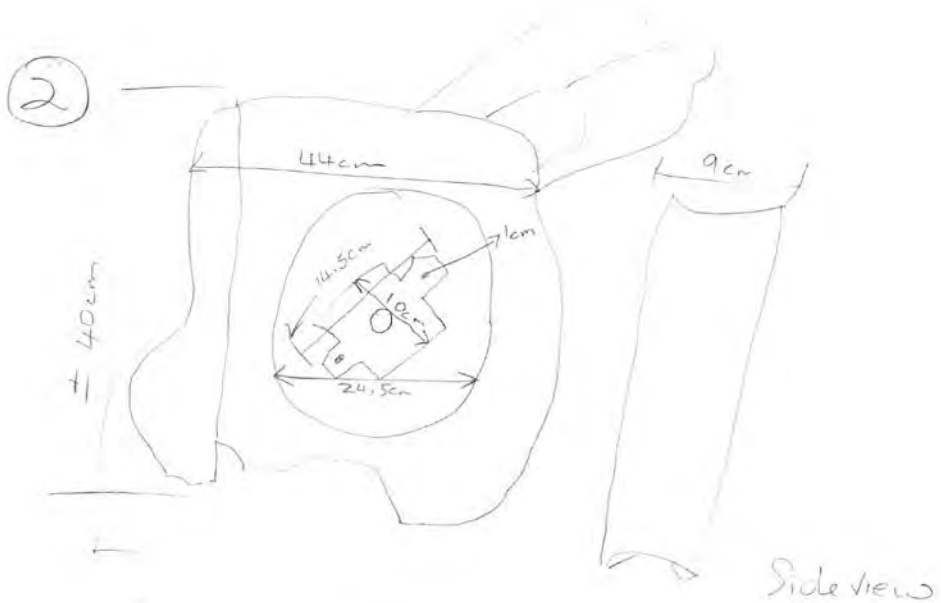
Pulleys

2 points on N Baseline

(1) N4 = 7.70m

(2) N5 = 9.80m



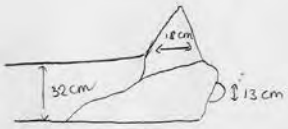


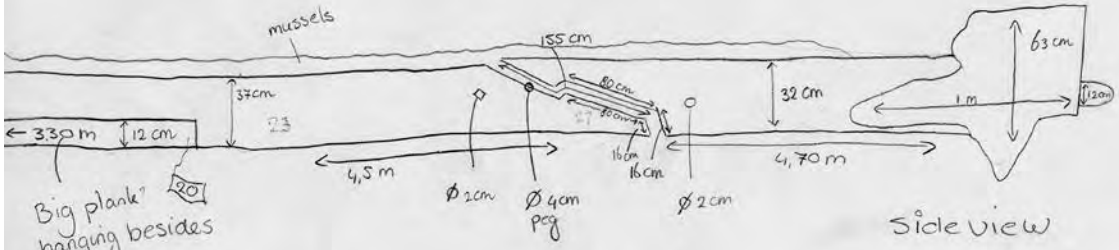
Baseline N4 = 7m

N5 = 7.8m

Wayne + Mareille
05/02/2011
keel drawing 1 of 2

top view

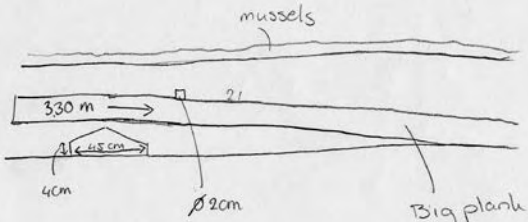


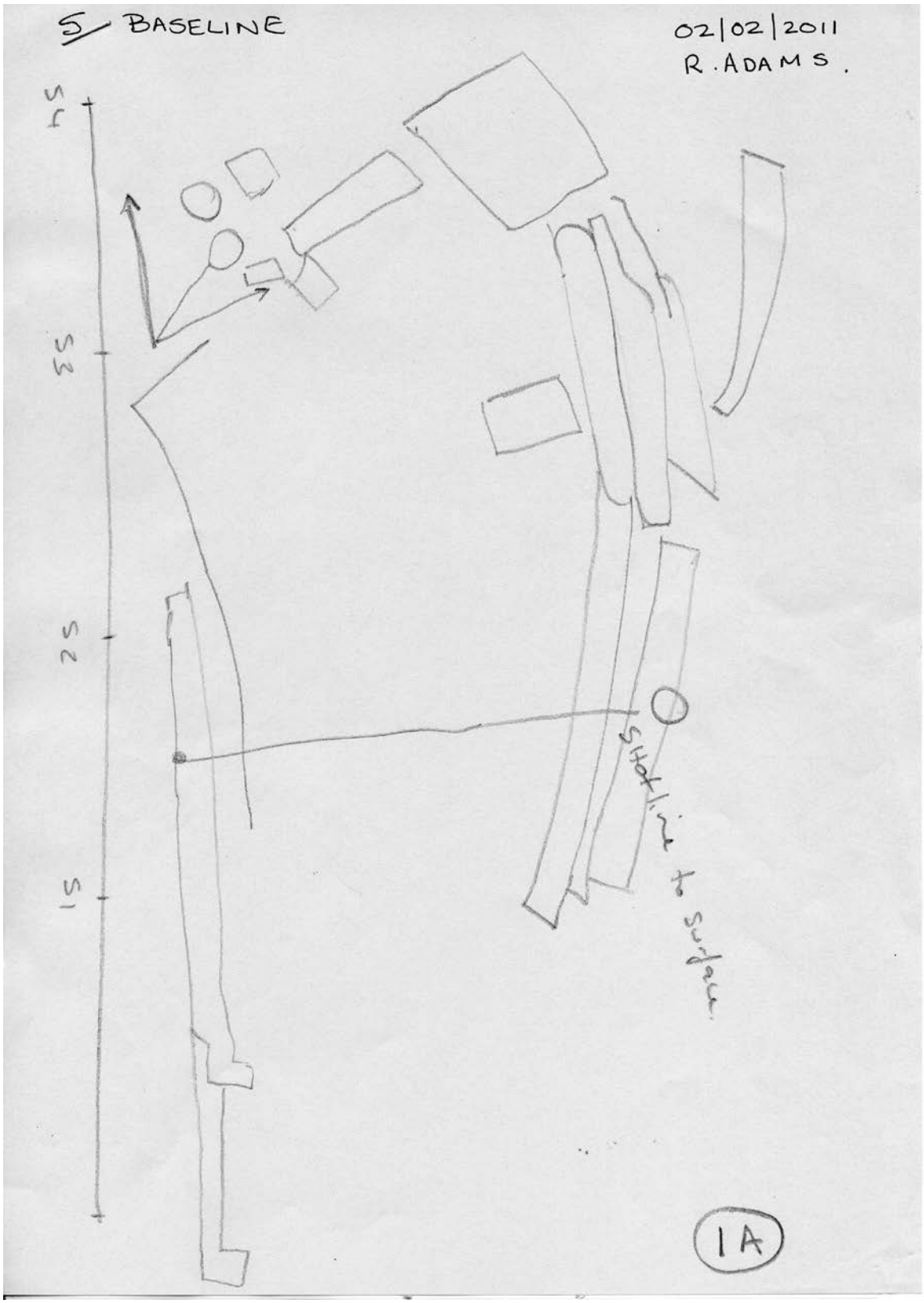


Big plank hanging besides keel.

Side view

Wayne, Mareille 05/02/2011
keel drawing 2 of 2



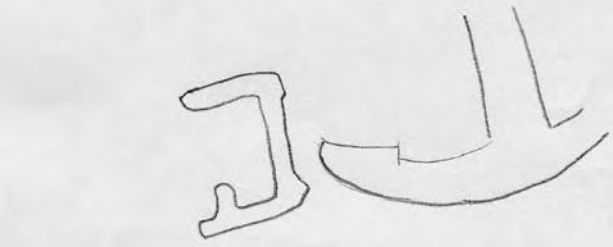

5/ BASELINE
02/02/2011
R. ADAMS.
45
35
25
15
shooting to subject
1A

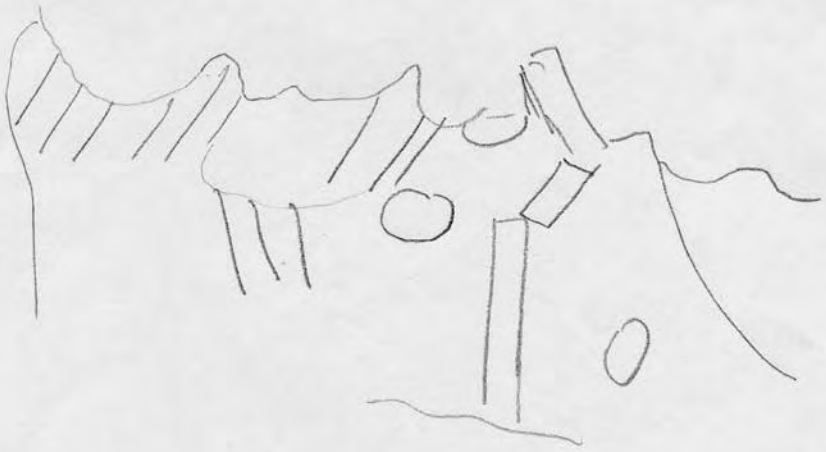
~~BEARINGS ??~~ ~~05-02-20~~11

SKETCH 2/2/2011 This Coenen

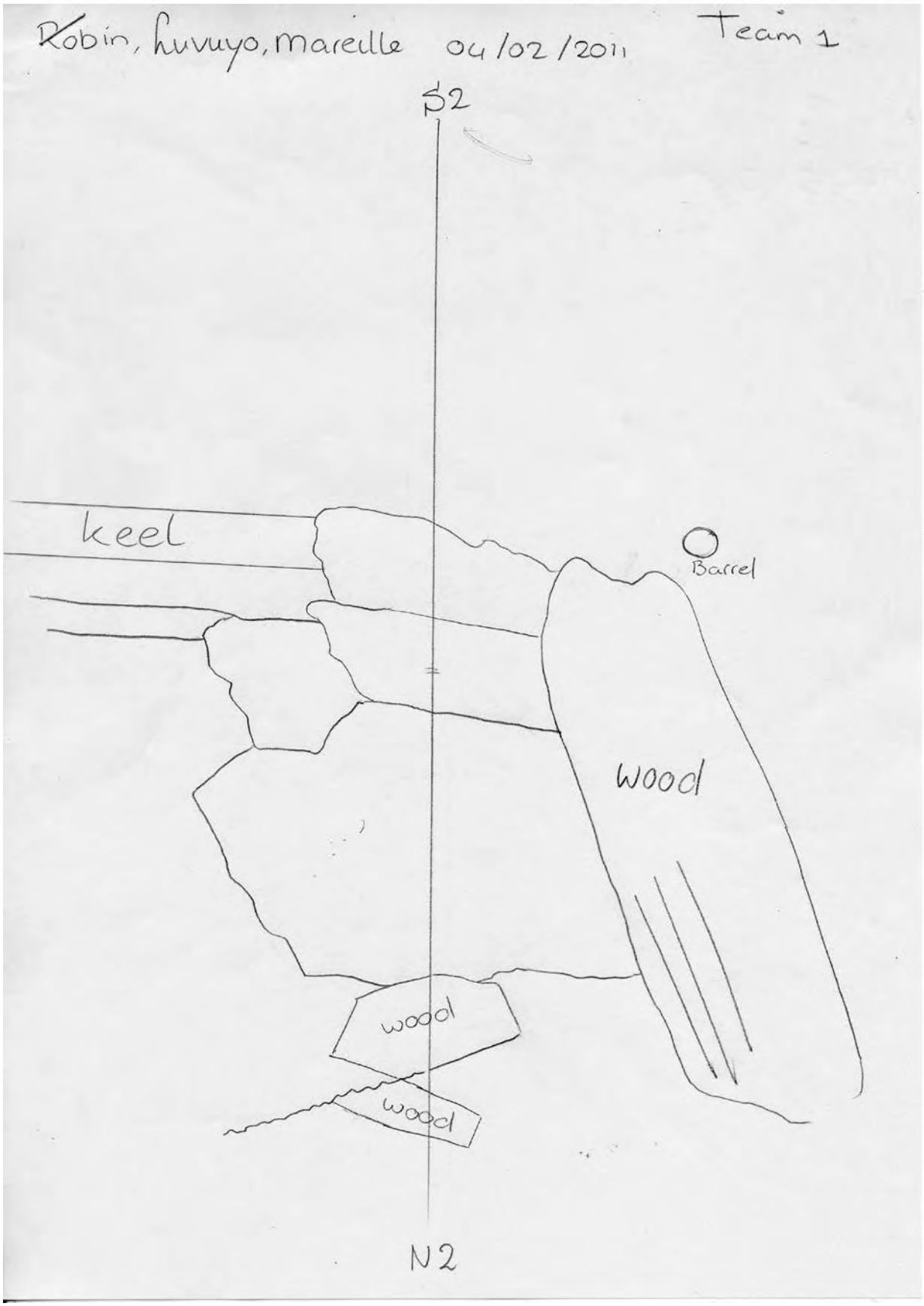
N - BASELINE

N





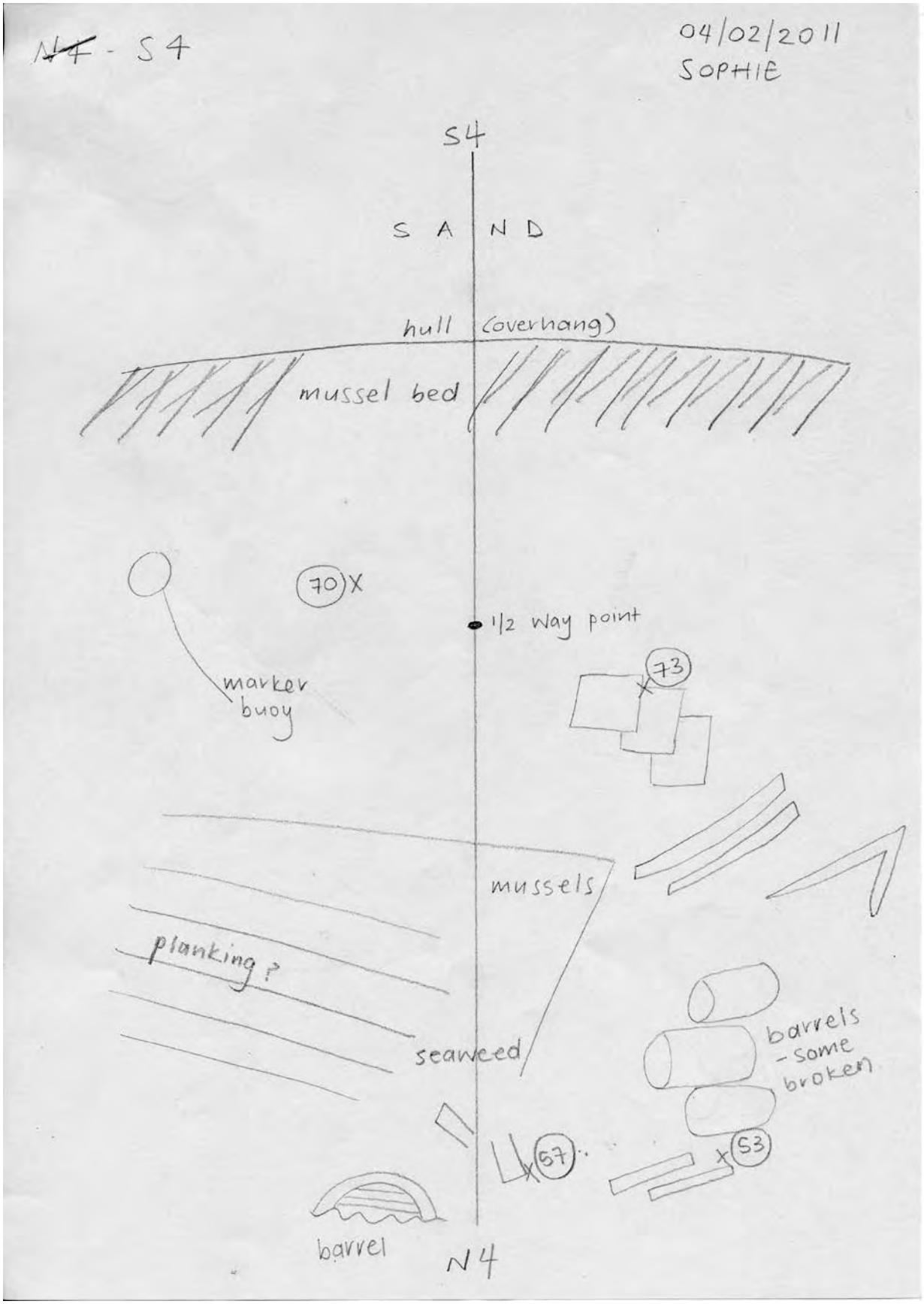
Appendix VI: Crossline drawings

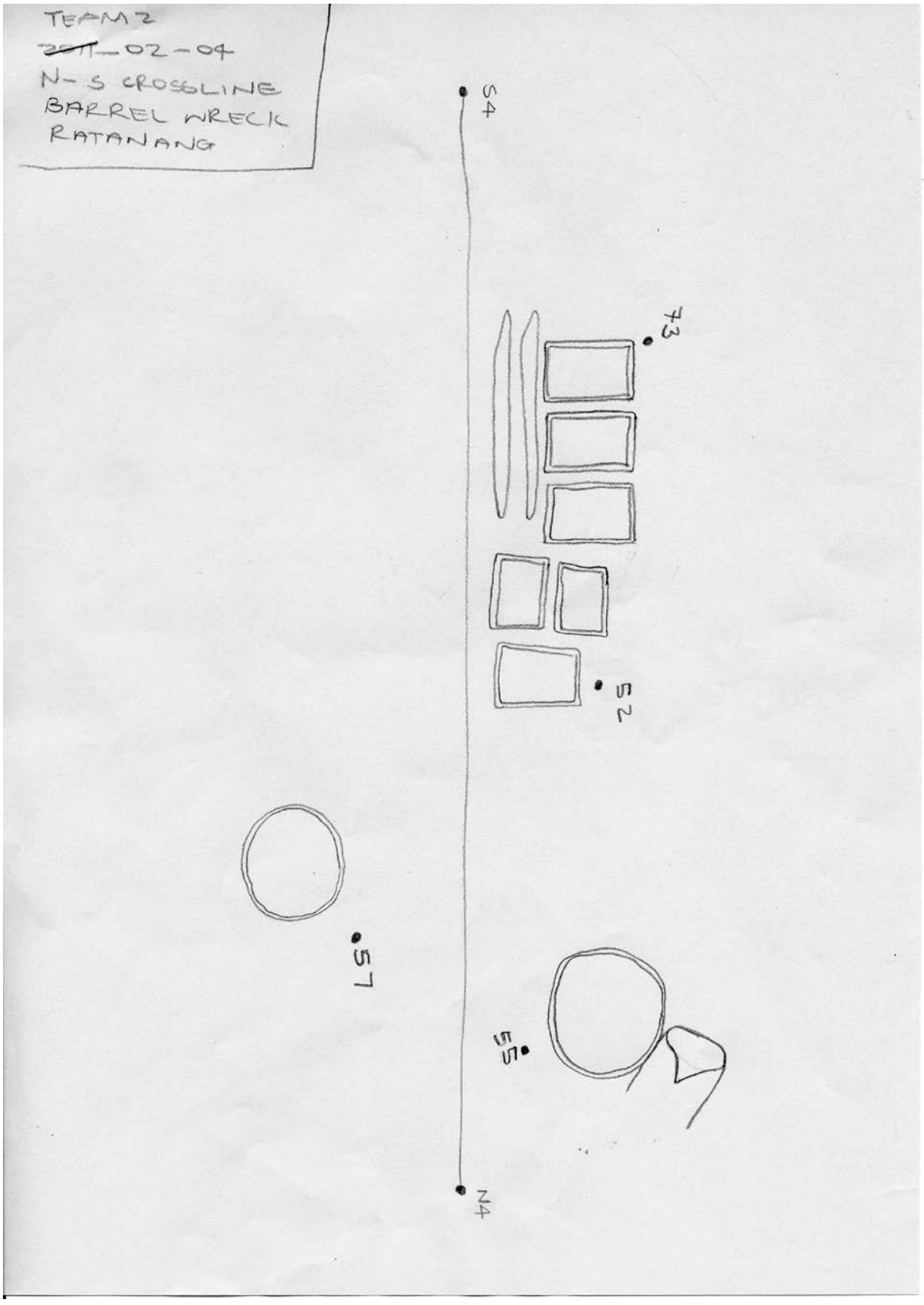


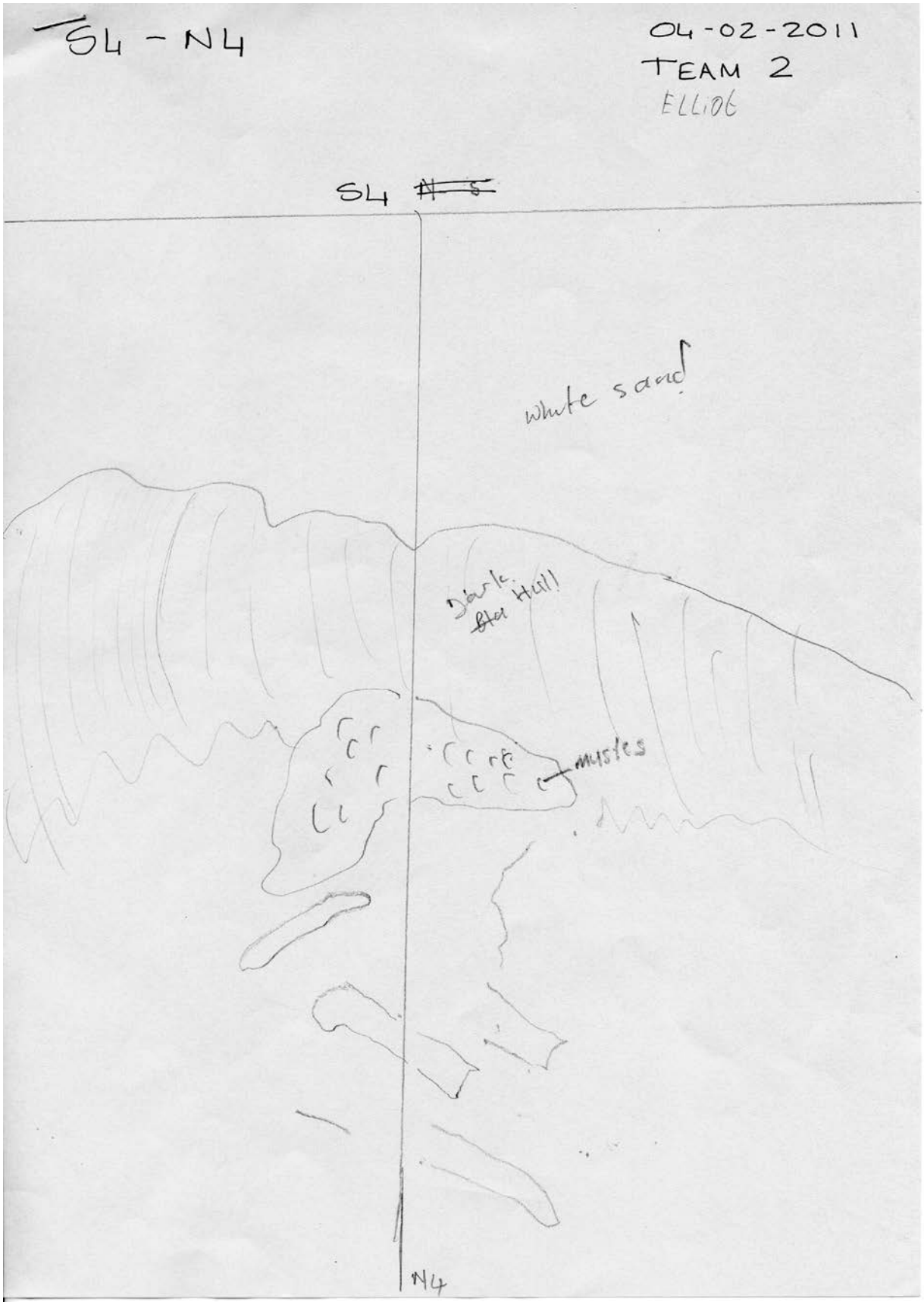

03-02-2011
SOPHIE ELLIOT
~~N2~~ – N4
N2
Sand
coral build up on hill
Tag 56
N4

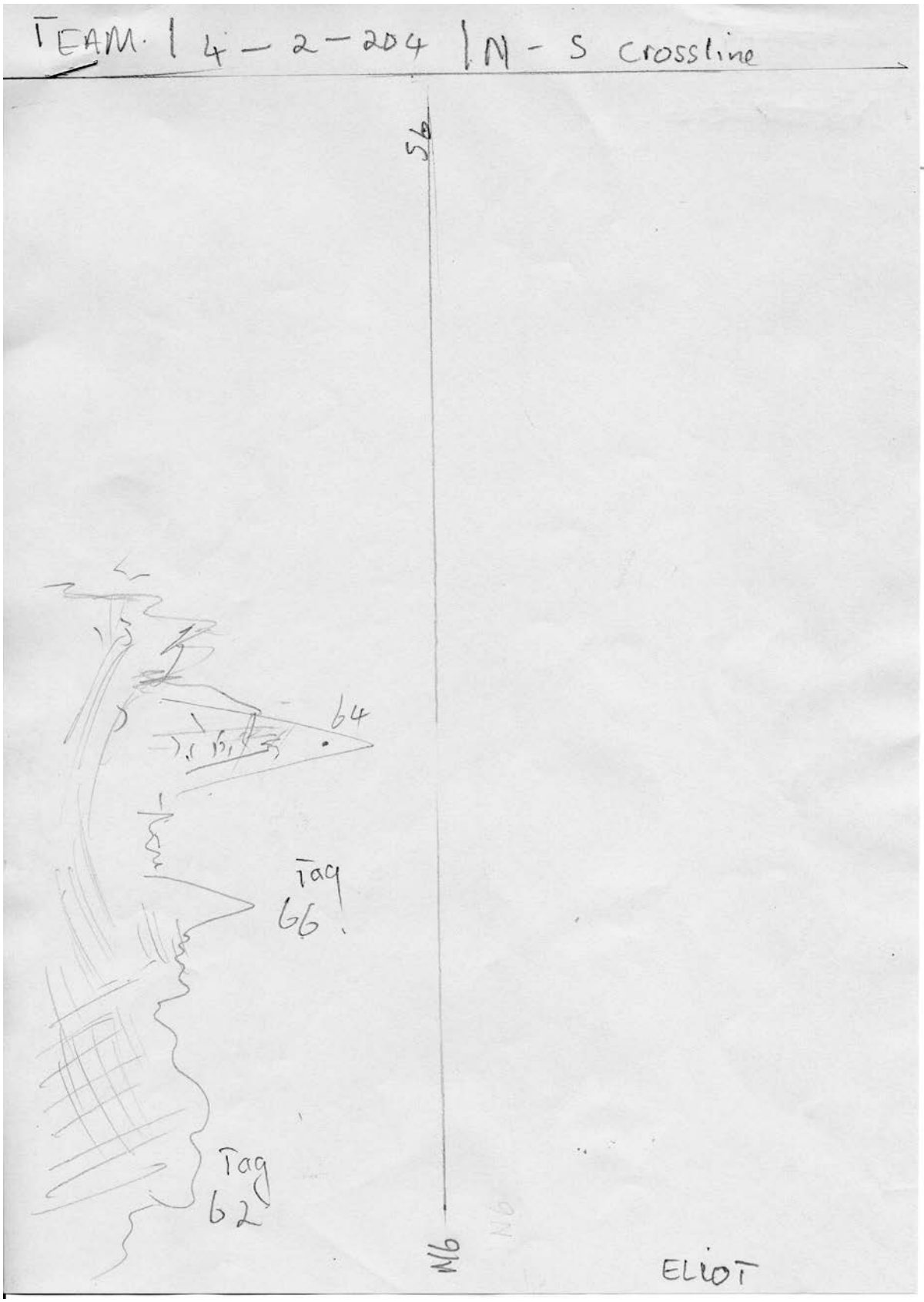
~~N4~~ - S4

04/02/2011
SOPHIE



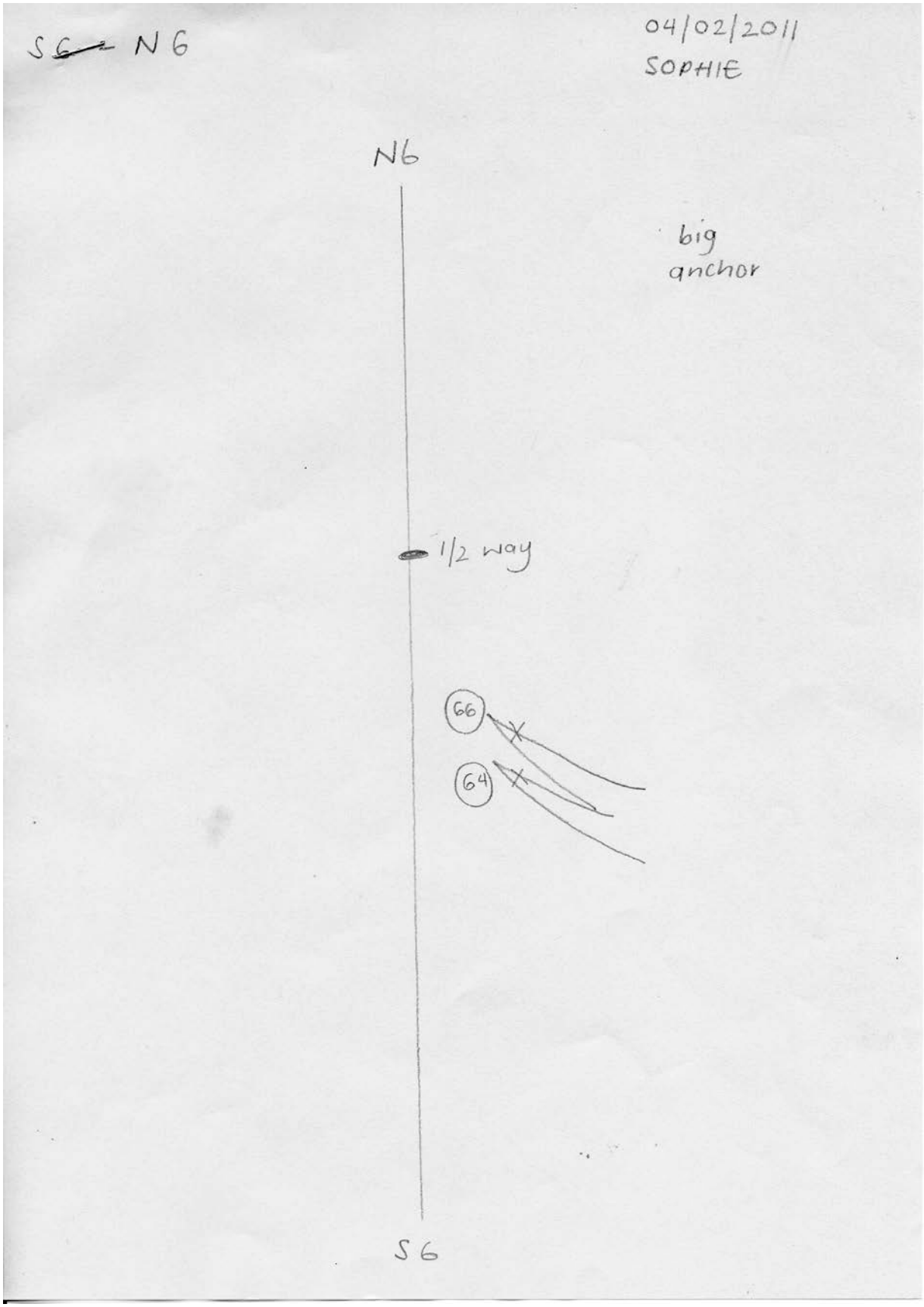

TEAM 2
~~27~~-02-04
N-S CROSSLINE
BARREL WRECK
RATANANG
S4
S3
S2
S7
S5
N4


S4 - N4
04-02-2011
TEAM 2
ELLIOT
S4 N
white sand
Dark Hill
reef
mussels
N4


TEAM. | 4 – 2 – 204 | N - S crossline
56
64
Tag
66
Tag
62
N6
ELIOT

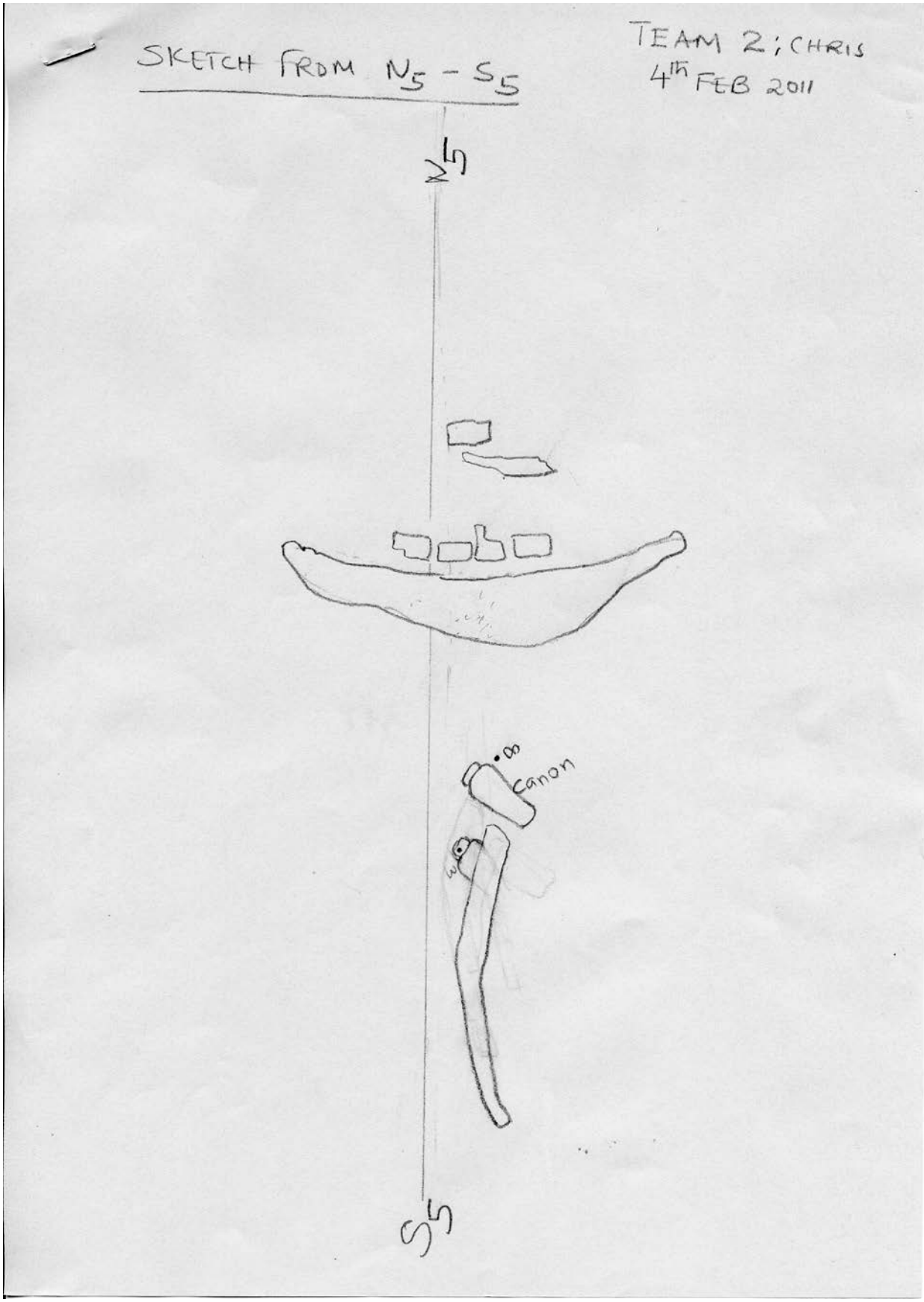
SG ~~—~~ NG

04/02/2011
SOPHIE



SKETCH FROM $N_5 - S_5$

TEAM 2; CHRIS
4th FEB 2011

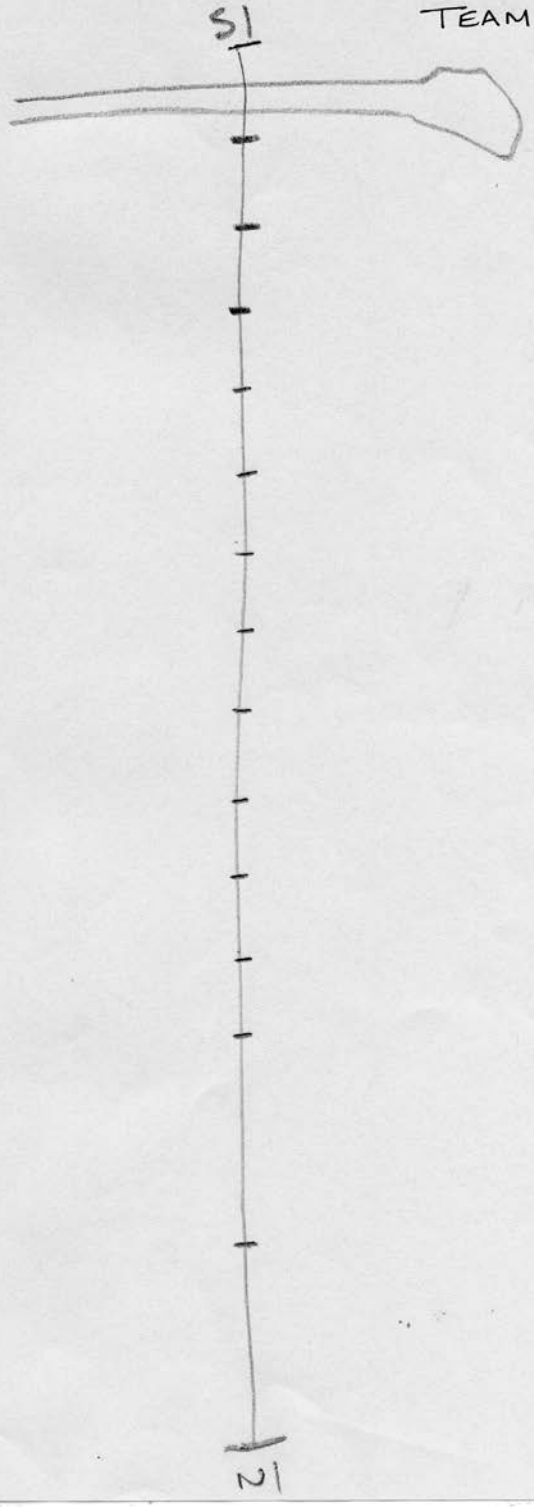


S1 — N1

04-02-2011

ROBIN, LUVUYO, MARIELLE

TEAM 1

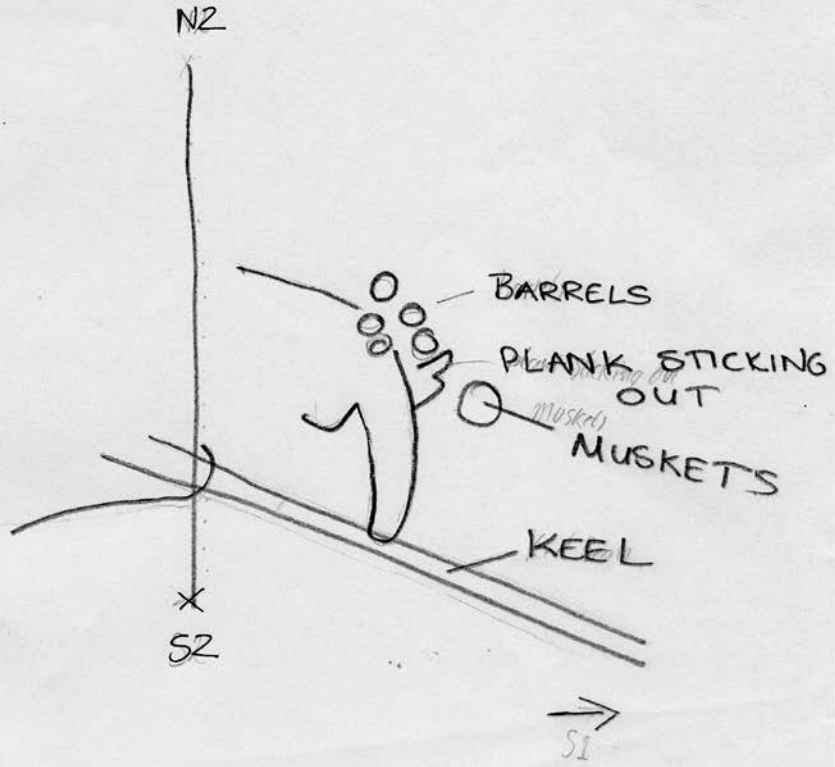


2A

SKETCH S2 - N2 LJ

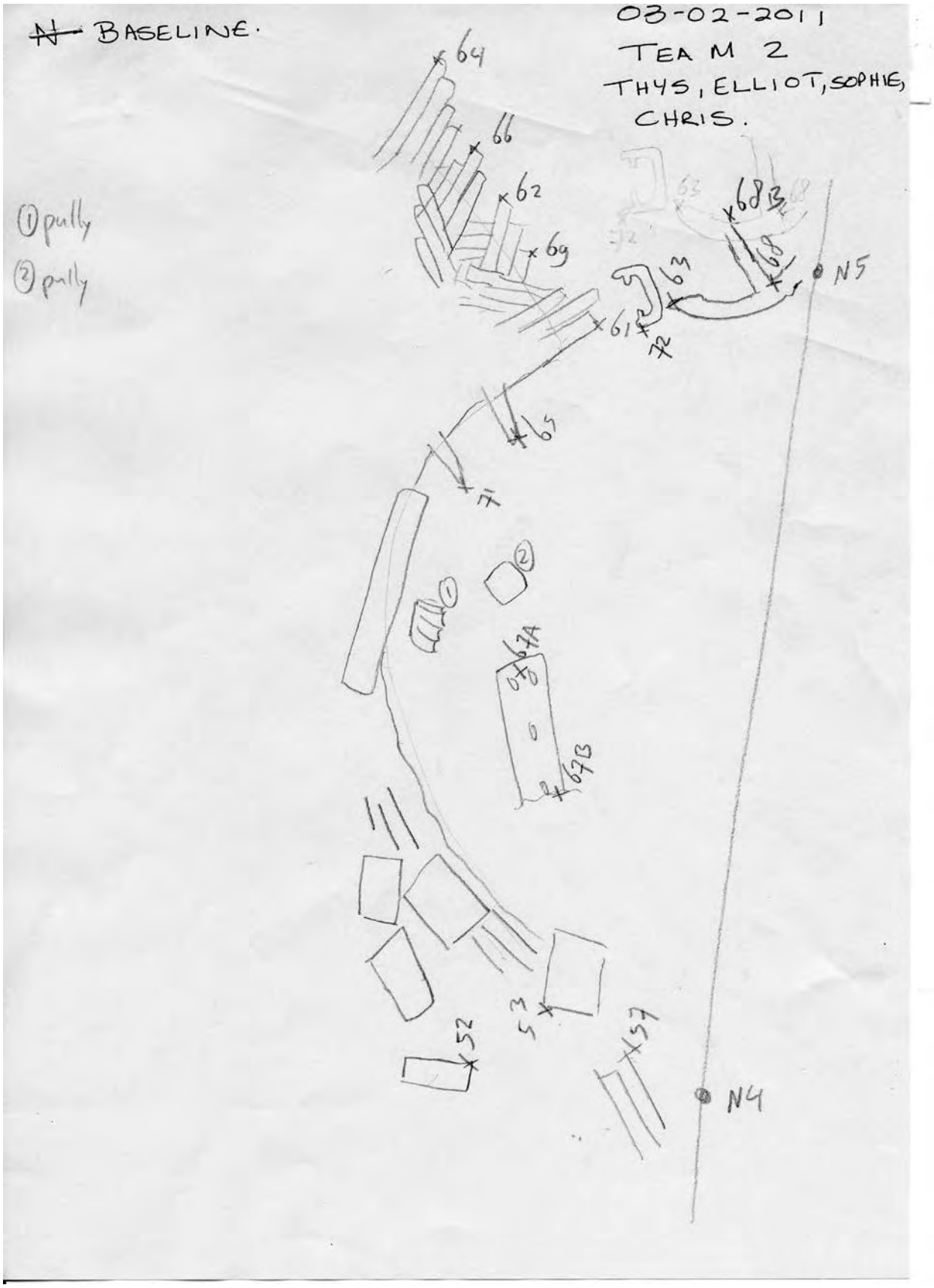
04-02-2011

LAURENS




ELLIOT & SOPHIE
DATE
03-02-2011
N 1
N 2
Tag 58
Tag 60
Tag 55
Fetlock
Ocean floor
Ocean floor

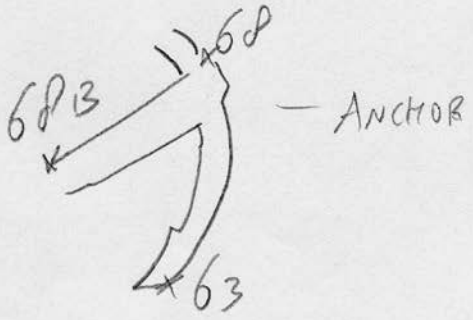
Appendix VII: N-baseline detail point measurements and drawings



MEASUREMENTS — N LINE

04-02-2011
TEAM 2

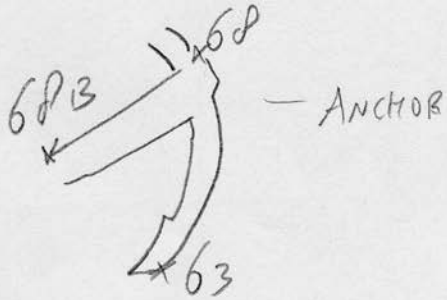
	N1	N2	N3	N4	N5	N6
6813						9,50



MEASUREMENTS — N LINE

04-02-2011
TEAM 2

	N1	N2	N3	N4	N5	N6
68B						9,50



TEAM 2
MEASUREMENTS
DIVE ??

MEASURE POINT	N1	N2	N3	N4	N5	N6
68					4	10,20
63					5,70	11,9
70					6,30	
65					7,10	14,30
64					11,80	16,20
66					11,20	15,90
62					9,80	15
69					8,90	14,60
61					7,70	13,40
72						11,80

N - LINE MEASUREMENTS

04-02-2011

TEAM 2.

MEASURE POINT	N1	N2	N3	N4	N5	N6
60	5,10	5,40				
58	5,70	5,50				
55	9,20	3,20				
54	10,30	3,10				
59	5,20	5,60				
56	18	8,60				
51	19,7	9,80				
70		14,1	7,10			
57			3,90	4,8		
52			10,50	5,55		
53				4	11,40	
67A				5,60	8,30	
67B				4,20	9,40	
71				7,60	7,60	
74				9,70	13,20	

FURTHER DETAIL POINTS ALONG THE EDGE OF THE SITE - N LINE - 10 FEB 2011 - DIVERS : THYS. ELIOT. CHRIS - SCRIBE WAYNE

N1.

N2.

x 98

x 78

MUSSEL BED

OVERHANG.

x 99

x 90

MUSSEL BED

N3.

x 79

x 85

x 88

N4.

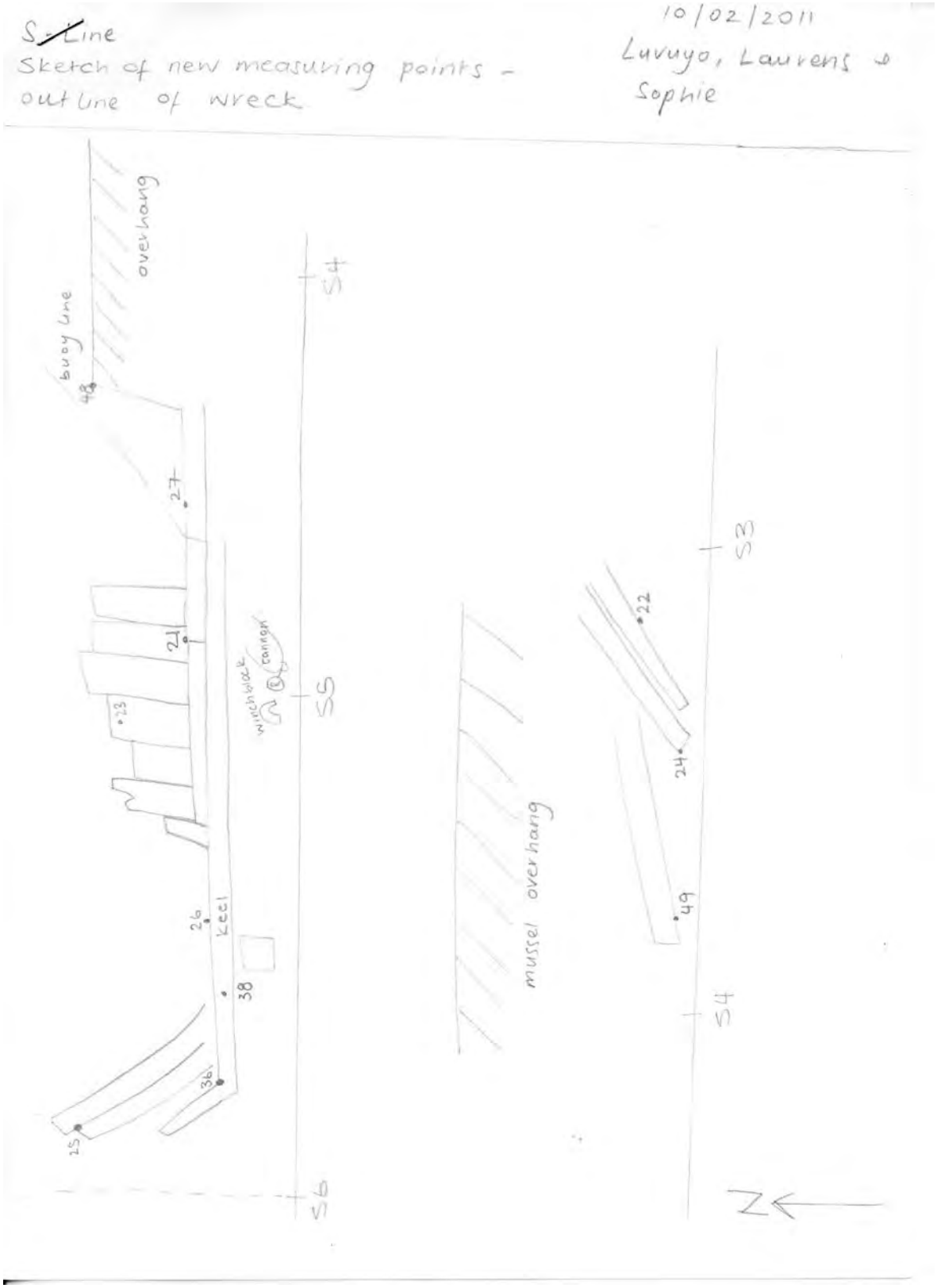
x 87

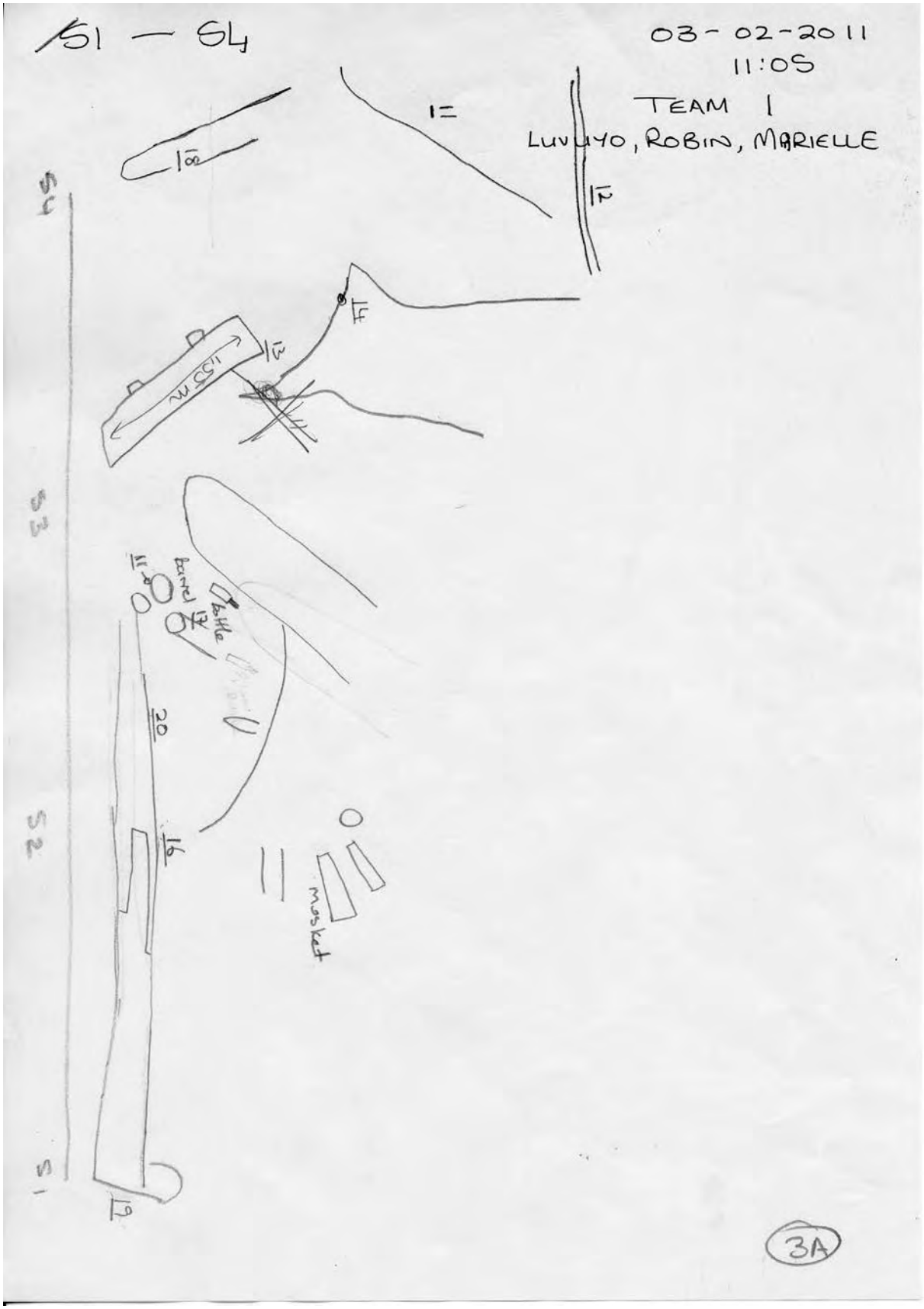
N5.

BY: WAYNE EVANS

N6.

Appendix VIII: S-baseline detail point measurements and drawings

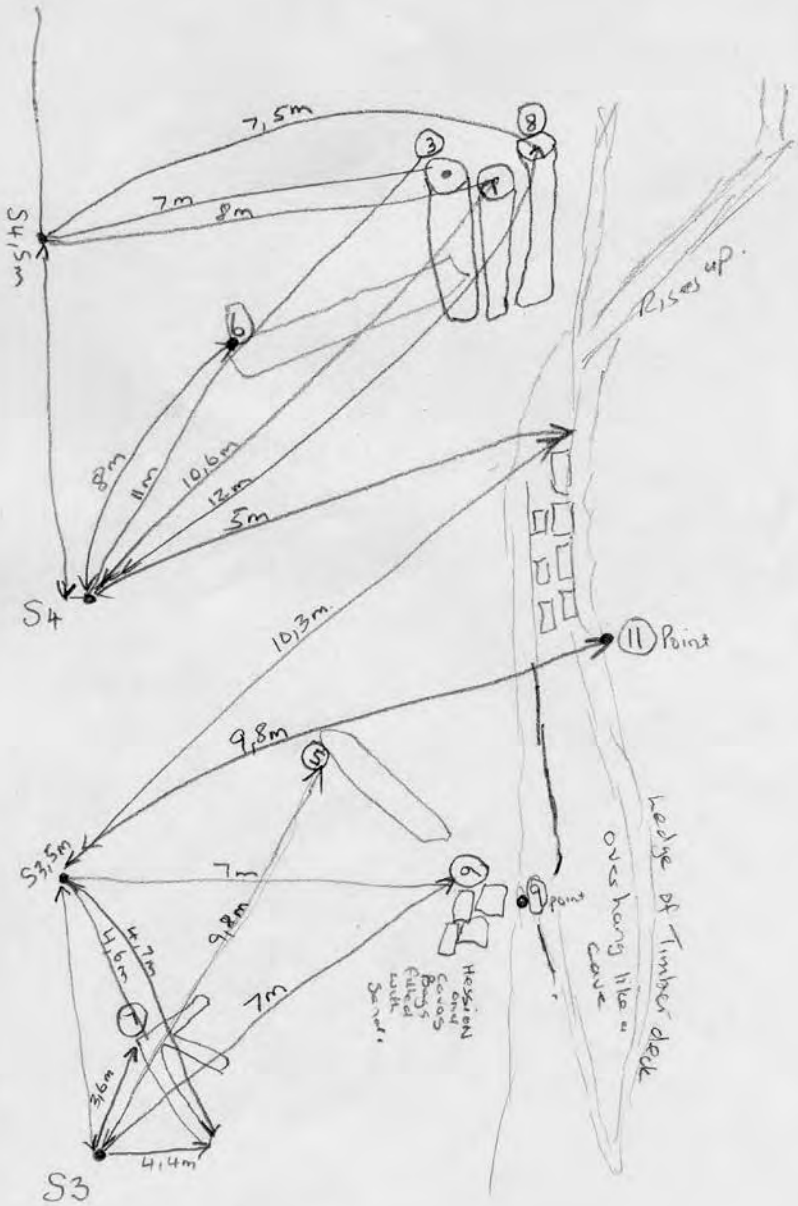


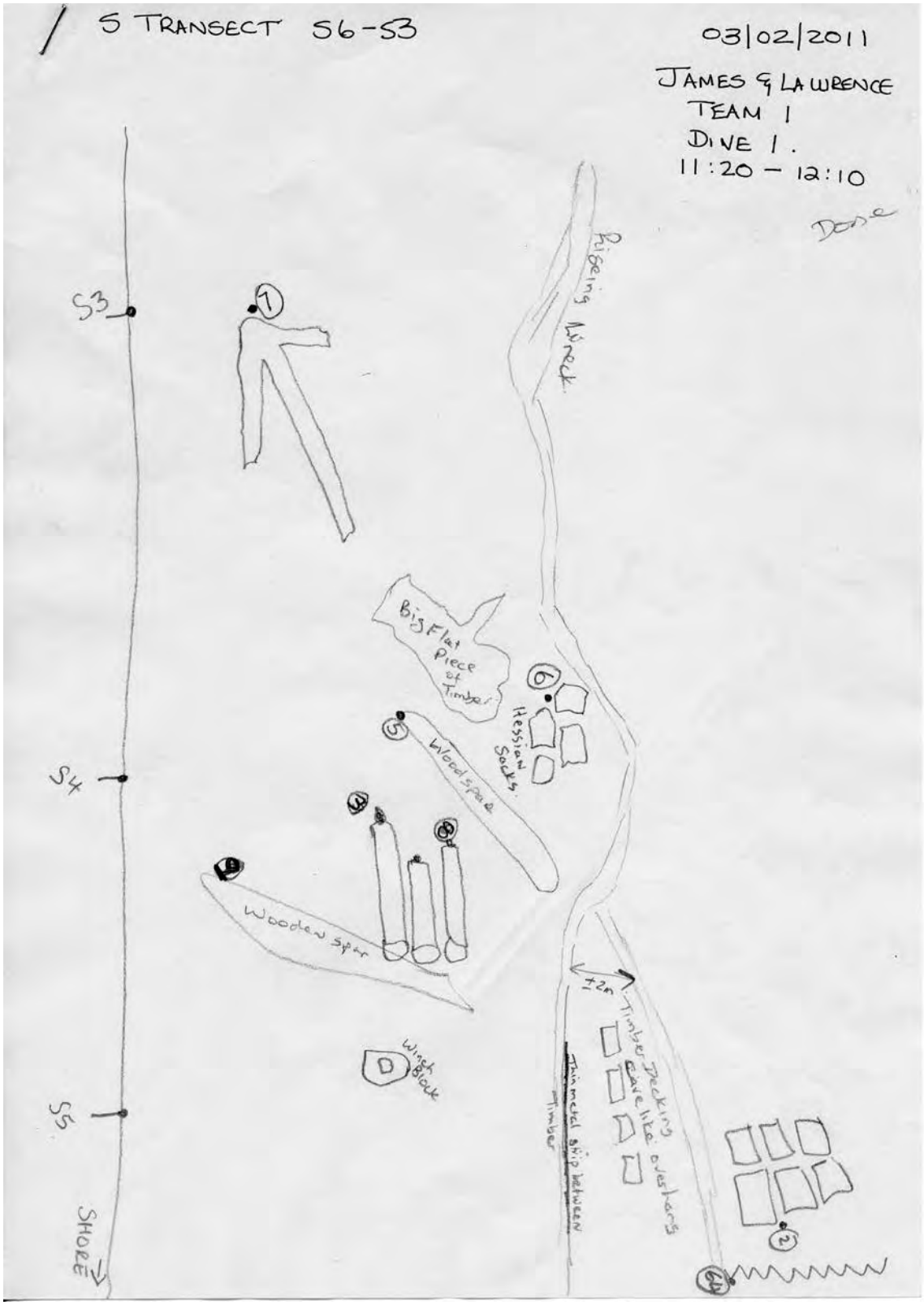

S1 — S4
03-02-2011
11:05
TEAM 1
LUVUYO, ROBIN, MARIELLE
S4
S3
S2
S1
18
17
16
15
14
13
12
11
10
155 NE
Barrel
Bottle
20
19
Mast

* TAPE ~~STARTED AT 1M.~~

Measurements on sketch have been corrected for tape.

03/02/2011
JAMES & LAWRENCE
TEAM 1
DIVE 2
15-50




5 TRANSECT S6-S3
03/02/2011
JAMES & LAWRENCE
TEAM 1
DIVE 1.
11:20 – 12:10
Dope
S3
S4
S5
SHORE
Rigging Wreck
Big Flat Piece of Timber
Hessian Sacks
Wood spar
Wooden spar
Winch Block
Timber Decking
Thin metal strip between timber

MEASUREMENTS. 10/4-02-2011

JAMES & LAWRENCE

DIVE 1.

S6	S5	S4	S3	S2	S1	Point
			2,10	12		7A
			3,30	12,45		7B
			6,95			18
			6,05			5
				12,8		7C
				10,40		S1

05-02-2011 LJ
Laurens & James

points measurements

	S2 (m)	S4 (m)	
5		7,00	near hull
6		9,00	Bags
7C		7,20	Base of Anchor
12	18,00		Mid ships near S4
17	9,10		
10			Keel end, Flushed away

Measurements S-Line 04-02-2011
Robin, Ruvuyo, Mareille

	S4	S5	S6
1	17,15		11,90
2		11,20	8,80
3	9,80	6,10	12,30
4		9,50	11,50
5			23,80
6	8,90		
8	10,80	6,70	12,00
9		4,30	13,00
18	7,20		

MEASUREMENTS

S1 – S4

04/02/2011

Luvuyo & Robin.

NO TAG	S1	S2	S3	S4	
19	4,90	10,50			
16	8,90	7,00			
20		6,60	12,50		
11 barrel			6,10 width 0,40	14,70	
17			12,90		
13		10,30 Height 1,53	6,40 height 1,55	12,40	
18			5,90	7,00	
12			13,00		
11			7,70		

(4A)

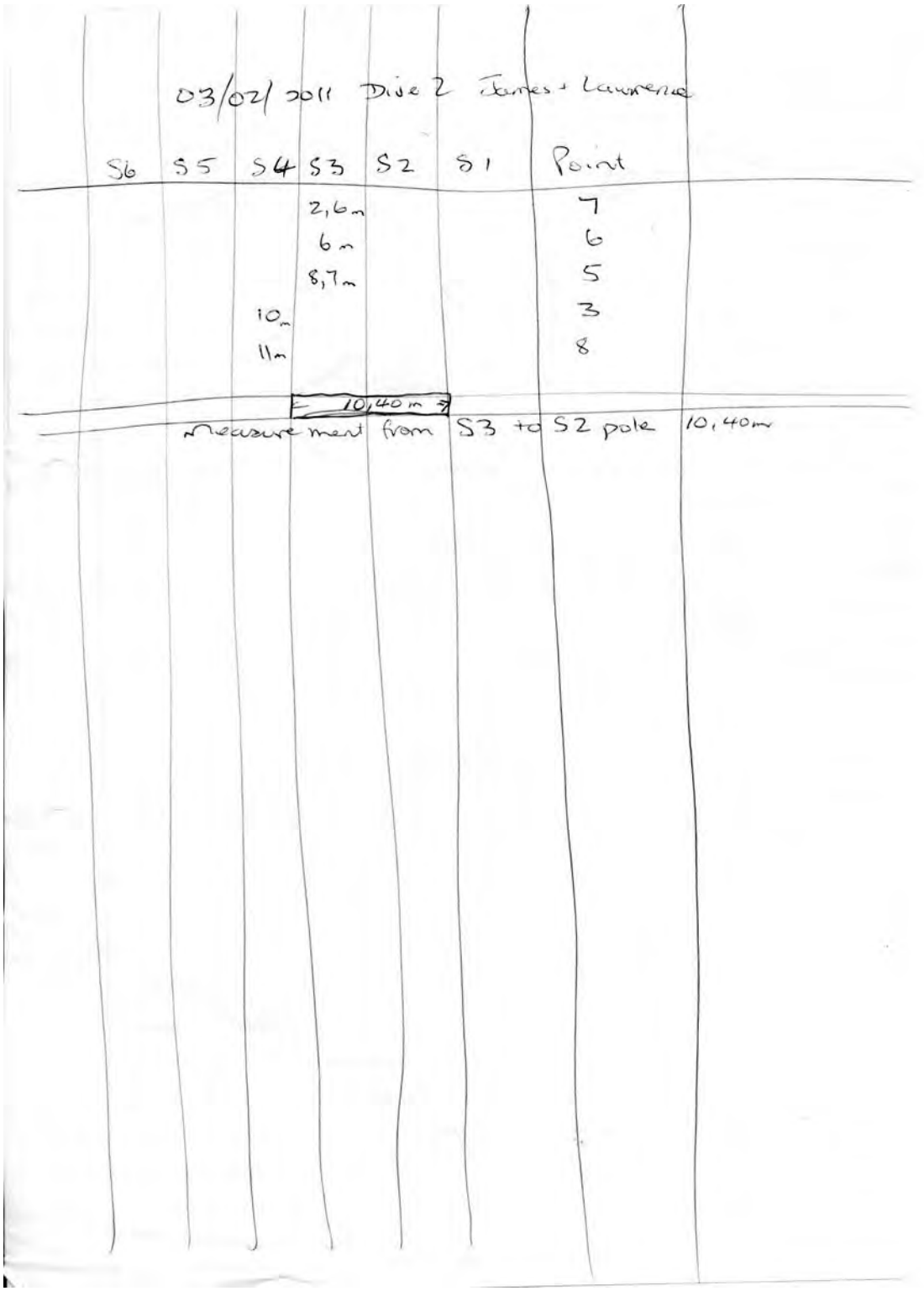
S-Line measurements (outline of wreck)

10/02/2011

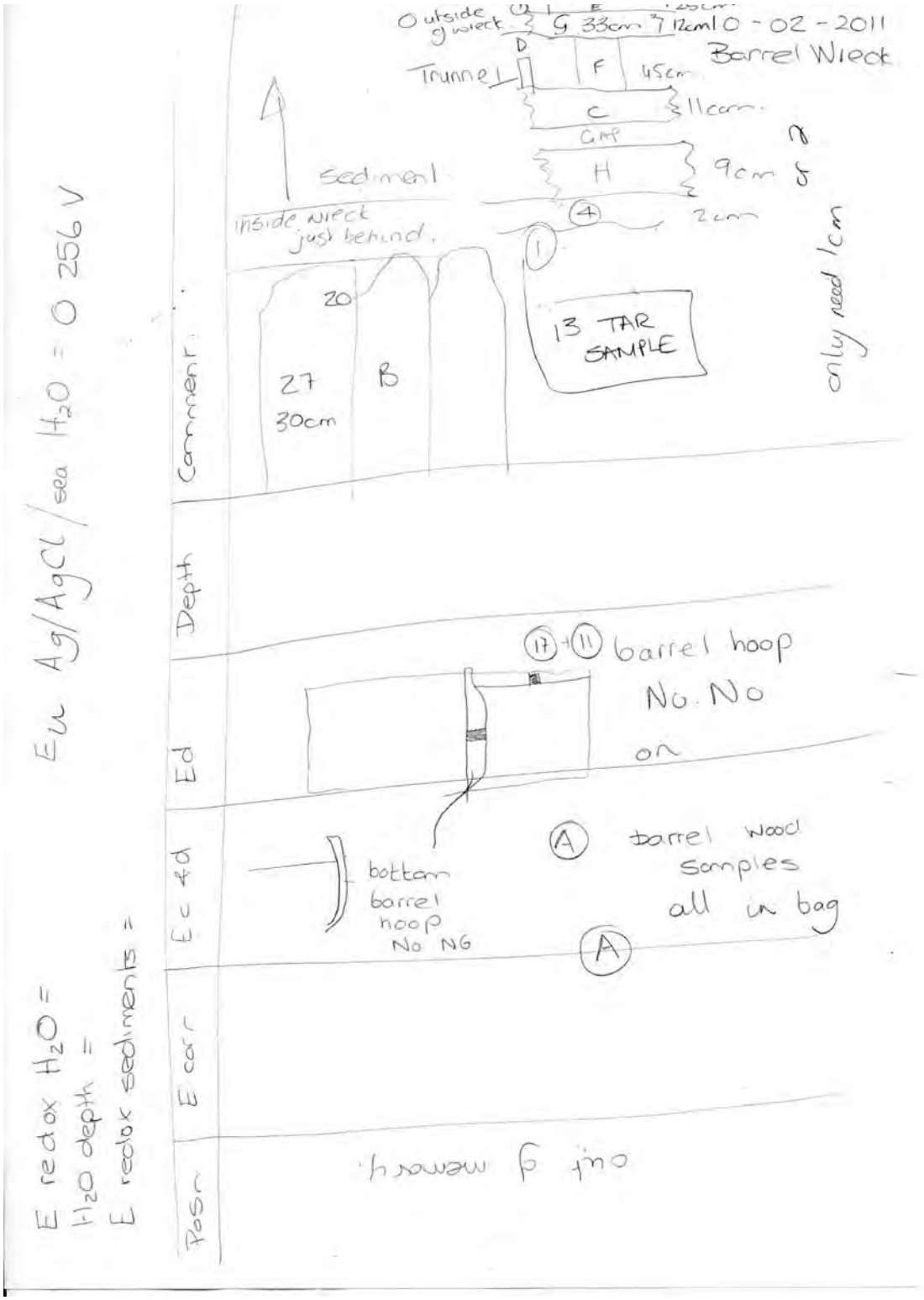
Laurens & Sophie

DP	S4	S5	S6	depth
25	/	15 15	9.75	5.4
36	/	14.13	8.90	6 6
38	/	12.40	8.70	6.4
26	/	11.40	9.20	6.3
23	15.30	9.70	10.50	5.9
21	3.30	8.90	/	6.6
27	9.70	9.0	/	6.0
48	9.60	8 45	/	5.1
49	6.55	12 80		6.6
24 Lx53 13 70	6 75	14.43	/	6.7
22	/	/	/	/

(all measurements in metres)


03/02/2011 Dive 2 James + Laurence
S6 S5 S4 S3 S2 S1 Point
2,6m 7
6m 6
8,7m 5
10m 3
11m 8
10,40m
Measurement from S3 to S2 pole 10,40m

Appendix IX: testing condition of the wreck



① The tar is leaking into wreck → does this have an impact on preservation.

② Between the sacrificial planking & the hull Jon Carpenter says he saw a fibre & possible tar & probably from the tar & fibre used to protect the hull

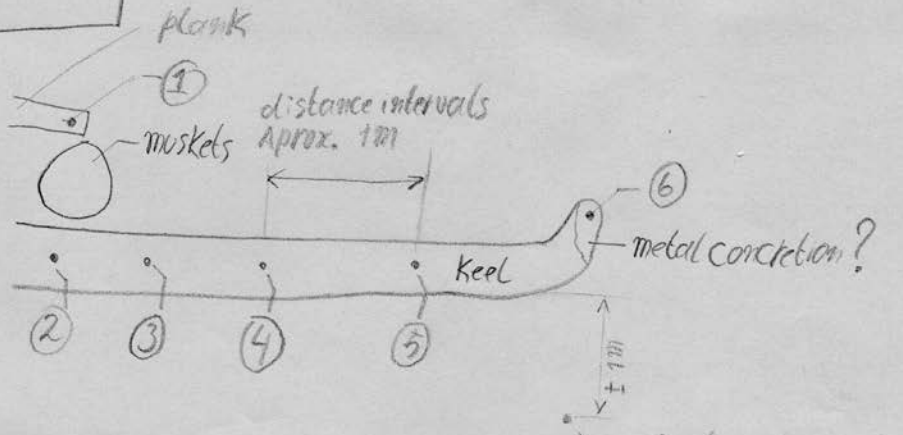
Roman law set → earlier.

08-02-2011
Laurens &
Luvuyo

LJ

probing & Sediment Sampling

x N1



1 - 5 bars
2 - 2 "
3 - 1 "
4 - 2 "
5 - 1 "
6 - 0 "

x
S1

RATANANG & WAYNE
2011 - 02 - 08
BARREL WRECK

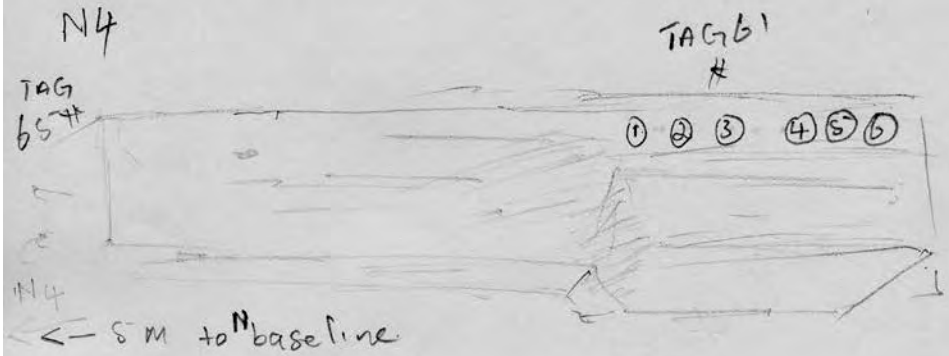
	DP 3 Cannon	Anchor	Round end of a pipe (where coal breaks the structure).
pH	4,21	4,59	5,11
mV	-0,32	-0,28	-0,12
Water Depth	6 m	5,6 m	5,9
Hole Depth	4 mm	9 mm	10 mm
			

S1/S2

WOOD Sampling

08-02-2011

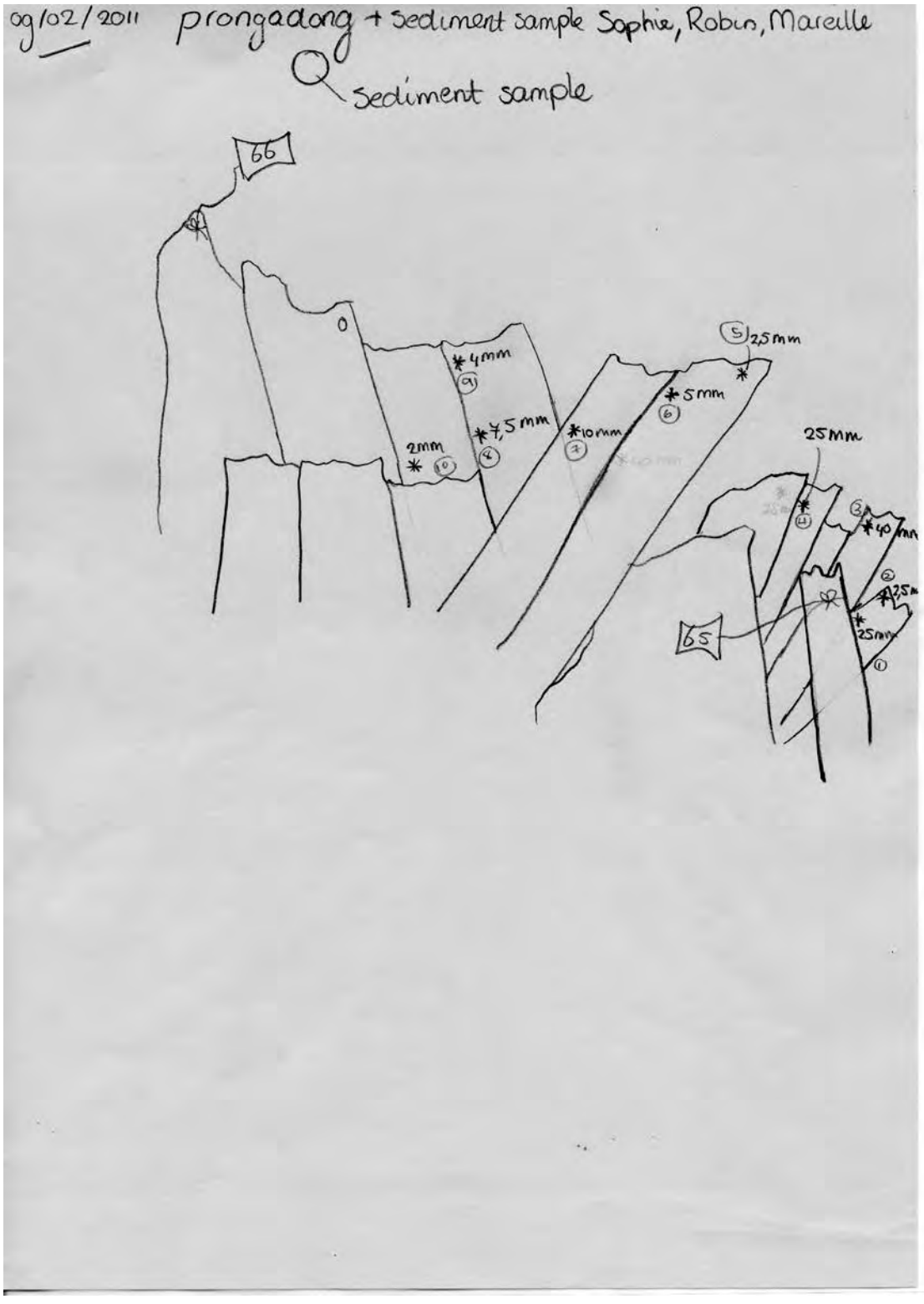
ELLIOT, THIJS, STRAUSS
VANNESSA.



① - 19 = 9.5 cm
② - 18 = 9 cm
③ - 19 = 9.5 cm
④ - 4 = 2 cm
⑤ - 16 = 8 cm
⑥ - 13 = 6.5 cm

5 M to Anchor

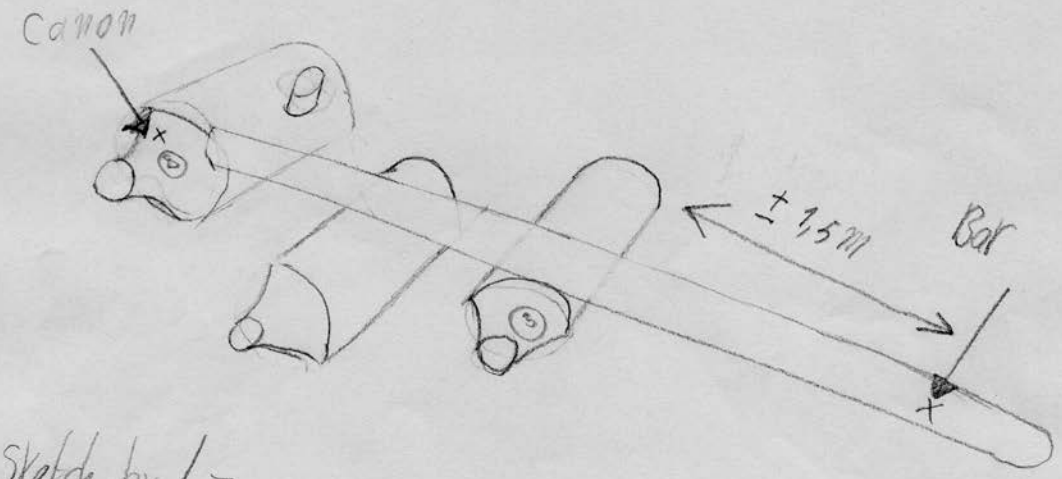
NS


09/02/2011 prongadong + sediment sample Sophie, Robin, Marelle
Sediment sample
66
65
4mm
2mm
7,5mm
10mm
5mm
2,5mm
25mm
40mm
25mm

09-02-2011
Laurens & Luvuyo

Drilling & Voltage Measurements.

	PE (mV Volts)	depth (mm)
Canon	-3.33	17
Bar	-1.25	28

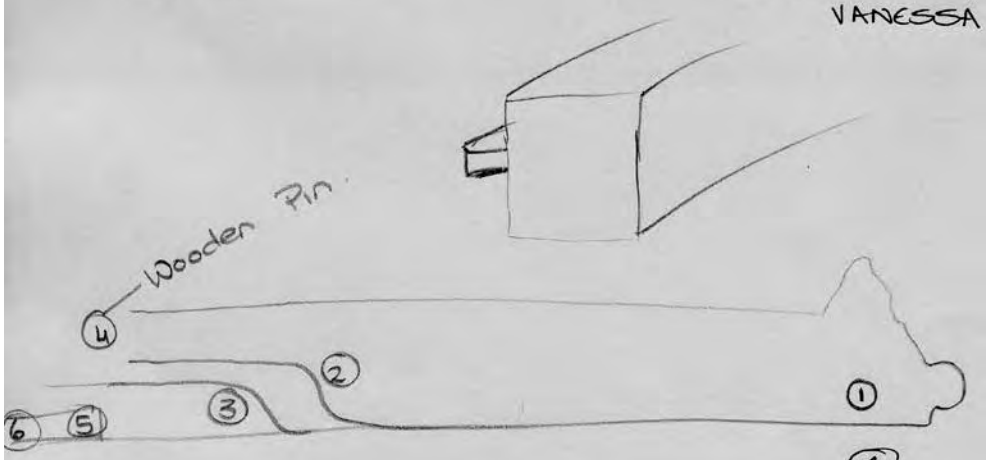


Sketch by LJ

WOOD SAMPLING — 08-02-2011

KEEL

ELLIOT, THIJS, SHAWN VANESSA.



① - 2 = 10mm

② - 2 = 10 mm

③ - 2 = 10 mm

④ - 1 = 5 mm

⑤ - 1 = 5 mm

⑥ - 3 = 15 mm.

SEDIMENT SAMPLE

TOP 9 cm - CREAMY SAND

BOTTOM - GREY SAND.

~~29~~-02-2011 LJ
Drilling
Laurens & Lovuyo

Drilling holes in Small Anker 2 (near corner S4) and in Big Anker at N6 taking Voltage & measuring depht. PH Sensor was Broken

	PL (mVolts)	depht (mm)
Small Anker (S4)	-4.48	35
Big Anker (N6)	-3.13	27

Small Anker (S4)

x marks the spot of probing

Big Anker (N6)

x marks the spot of probing

METAL TESTING

08/02/2011

Mareille, Robin & Sophie.

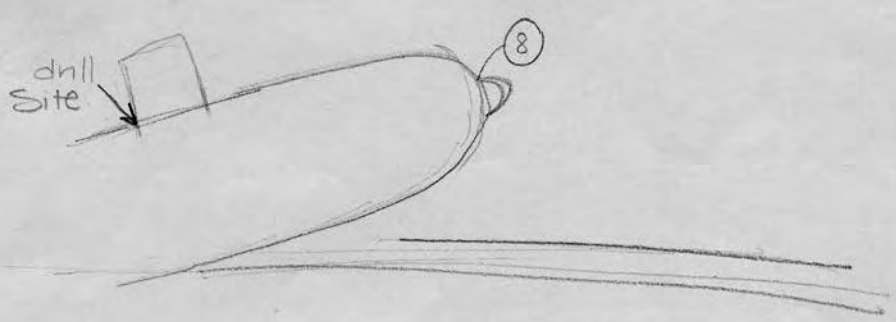
location - cannon (see sketch below)

corrosion layer - 4mm

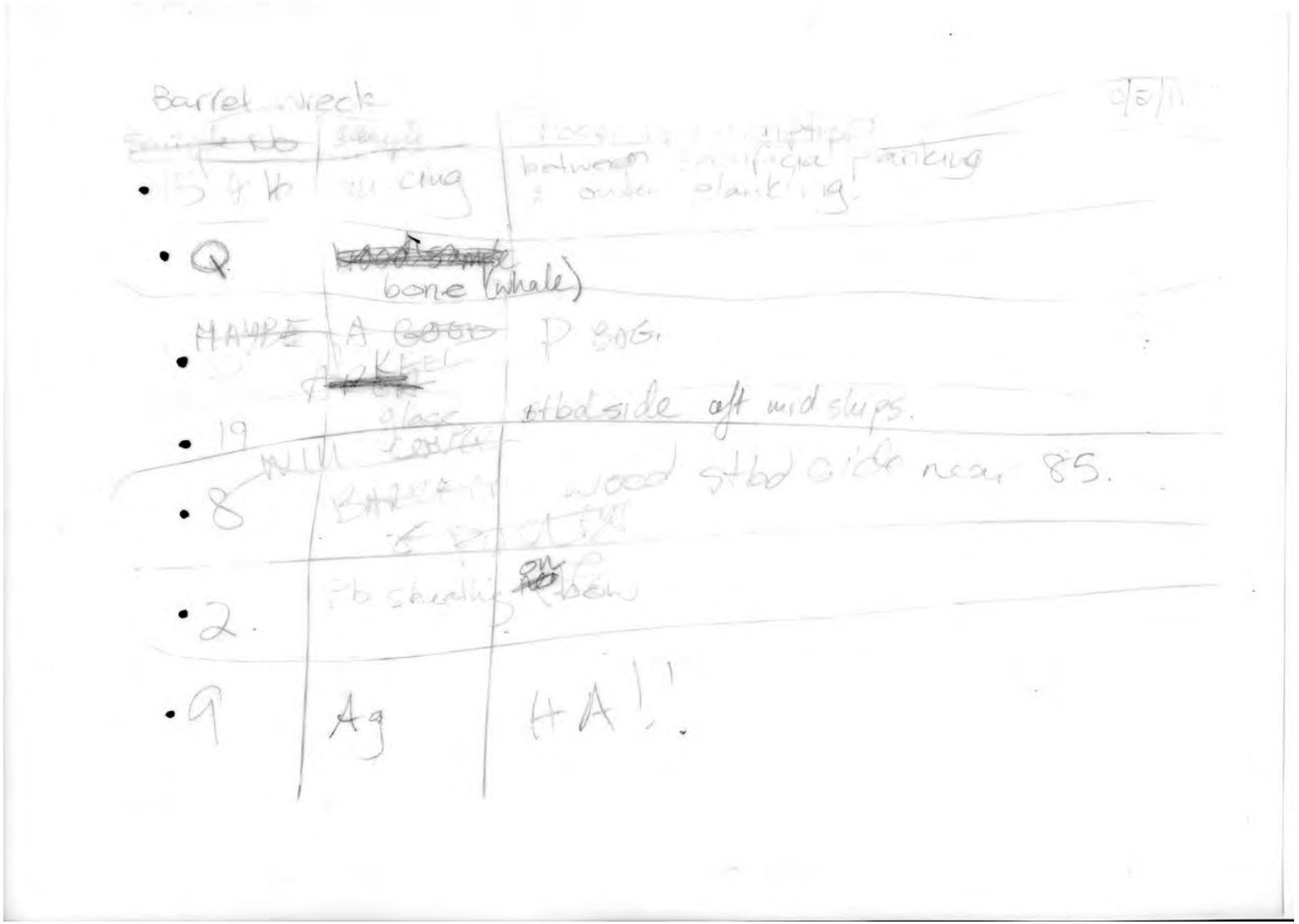
pH - 6.20

corrosion potential - -3.91

Sketch.



distance from boat to beach today	~330m
bearing "	92° magnetic
bearing from beach to boat	172°


Barrel wreck
bone (whale)
wood stbd side near 85.