



DIGBY WELLS ENVIRONMENTAL



Accidental Discovery of Human Remains at Boikarabelo Coal Mine

NHRA Section 36 Rescue Permit Report (Permit ID 1149)

Project Number:

LED 1656

Prepared for:

Lediadja Coal Boikarabelo Coal Mine


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DIGBY WELLS
ENVIRONMENTAL

This document has been prepared by Digby Wells Environmental.

Report Type:	NHRA Section 36 Rescue Permit Report (Permit ID 1149)		
Project Name:	Accidental Discovery of Human Remains at Boikarabelo Coal Mine		
Project Code:	LED 1656		

Name	Responsibility	Signature	Date
Johan Nel	Report writer; Permit holder.		17 January 2014

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1 Introduction

Digby Wells Environmental (Digby Wells) was notified by the Environmental Officer of Ledjadia Coal's Boikarabelo Coal Mine (Boikarabelo) of a chance find of archaeological human skeletal remains during bulk earthworks of a borrow pit on the farm Witkopje 238 LQX.

Ledjadia Coal has received Environmental Authorisation for all activities associated with the construction and operation of the Boikarabelo Coal Mine, including an archaeological site destruction permit issued by the South African Heritage Resources Agency (SAHRA).

2 Project Background

A borrow pit area was identified on Witkopje 238 LQ where material suitable for use in construction was excavated. The excavation was conducted mechanically using a large excavator.

The machine operator noted the first skeletal remains at 10h00 on 28 November 2013. He immediately ceased all work and contacted the site foreman, who in turn contacted the Boikarabelo environmental manager.

Chance find procedures were implemented that included (refer to Appendix A for detailed Chance Find Note):

- Ceasing all activities in and around the find;
- Establishing a 20 m buffer area surrounding the find;
- Notification of an archaeologist; and
- Notification of the local South African Police Services station commander.

On being notified the archaeologist – Johan Nel – immediately informed both the Burial Grounds and Graves (BGG) and Archaeological, Palaeontological and Meteorite (APM) units of the South African Heritage Resources Agency (SAHRA).

It was determined that the skeletal remains were archaeological and an urgent rescue permit was submitted to the APM unit through the South African Heritage Resources Information System (SAHRIS) on 28 November 2013. Subsequently the archaeologist undertook a site visit on 2 to 5 December 2013. The purpose of the site visit was to determine the context of the burial through excavation and detailed recording, ascertain whether any other remains may exist in the area.

No context could however be determined as the remains had been removed from any original context when exposed. A site walk down also did not identify any surface indicators that could identify any additional burials (see 4.2 below for detailed methodology). A second chance find was however made on 4 December 2013 within approximately 5 m of the first find. The same Chance Find Procedure was implemented but the local SAPS station commander was not notified at this time.



3 Site description

The location of the borrow pit where the remains were exposed is located in the relative centre of the farm Witkopje 238 LQ in the Limpopo Province.

Table 3-1: Geographical location details of site where human remains were discovered

Farm name	Witkopje 238 LQ
Site co-ordinates	-23. 586833° 27.159278°(accuracy ~5 meter)
Datum	WGS 84
1 : 50 000 map reference	2327 CA Hardekraaltjie
Province	Limpopo Province
Magisterial district	Ellisras
District	Waterberg District Municipality
Local	Lephalale Local Municipality
Nearest town/s (by road)	Steenbokpan (hamlet) approx.. 20 km south east Lephalale (town) approx. 70 km west

The remains were found approximately 450 meters north of the closest previously recorded archaeological site – Site 002 (cf. Fourie 2010; Fourie & Fourie 2010; Higitt & Nel 2011a, 2011b; Nel 2011; Nel & du Piesanie 2012a, 2012b). Although no association to this site could be established it was used as a reference point in terms of site naming (see Methodology below).

The site is located on the edge of a calcrete outcrop as depicted in Figure 3-1. Very little surface indicators were noted to identify the area as a likely archaeological site. Visible artefacts were limited to scattered ceramic fragments with a spatial density of less than five fragments per 25 m² (roughly 5 x 5 m 'grid'). No deposit was noted on the surface nor in nearby animal burrows, in addition surface features generally identified at other sites (cf. Fourie 2010; Nel & du Piesanie 2012a, 2012b) in the region such as stone-packed grain bin platforms were also absent. The greyish area in the centre of the image – outlined in red dashed line depicted in Figure 3-1 – represents part of the calcrete outcrop being sourced for construction purposes.

This is typical of the general cultural landscape and consistent with recorded observations made in several previous investigations, including archaeological excavations of sites (Nel & du Piesanie 2012a, 2012b).



Figure 3-1: Location of site where remains 2327CA/WKP/238 LQ/001 & 002 were found (at top) in relation to site 002 (at bottom). The distance between these two sites are more than 450 m. The red outline delineates a calcrete outcrop.

No cultural stratification was noted in the section created by the excavated borrow pit as illustrated in Figure 3-6. The average depth of the topsoil – where deposit could be expected – was less than 400 mm from surface to the upper level of the calcrete deposit. It is assumed that the remains were buried in this layer possibly intruding into calcrete. Figure 3-2 to Figure 3-5 depicts the general site conditions.



Figure 3-2: Eastern view towards the excavated borrow pit area. Note absence of any surface indicators on the undisturbed surface



Figure 3-3: General view west of the excavated borrow pit. No surface indicators present.



Figure 3-4: View eastwards towards borrow pit. The stockpiled soil in the background is cleared topsoil. No artefacts were noted in the stockpiled topsoil.



Figure 3-5: General view southwards of the excavated borrow pit.

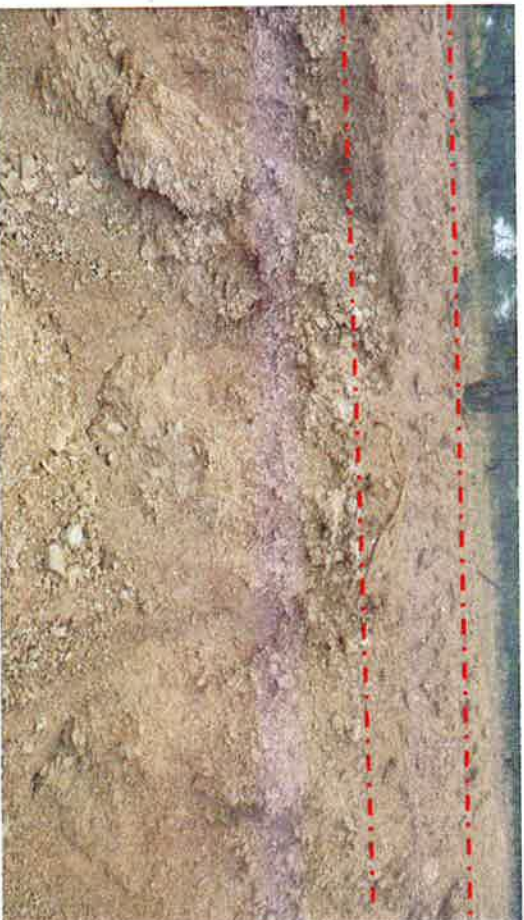


Figure 3-6: Detail of section created by borrow pit excavation. The topsoil layer is between the red dashed line. No deposit or artefacts were noted in this layer. The calcrete layer below the bottom line was found to be sterile in terms of material culture.



Figure 3-7: Area in excavated borrow pit where remains were found. Arrow 1 indicates the spoil heap where the first set of skeletal material was found. Arrow 2 indicates the probably location of the second set of remains. The red dashed lines indicate the topsoil level. The white stakes represent the 20 m buffer area to the east of the find.



Figure 3-8: Detail view of the borrow pit area where the remains were exposed. Arrow 1a indicates the spoil heap where the first skeletal material was noted. Arrow 1b indicates the spoil heap from where some additional bones were retrieved. Arrow 2 indicates the area where the second set of remains were exposed.



Figure 3-9: View of the northern extent of the borrow pit. The arrow indicates the area where the second skeleton was exposed. Note that the topsoil has been removed. No evidence of any burials, intrusions, features or deposit was found in this area.

4 Methodology

The methodology that was proposed to complete the rescue excavation was based on standard archaeological excavation techniques, i.e. establishing a reference grid,



documenting position of remains and manual excavation to retrieve remains and artefacts from the surrounding matrix to determine context.

This was however not implemented as the remains were completely out of context and surrounding matrix. Instead, soil left on site that contained the skeletal remains was screened through sieves comprising 20 mm, 5 mm and 1 mm mesh to retrieve bone fragments and any material culture. The 5 mm and 1 mm sieves were abandoned after no material was retrieved. This ensured that nearly all bones from the right side of the remains were recovered, vertebrae, rib fragments and hand and foot bones.

Soil that was already removed and dumped on the platform before the remains were noticed was also searched. However, as this soil comprised around 12 m³, it was not feasible to screen the soil. The dumped soil heaps were spread out and levelled to a depth of around 50 mm. This layer was subsequently 'screened' using steel rakes. The remaining long bones and others were retrieved in this manner.



Figure 4-1: Screening through spoil heap where first skeletal remains were found.



Figure 4-2: Borrow pit material dumped on platform area. The material that contained the skeletal remains is in the left foreground.



Figure 4-3: Material from borrow pit spread out on platform area.



Figure 4-4: ‘Screening’ of borrow pit material by raking through soil.

Through employing this adapted methodology, more than 95% of bones making up the first skeletal remains were retrieved with little damage.

The second set of remains that was found was collected on site. The remains were similarly not in any context and were much more fragmented and damaged than the first find. It appeared that the excavator exposed this set of remains in a single action. The ‘scoop’ that contained the remains was emptied and all bones retrieved. The remaining soil was screened using a 20 mm mesh.

No material culture was found with either set of remains., although a single ceramic fragment was identified by the EO when the first remains were exposed.

5 Findings

The condition of the remains were in a good state of preservation although damage occurred during the exposure thereof by the excavating plant.

The site where the remains were found was not identified in any previous assessments. Surface indicator that may have indicated the presence of an extensive settlement were negligible, comprising only a few scattered ceramics. No evidence of deposit was noted, nor were other surface features identified such as grain bin foundations.

No material culture was found associated with the human remains – even though the surrounding matrix was screened using sieves with ~2 mm and 20 mm apertures. This may



be indicative of the relative transient and poor nature of the settlements found in the area, described in previous reports on mitigation of several sites in the area.

6 Way forward

The following action items and recommendations are proposed with regard to the rescued remains and possible future finds.

- The remains will be delivered to the Department of Anatomy, University of Pretoria for analyses and interim curation. Analyses should include:
 - Palaeoanthropological analysis to determine the age, sex, race and any health status of the remains; and
 - Carbon dating of the remains.
- The remains should be returned to site and reburied in a prepared grave that will allow access to the remains if required. In the interim, the remains should be curated by the Department of Anatomy.
- Given the lack of surface indicators that may have indicated the possible presence of the remains, the following recommendations should be considered:
 - The onsite Environmental Officer (EO), or persons delegated, should undergo training to screen sites where earthworks are expected before any activity takes place;
 - Screening should take into account the presence of any material culture and the density thereof;
 - Should the EO expect that there may be a likelihood of subsurface deposit that may include human remains, an archaeologist should be requested to undertake a watching brief during initial clearance of topsoil;
 - Consideration should be given to clearing topsoil ahead of bulk earthworks using a grader or similar equipment to reduce the chances of exposing human remains as have occurred;
 - Any remains that are identified in this manner should be recorded *in situ* through archaeological test excavations;
- Boikarabelo Coal Mine should further consider the appointment of an onsite archaeologist for the duration of the construction period as necessary to reduce any negative impacts on unidentified sites.

7 References

Fourie, W. 2010. *Archaeological Impact Assessment. Res Gen SA Boikarabelo Coal Mine Project on Portions of the Farms Orsono 700 LQ, Zeekoewley 421 LQ, Vischpan 274 LQ, Kruishout 271 LQ, Kalkpan 243 LQ, Witkopje 238 LQ, and Diepspruit 386 LQ, District Lephalele, Limpopo*. Pretoria: Professional Grave Solutions (Pty) Ltd.

Higgit, N., & Nel, J. 2012a. *Phase 1 Archaeological Impact Assessment for MBET Pipeline.*
Randburg: Digby Wells & Associates (Pty) Ltd.

Higgit, N., & Nel, J. 2012b. *Heritage Statement for Marapong-Boikarabelo Water Treatment Plant.* Randburg: Digby Wells & Associates (Pty) Ltd.

Nel, J. 2011. *Addendum to Phase 1 Archaeological Impact Assessment for the Boikarabelo Coal Mine (Proposed Railway Link from the Farm Kruishout to the Farm Buffelsjagt), Lephalale Local Municipality, Waterberg District, Limpopo Province.* Randburg: Digby Wells & Associates (Pty) Ltd.

Nel, J., & du Piesanie, J. 2012a. *Interim Phase 2 Archaeological Impact Assessment for the Boikarabelo Coal Mine, Limpopo Province (SAHRA Permit No. 80/11/07/015/51).*
Randburg: Digby Wells & Associates (Pty) Ltd.

Nel, J., & du Piesanie, J. 2012b. *Phase 2 Archaeological Impact Assessment for the Boikarabelo Coal Mine, Limpopo Province (SAHRA Permit No. 80/11/07/015/51).*
Randburg: Digby Wells & Associates (Pty) Ltd.



Appendix A: Environmental Incident Reports (Accidental Discovery of Human Remains)



BOIKARABELO COAL MINE ENVIRONMENTAL INCIDENT REPORT

CONTRACTOR: Protech Khuthale	
INCIDENT DATE: 13/01/2014	
INCIDENT TIME: 07h30	
PERSON INVOLVED: Amos Ishalala	
LOCATION: Mkhokpie G7 borrow pit	
REPORTED BY: E de la Harpe	
SIGNATURE:	

CATEGORY	TYPE OF INCIDENT	CONTRACTOR:
1: Major <input type="checkbox"/> Breach of license conditions and or environmental law/regulations/Mine policy & procedure Reportable to government Has caused significant environmental harm Impacts extended outside of project area & could potentially impact on surrounding community/property	2: Moderate <input type="checkbox"/> Potential to breach license conditions and or environmental law/regulations/Mine policy & procedure Government reporting voluntary Has caused moderate environmental harm Includes incidents which have interfered with the public domain outside the mine property	3: Minor <input checked="" type="checkbox"/> No breach license conditions and or environmental law/regulations/Mine policy & procedure Has cause minor environmental harm Site specific incident

PART A: INCIDENT DETAILS

TYPE OF INCIDENT

Hydrocarbon spillage Chemical spillage Non permitted bush clearing
 Animal harm/fatality Clean water wastage Effluent spillage
 Incorrect waste handling/disposal Other (describe) Change find of human skeletal remains

DESCRIPTION OF THE INCIDENT

Skeletal remains were unearthed during the excavation of G7 material from an identified borrow pit area located on Witkoppe. Once the bones were seen the operated stopped work and notified the supervisor. Work on the borrow pit ceased until cleared by the environmental officer. The location of the third set of remains was approximately 3m west of the first set.

Witnesses: _____
 Statements Attached : Yes No
 Photos Attached: Yes No

IMMEDIATE ACTION TAKEN

Worked was stopped. The Environmental Officer was called to site to collect the bones.

PART B: CORRECTIVE ACTION

Responsible Champion: _____ Sign: _____ Date: _____

Identify the root cause(s) associated with the incident:
 The root cause was the excavation of borrow pit material, no corrective action can be completed.

Required Corrective Action To be taken

NOTE • ALL INCIDENTS ARE TO BE CLOSED WITHIN 14 WORKING DAYS FROM ISSUE DATE. Further recommendations may also be provided within the incident report completed by the Environmental Department

Action	Responsible Person	Target Date

Verify that the preventative action stated above has been completed

Sign: _____ Date: _____

PART C: PREVENTATIVE ACTION

To prevent incident from ever happening again & to eliminate the problem, including (similar) occurrences elsewhere

Identify other areas which could also be affected by the incident: _____ Remaining borrow pit area

Develop actions to be taken:

Action	Responsible Person	Target Date
Surface indicators in the borrow pit area need to be identified	Lediadia Environmental Officer/Archaeologist	Mar-14

Verify that the preventative action stated above has been completed

Sign: _____ Date: _____

PART D: VERIFICATION

Verify that all actions (corrective & preventative) taken have been effective to eliminate the problem

An investigation report has been completed

Yes No
 Yes No

Incident Register	EM004	Date captured	05/02/2014
Signature		Date	15/01/2014

Statement Form



PKH-SDF-00008
Revision: 0
Date: 31/01/2013

This form should be used as a guidance template to take statements following any incident, including minor incidents and environmental incidents. Statements should be taken from the injured parties (if any), operators involved, external parties involved as well as witnesses and foremen for the area in which the incident happened.

The statement may be written by the individual themselves or it may be translated and written by a translator. Statements should be taken down as spoken and should be truthful and as accurate as possible.

Please complete all of the following sections:

Explain in your own words, what happened.

I WAS BUSY LOADING THE ADT AND SAW THE BONES AS I SAW THEM THE LAST TIME. I STOPPED AND CALLED THE SUPERVISOR ON THE RADIO AND THEY CAME AND SHOWED ME WHERE I SHOULD START DIGGING AGAIN, BUT AWAY FROM THE AREA WHERE I FOUND THE BONES.

Explain in your own words, how it happened.

IT HAPPENED WHILE I WAS BUSY LOADING THE ADT WITH THE MATERIAL.
I NORMALLY ASK AROUND THAT AREA SEE IF ANY WAS SURPRISED TO FIND THE HUMAN BONES.

In your opinion, why did the incident happen? What caused it?

I DON'T HAVE A CLUE ON ~~HOW~~ WHAT MAY HAVE CAUSED THE FOUNDATION OF THIS BONES.

Where did the incident occur? Give an address if possible.

Statement Form



PKH-SDF-00008
Revision: 0
Date: 31/01/2013

Who was involved with the incident? Names and surnames.

Additional information you would like to add with regards to the incident.

Note to investigation team member: Please add photos of the damages, injuries, spillages, etc. that could support the statements.

I, Lin Delani Ruzira hereby declare that the information above is my truthful reflection of the event.

Name: Lin Delani Surname: Ruzira

ID number: 8310107004082

Date: 13/01/2014 Time: 05h00

Signature: [Signature]

I, Terese translator of the above statement, hereby declare that the information above is a truthful and accurate translation of the words.

Name: Terese Surname: [Signature]

ID number: 83820526083

Date: _____ Time: _____

Signature: [Signature]

Statement Form



PKH-SDF-00008
Revision: 0
Date: 31/01/2013

This form should be used as a guidance template to take statements following any incident, including minor incidents and environmental incidents. Statements should be taken from the injured parties (if any), operators involved, external parties involved as well as witnesses and foremen for the area in which the incident happened.

The statement may be written by the individual themselves or it may be translated and written by a translator. Statements should be taken down as spoken and should be truthful and as accurate as possible.

Please complete all of the following sections:

Explain in your own words, what happened.

I was busy working the ATI and I saw the bones. I started and called the supervisor on the radio and they came and showed me where I should start digging around the area from the area where I found the bones

Explain in your own words, how it happened.

She managed to write I was busy working the ATI with the material. I normally dig around with a metal detector and I was surprised to find the human bones

In your opinion, why did the incident happen? What caused it?

I don't have a clue on where my bones are. I was surprised to find the human bones

Where did the incident occur? Give an address if possible.

Statement Form



PKH-SDF-00008
Revision: 0
Date: 31/01/2013

Who was involved with the incident? Names and surnames.

Additional information you would like to add with regards to the incident.

Note to investigation team member: Please add photos of the damages, injuries, spillages, etc. that could support the statements.

I, Ones Tsewete, hereby declare that the information above is my truthful reflection of the event.

Name: Ones Surname: Tsewete

ID number: 8603206277082

Date: 04/2/2013 Time: 16:00

Signature: [Handwritten Signature]

I, _____, translator of the above statement, hereby declare that the information above is a truthful and accurate translation of the words.

Name: _____ Surname: _____

ID number: _____

Date: _____ Time: _____

Signature: _____



BOIKARABELO COAL MINE		CONTRACTOR:	Protech Khuthele
ENVIRONMENTAL INCIDENT REPORT		INCIDENT DATE:	28/11/2013
Doc No:	ESOP002	Office Use	INCIDENT TIME: 10h30
Issue Date:	16/12/2013	Incident No.:	PERSON INVOLVED: Lindane Zwane
Revision:	1		LOCATION: Witkopje G7 borrow pit
			REPORTED BY: E de la Harpe
			SIGNATURE:

1: Major <input type="checkbox"/>	Breach of license conditions and or environmental law/regulations/Mine policy & procedure Reportable to government Has caused significant environmental harm Impacts extended outside of project area & could potentially impact on surrounding community/property	2: Moderate <input type="checkbox"/>	Potential to breach license conditions and or environmental law/regulations/Mine policy & procedure Government reporting voluntary Has caused moderate environmental harm Includes incidents which have interfered with the public domain outside the mine property	3: Minor <input checked="" type="checkbox"/>	No breach license conditions and or environmental law/regulations/Mine policy & procedure Has cause minor environmental harm Site specific incident
--	---	---	--	---	---

PART A: INCIDENT DETAILS	TYPE OF INCIDENT	
<input type="checkbox"/> Hydrocarbon spillage	<input type="checkbox"/> Chemical spillage	<input type="checkbox"/> Non permitted bush clearing
<input type="checkbox"/> Animal harmful/fatality	<input type="checkbox"/> Clean water wastage	<input type="checkbox"/> Effluent spillage
<input type="checkbox"/> Incorrect waste handling/disposal	<input checked="" type="checkbox"/> Other (describe)	Chance find of human skeletal remains
DESCRIPTION OF THE INCIDENT		
Skeletal remains were un earthed during the excavation of G7 material from an identified borrow pit area located on Witkopje. Once the bones were seen the operated stopped work and notified the supervisor. Work on the borrow pit ceased until cleared by the environmental officer		
Witnesses: _____ Statements Attached : <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Photos Attached: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
IMMEDIATE ACTION TAKEN		
Worked was stopped. 20m around the borrow pit was cornered off. The Environmental Officer called an archaeologist to site and notified the SAPS. The archaeologist notified SAHRA in order to obtain a rescue permit for the collection of the bones		

PART B: CORRECTIVE ACTION	Sign: _____	Date: _____
Responsible Champion: _____		
Identify the root cause(s) associated with the incident: The root cause was the excavation of borrow pit material, no corrective action can be completed.		
Required Corrective Action To be taken * NOTE * ALL INCIDENTS ARE TO BE CLOSED WITHIN 14 WORKING DAYS FROM ISSUE DATE. Further recommendations may also be provided within the incident report completed by the Environmental Department		
Action	Responsible Person	Target Date
Verify that the preventative action stated above has been completed	Sign: _____	Date: _____

PART C: PREVENTATIVE ACTION		
To prevent incident from ever happening again & to eliminate the problem, including (similar) occurrences elsewhere		
Identify other areas which could also be affected by the incident: Develop actions to be taken:	Remaining borrow pit area	
Action	Responsible Person	Target Date
Surface indicators in the borrow pit area need to be identified	Ledjadia Environmental Officer/Archaeologist	Mar-14
Verify that the preventative action stated above has been completed	Sign: _____	Date: _____

PART D: VERIFICATION	
Verify that all actions (corrective & preventative) taken have been effective to eliminate the problem	<input type="checkbox"/> Yes <input type="checkbox"/> No
An investigation report has been completed	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Signature:	
Date: 29/11/2013	
Incident Register: E1002	Date captured: 04/12/2013

Statement Form



PKH-SDF-00008
Revision: 0
Date: 31/01/2013

This form should be used as a guidance template to take statements following any incident, including minor incidents and environmental incidents. Statements should be taken from the injured parties (if any), operators involved, external parties involved as well as witnesses and foremen for the area in which the incident happened.

The statement may be written by the individual themselves or it may be translated and written by a translator. Statements should be taken down as spoken and should be truthful and as accurate as possible.

Please complete all of the following sections:

Explain in your own words, what happened.

I was busy loading as usual and when I was about to load the fourth ADT, just after I loaded one bucket, I saw a bones and felt they are human's. And I stopped immediately after I put aside the bones using the bucket, then decided to call the foreman.

Explain in your own words, how it happened.

It happened during the normal process because by then I was just loading and I believe it happened because loading opens the underground.

In your opinion, why did the incident happen? What caused it?

It happened because I was loading.

Where did the incident occur? Give an address if possible.

A7 THE BOPKOP PIT

Statement Form



PKH-SDF-00008
Revision: 0
Date: 31/01/2013

Who was involved with the incident? Names and surnames.

LINDANI ZWANE

Additional information you would like to add with regards to the incident.

Note to investigation team member: Please add photos of the damages, injuries, spillages, etc. that could support the statements.

I, Lindani Zwane hereby declare that the information above is my truthful reflection of the event.

Name: Lindani Surname: Zwane

ID number: 8310107004082

Date: 28/1/2013 Time: _____

Signature: [Signature]

I, Trevor Sparks translator of the above statement, hereby declare that the information above is a truthful and accurate translation of the words.

Name: Trevor Surname: Sparks

ID number: 830620576083

Date: 28/1/2013 Time: 10H05

Signature: [Signature]

Statement Form



PKH-SDF-00008
Revision: 0
Date: 31/01/2013

This form should be used as a guidance template to take statements following any incident, including minor incidents and environmental incidents. Statements should be taken from the injured parties (if any), operators involved, external parties involved as well as witnesses and foremen for the area in which the incident happened.

The statement may be written by the individual themselves or it may be translated and written by a translator. Statements should be taken down as spoken and should be truthful and as accurate as possible.

Please complete all of the following sections:

Explain in your own words, what happened.

I THABO MOKHUTSHELE 790805 6182 089 on the 28/11/2013 - 10:20 received a call from Admont Mogan ADI operator (A119) telling me about emergency at borrow pit, he told me that they to stop loading due to that emergency, I told him to come and fetch because the was no transport to take me there, in 15 minutes time he fetched me to borrow pit where we are loading G7. When we arrived there everyone was in his machine.

Explain in your own words, how it happened.

The machines were switched off. I asked Lindelani Zwane what happened; he told me that he was loading the ADI (A112) and he just saw the bones and skull of the human being; he told the ADI operators about it and they stop the operation then call me on the radio

In your opinion, why did the incident happen? What caused it?

No idea. I don't know.

Where did the incident occur? Give an address if possible.

Borrow pit, G7 Loading area.

Statement Form



PKH-SDF-00008
Revision: 0
Date: 31/01/2013

Who was involved with the incident? Names and surnames.

- * Lindelani Zwane
- * Admont Magam
- * Bheki Nombela and Hendrie Mkhayi

Additional information you would like to add with regards to the incident.

I can see my operators know what to do in case of incident. They know emergency procedure.

Note to investigation team member: Please add photos of the damages, injuries, spillages, etc. that could support the statements.

I, THABO MAKHUBELE hereby declare that the information above is my truthful reflection of the event.

Name: THABO ~~MAKHE~~ Surname: MAKHUBELE

ID number: 790805 6182 089

Date: 28/11/2013 Time: 10:20

Signature:

I, _____ translator of the above statement, hereby declare that the information above is a truthful and accurate translation of the words.

Name: _____ Surname: _____

ID number: _____

Date: _____ Time: _____

Signature: _____

Statement Form



PKH-SDF-00008
Revision: 0
Date: 31/01/2013

This form should be used as a guidance template to take statements following any incident, including minor incidents and environmental incidents. Statements should be taken from the injured parties (if any), operators involved, external parties involved as well as witnesses and foremen for the area in which the incident happened.

The statement may be written by the individual themselves or it may be translated and written by a translator. Statements should be taken down as spoken and should be truthful and as accurate as possible.

Please complete all of the following sections:

Explain in your own words, what happened.

Munyai Hendricks I reverse to the loading area towards excavator bucket and load the first bucket. Muntelani Zwane excavate again then he put material aside. He communicate with me to switch the equipment (ADT) and have a look. I saw human bones

Explain in your own words, how it happened.

We were using excavator of ADTS to load of transport GT material from borrow pit to tailracebels project

In your opinion, why did the incident happen? What caused it?

We did not notice any sign of any grave on top of the ground and we only know the place as a game farm

Where did the incident occur? Give an address if possible.

Borrow pit

Statement Form



PKH-SDF-00008
Revision: 0
Date: 31/01/2013

Who was involved with the incident? Names and surnames.

* Lindelani Zweni * Bhekizizwe Mzimela
* Hendric Mungai
* Adnani Magara

Additional information you would like to add with regards to the incident.

We must report anything to site manager / safety officer

Note to investigation team member: Please add photos of the damages, injuries, spillages, etc. that could support the statements.

I, _____ hereby declare that the information above is my truthful reflection of the event.

Name: Hendrick Surname: Mungai

ID number: 76102 5855 088

Date: 28/11/2013 Time: 10:10

Signature: [Signature]

I, Orqanus Zulu translator of the above statement, hereby declare that the information above is a truthful and accurate translation of the words.

Name: Orqanus Surname: Zulu

ID number: 7805 22 5679 085

Date: 28/11/2013 Time: 10H10

Signature: [Signature]



Appendix B: Rescue Permit

Boikarabelo_permit

Our Ref: 9/2/253/0003

Enquiries: Mariagrazia Galimberti
Tel: 021 462 4502
Email: mgalimberti@sahra.org.za
CaseID: 881

Date: Thursday December 12, 2013
Page No: 1

PermitID: 1149



PERMIT: Excavation

In terms of Section 35(4) of the National Heritage Resources Act (Act 25 of 1999)

Permit Holder: Mr Johan Nel
Digby Wells Environmental
Fern Isle
Section 10
359 Pretoria Avenue
Randburg
Site: Archaeological Burial at Site 002 Boikarabelo (Site 002 Boikarabelo)

This permit is for the rescue of archaeological human remains identified during mining activities at Boikarabelo.

Conditions:

1. If Mr Nel is not to be present on the site at all times SAHRA must be provided with the names and qualifications of the authorised representatives.
2. Adequate recording methods as specified in the Regulations and Guidelines pertaining to the National Heritage Resources Act must be employed. Note that the position of the excavation must be marked on a plan of site.
3. A full analysis and documentation of the remains themselves and of the context of the remains must be undertaken.
4. The archaeological human remains will be analysed at the University of Pretoria.
5. After analyses the remains will be reburied on the mine property on the farm Vlugtkraal 273LQ.
6. SAHRA must be consulted about the position of the reburial.
7. An report on the results of the excavation and analyses must be submitted to SAHRA before the end of December 2014.
8. Reprints of all published papers or copies of theses and/or reports resulting from this work must be lodged with SAHRA.
9. If a published report has not appeared within three years of the lapsing of this permit, the report required in terms of the permit will be made available to researchers on request.
10. It is the responsibility of Mr Nel to obtain permission from the landowner for each visit, and conditions of access imposed by the landowner must be observed.
11. It is the responsibility of Mr Nel to fill in excavations and protect sites during and after excavation to the satisfaction of SAHRA and the landowner.
12. SAHRA shall not be liable for any losses, damages or injuries to persons or properties as a result of any activities in connection with this permit.
13. SAHRA reserves the right to cancel this permit by notice to the permit holder.

This permit is valid from **12/12/2013 to 31/12/2014**.



Boikarabelo_permit

Our Ref: 9/2/253/0003

Enquiries: Mariagrazia Galimberti
Tel: 021 462 4502
Email: mgalimberti@sahra.org.za
CaselD: 881

Date: Thursday December 12, 2013
Page No: 2

PermitID: 1149



an Agency of the
Department of Arts and Culture

Mgalimberti

Mariagrazia Galimberti
Heritage Officer: Archaeology
South African Heritage Resources Agency

Colette Scheermeyer

Colette Scheermeyer
SAHRA Head Archaeologist
South African Heritage Resources Agency

Additional Info:

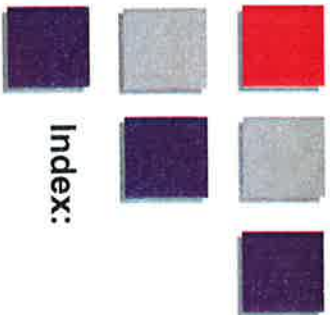
Please note that this permit may be suspended should an appeal against the decisions be received by SAHRA within 14 days from the date of the permit. SAHRA may not be held responsible for any costs or losses incurred in the event of the suspension or retraction of this permit.



The South African Heritage Resources Agency
Street Address: 111 Hartleyton Street, Cape Town, 8000 • Postal Address: PO Box 4537, Cape Town 8000
• Tel: +27 21 462 4502 • Fax: +27 21 462 4509 • Web: <http://www.sahra.org.za>

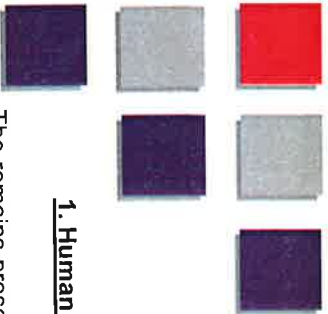


Appendix C: Physical Anthropological Analysis Report



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1. Human skeletal remains

The remains presented three individuals. The remains were fully skeletonized, and preservation was fair to poor. The remains required cleaning before any inventory could be taken and before the analysis could be conducted. Excess soil on the skeletons was removed using soft brushes, and areas of more visual importance such as bones indicating pathology or trauma, as well as the teeth, were cleaned with water and brushes. Overall the cleaning process was performed in such a way as to prevent any damage to the skeletal remains.

The analysis of the remains entailed a standard physical anthropological analysis and the “Standards for data collection from human skeletal remains” by Buikstra and Ubelaker (1994) was used as a basis for this analytical procedure. Standardised osteometric measurements and calculations, together with morphological characteristics were used, where possible, to determine the demographic profile of each individual.

2. Analytical methods

The remains were cleaned and analysed using standard physical anthropological techniques (Buikstra and Ubelaker, 1994). Age at death was estimated by the degree of epiphyseal closure (Krogman and İşcan, 1986; Scheuer and Black, 2004; Schaefer *et al.*, 2009) and tooth development (Loth and İşcan, 2000a; Scheuer and Black, 2004) for possible adolescent individuals. For adult individuals, age was estimated using the following methods: changes in the sternal ends of ribs (Loth and İşcan, 2000a), changes in the face of the pubic symphysis of the pelvis (Brooks and Suchey, 1990), status of cranial suture closure (Acşadı and Nemeskéri, 1970; Krogman and İşcan 1986), and changes in the auricular surface of the ilium (Lovejoy *et al.*, 1985). Any observable degenerative changes and dental wear (Brothwell, 1981; Hillson, 1998) were noted for each individual where present (Loth and İşcan, 2000a; Orther, 2003) which would suggest an older age. The fragmentary and incomplete nature of some of the skeletal elements however hampered the use of some of these techniques.

Both metric and non-metric techniques were used to determine sex. Non-metric characteristics of the pelvis and the skull were used where discerning features were preserved (Krogman and İşcan, 1986; Loth and İşcan, 2000). Metric assessment of sex was done by canonical discriminant function analyses of the skull and pelvis as well as by comparing single long bone measurements to known standards (Loth and İşcan, 2000, Patricuin *et al.*, 2003a). For the determination of ancestry both non-metric and metric techniques were used where possible. This included the non-metric characteristics observable from the





skull and mandible (İşcan et. al., 2000; Krogman and İşcan, 1986) and metric analysis of the cranial dimension indices and canonical discriminant function coefficients for the skull and mandible (İşcan and Steyn, 1999; Patriquin *et al.*, 2003b). The archaeological context of the remains, however, already suggests an African ancestry for these individuals.

Stature was determined by regression formulae for single long bone measurements where possible (Lundy and Feldesman, 1987).

Several sources were referred to for the pathology observed on the skeleton and teeth (Aufderheide and Rodriguez-Martin, 1998; Hillson, 1998; Orther, 2003).

3. Results

Skeleton 001:

1.1. Preservation and inventory

The remains were in a fair state of preservation except for the lower right leg which was completely fragmented. The remains were covered in grey ashy soil, often associated with archaeological burials in ash middens. Almost all of the cranial bones were present except for the right zygomatic bone, orbital bridge and a portion of the maxilla. The mandible was complete except for the left and right condyles which were slightly damaged. Most of the postcranial remains were present however some skeletal elements were fragmented and damaged due to postmortem alterations. Those postcranial elements not present included the left patella, the left ischium and acetabulum, three cervical vertebrae (C2, C5 and C6), three thoracic vertebrae (T2, T11 and T12), the sternum, several ribs (severely fragmented with only three left and two right ribs identified), the distal third/epiphysis of the left radius and ulna, the complete right ulna, the shaft of the right tibia (which was completely fragmented), the proximal and distal epiphyses of the left and right fibula, the right talus, seven left carpals and all eight right carpals, three left metacarpals and all five right metacarpals, twelve phalanges, two left tarsals and six right tarsals, one left metatarsal and all five right metatarsals, and finally all of the phalanges of the foot.





1.2. Age at death



The medial ends of the clavicle, spheno-occipital synchondrosis, and S1 and S2 of the sacrum were completely fused suggesting an age older than 30 years. Changes to the pubic symphyses and the right auricular surface suggested an age range of between 45 and 60 years. The sternal ends of the ribs presented as phase 6 which indicated an age range of between 47 and 55 years. Some degenerative changes could be observed in the vertebrae and pelvis also suggesting an older adult age for this individual. A final age estimate of 45 to 55 was given for this individual.

1.3. Sex

The morphological features observable on the skull and pelvis were consistent with that of a male. The skull presented with a prominent nuchal crest, large mastoid processes, a sloped forehead, a well-developed glabella with a well-defined supraorbital ridge. The pelvis presented with a narrow greater sciatic notch and the absence of a pre-auricular sulcus, a ventral arch, subpubic concavity and an ischiopubic ramus ridge.

Metric assessment of sex was done by using single long bone measurements and comparing these to know standards for males and females. The humeral head diameter, humeral epicondylar breadth, femoral head diameter, femoral midshafts circumference, tibial proximal epiphyseal breadth and the tibial circumference at the nutrient foramen all fell well within the limits indicated for males. (Refer to Table 2 for all postcranial measurements)

This individual was therefore classified as male based on the morphological and metric characteristics.

1.4. Ancestry

The morphological features observable on the skull were consistent with that associated with an African ancestry. The skull was long and low with wide nasal openings and guttered nasal sills and a prognathic facial profile (Figs. 1&2).

Metric analysis revealed the same result with the cranial index (69.94), nasal index (56.88), and gnathic index (104.76) falling within the limits of South African Negroid populations. Canonical discriminant function analysis (Function 1 = -0.389962119) also suggested an African ancestry for this individual (Refer to Table 1 for cranial measurements).





Figure 1: Frontal view of skull (Skeleton 001)



Figure 2: Profile view of skull (Skeleton 001)

1.5. Stature

Stature was calculated using the physiological length of the tibia. A stature of 167.16 ± 2.78 cm was obtained. According to Steyn and Smith (2007) this is an average stature for this population group.

1.6. Dentition

Teeth that were present included the upper left canine, first and second premolars, the first, second and third molars, the lower right first molar, first premolar, the canine, and the lower left central incisor, canine, first premolar and third molar.

The upper right first and second molars, first and second premolars, canine, lateral and central incisors, the left central incisor, the lower right second and third molars, the second premolar and the lower left second premolar and first and second molars were lost antemortem. All other teeth were lost postmortem.





Dental pathology included antemortem tooth loss (Fig. 3) as already mentioned above. In the region of the upper right first premolar and the lower right second premolar as well as the second and third molars the antemortem tooth loss may be attributed to abscess formation visible in the alveolar bone. Another abscess was observed in the region of the upper left first and second molars on the buccal side and within the alveolar bone. These teeth were however not yet shed. Severe occlusal weathering (Fig. 3) was observed on the upper left canine, premolars and molars, as well as the lower right first molar, first premolar and canine, and the lower left third molar. These areas presented with severe dentine exposure. Dental calculus deposits were observed on most of the teeth. Alveolar regression in the areas still containing teeth indicated the possible presence of periodontal disease. (Refer to Table 3 for dental measurements)



Figure 3: Antemortem tooth loss and occlusal wear on the mandible (Skeleton 001)

1.7. Trauma and pathology

No trauma could be observed. Degenerative pathology could be observed in the form of osteoarthritis in the clavicle, pelvis and cervical vertebrae. The lumbar vertebrae presented with osteophytes (Fig. 4). Slight periostitis could be observed on the distal third of the left and right fibula as well as on the medial aspect of the left tibia shaft.





**Figure 4: Osteophytes on L5
(Skeleton 001)**

1.8. Summary

The remains were that of an adult male individual between the ages of 45 and 55 at the time of his death. He was of African ancestry with an estimated stature of 167.16 ± 2.78 cm. Antemortem tooth loss, dental abscesses, dental calculus and periodontal disease were observed along with degenerative pathology to the upper joints and vertebrae. Periostritis was also observable on the lower extremities.

Skeleton 002:

2.1. Preservation and inventory

In general the remains were in a fair state of preservation except for the skull which was completely fragmented. The remains were covered in grey ashy soil, often associated with archaeological burials in ash middens. Even though the skull was fragmented most of the cranial bones were present. Portions of the frontal and parietal bones, the sphenoid and zygomatic bones were missing. The palatine was absent due to postmortem weathering. Almost all of the postcranial remains were present except for the right patella, portions of the sacrum, the right pubic bone, one thoracic vertebrae (T8), one right rib, the proximal epiphysis and proximal third of the right humerus shaft, the distal third and epiphysis of the right radius, the complete left ulna, six left carpals, seven right carpals, three left and right metacarpals, nine phalanges of the hand, two left tarsals, five right tarsals, two left and right metatarsals and ten phalanges of the foot.





2.2. Age at death



The upper and lower third molars were in almost full occlusion and showed no signs of wear suggesting a young adult age. The medial ends of the clavicles were fused but still presented with a fusion line suggesting an age younger than 29 years. S1 and S2 of the sacrum were completely unfused suggesting an age younger than 25 years. The iliac crest still presented with a fusion line suggesting an age range of between 20 and 23 years. The humeral head also presented with a very faint fusion line suggesting that fusion had recently occurred. The fusion time for the proximal humerus is 16-21 years which indicates that this individual was around the age of 21 when he died. A final age estimate of 20-23 years at the time of death was therefore given here.

2.3. Sex

The morphological features observable on the skull and pelvis were consistent with that of males. The skull presented with a prominent nuchal crest and a well-defined mental eminence. The mandible was square shaped and presented with some gonial flaring. The pelvis presented with narrow greater sciatic notches and the absence of ventral arches and pre-auricular sulci.

Metric assessment was done by using single long bone dimensions and comparing those with known standards for males and females. The humeral head diameter, femoral epicondylar breadth, femoral head diameter and tibial distal breadth (refer to Table 2) were consistent with measurements obtained for male individuals. The humeral epicondylar breadth and tibial proximal breadth measurements however showed some overlap with female standards. This may however be due to this individual's young age.

Based on morphological and metric assessment this individual was classified as male.

2.4. Ancestry

The morphological features observable on the skull were consistent with someone of African ancestry. The orbits were square shaped and the nasal opening was wide with guttered nasal slits. Due to the fragmented nature of the skull and pelvis no metric analysis could be done to confirm the morphological findings. The archaeological nature of the remains however already suggests an African ancestry for these individuals.





2.5. Stature

Stature was determined by using the physiological length of the femur and tibia combined. A stature of 162.93 ± 2.371 cm was obtained for this individual. This stature is regarded as being short for this population group (Steyn and Smith, 2007).

2.6. Dentition

Almost all the teeth were present except for the upper left central incisor which was lost postmortem. Slight occlusal weathering was observed on the upper and lowers left and right first molars. Dental pathology that could be observed included dental calculus deposits on almost all the teeth except the third molars. These deposits presented as thin bands on the buccal surfaces of the teeth. Some alveolar regression (Fig. 5) was observed possibly suggestive of periodontal disease. Dental modification was also observed on the upper central and lateral incisors (Fig. 6). The medial and lateral surfaces of each tooth were filed down to create a sharpened appearance (Fig. 7).



Figure 5: Alveolar regression (Skeleton 002)



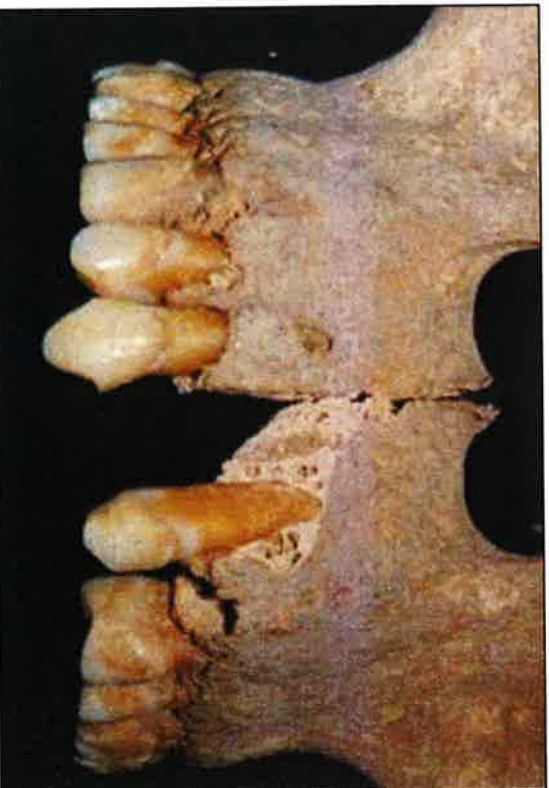


Figure 6: Dental modification of the upper central and lateral incisors (Skeleton 002).



Figure 7: Medial and lateral edges of central and lateral incisors filed down (Skeleton 002)





2.7. Trauma and pathology



No trauma could be observed. Pathology that could be observed included slight cribra orbitalia in both the left and right orbital roofs (Fig. 8). Slight periostitis was also observed on the medial surfaces of the tibia.



Figure 8: Possible cribra orbitalia in left orbital roof (Skeleton 002)

2.8. Summary




The remains were that of a young adult male between 20 and 23 at the time of his death. He was of African ancestry with an estimated stature of 162.93 ± 2.371 cm. Dental pathology included dental calculus and possible periodontal disease. The individual also presented with dental modifications to his upper central and lateral incisors. Skeletal pathology that could be observed included slight cribra orbitalia and periostitis on the medial surfaces of the tibiae.

Skeleton 003:

3.1. Preservation and inventory

The remains were in a poor state of preservation and were mostly fragmented and incomplete. The only cranial remains present were the occipital bone and portions of the zygomatic bones. Post cranially the following skeletal elements were present: the left clavicle, portions of the left and right scapula, the sacrum, a portion of the left ischium, the complete right os coxa, three thoracic vertebrae, two lumbar





vertebrae, five left ribs, two right ribs and eleven fragments, the left and right humerus, the right radius, the proximal and middle third of the right femur, the distal and middle third of the left tibia and the proximal epiphysis of the right tibia, the distal thirds of the left and right fibula, two right metacarpals (first and third), one phalange from the hand (middle), one left calcaneus, and one distal phalange from the foot.

3.2. Age at death

The medial end of the clavicle was not yet completely fused, suggesting an age younger than 30. S1 and S2 of the sacrum was also not fused suggesting an age younger than 25. A slight fusion line was still visible on the distal radius suggesting that fusion was recently completed and suggesting an age older than 19. A final age estimate of 20 – 25 years at the time of death was given here.

3.3. Sex

The morphological features observable on the pelvis were consistent with those associated with females. The pubic bone presented with subpubic concavity and an ischiopubic ramus ridge. The greater sciatic notch was wide along with the subpubic angle. The pelvic inlet also seemed to be oval shaped. A preauricular sulcus was also present with multiple scars suggestive of child bearing (Fig. 9).



Figure 9: Pre-auricular sulcus with multiple scars





3.4. Ancestry

Due to the poor preservation of the skull no discernable features indicative of ancestry could be observed. Canonical discriminant function analysis of pelvic dimensions (Function 4) revealed a Black ancestry for this individual. Based on the metric analysis and the archaeological nature of the remains this individual was classified as African.

3.5. Stature

The stature was determined by using the length of the radius. A stature of 167.47 ± 3.387 cm was obtained which is quite a tall stature for someone of this population group.

3.6. Dentition

No teeth were recovered.

3.7. Trauma and pathology

No trauma or pathology could be observed.

3.8. Summary

The remains presented that of a young adult female between the ages of 20 and 25 at the time of her death. She was of African ancestry with a stature of 167.47 ± 3.387 cm. No trauma or pathology could be observed.



4. Conclusion

The remains presented that of three individuals. Skeleton 001 was that of an adult male between 45 and 55 at the time of his death. He presented with antemortem tooth loss, dental abscesses, dental calculus and periodontal disease. Degenerative pathology was also noted to the upper joints and vertebrae consistent with someone of older age. Skeleton 002 presented the remains of another adult male between the ages of 20 and 23 at the time of his death. This individual presented with tooth modifications to his upper central and lateral incisors. Pathology that could be observed included possible periodontal disease, cribra orbitalia and slight periostitis which are often associated with a vitamin C deficiency (Other, 2003). In this case the pathology does not seem to be active, suggesting a possible vitamin deficiency during childhood. The remains of skeleton 003 were that of an adult female between the ages of 20 and 25 at her time of death. She did not present with any pathology. The presence of a pre-auricular sulcus indicates child birth. Multiple scarring may suggest that she had more than one child.



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Table 1: Cranial measurements

All measurements in mm.

- skeletal element was absent or damaged and therefore measurements could not be obtained

* indicates right side

<u>Skeletal dimension</u>	<u>Skeleton 001</u>	<u>Skeleton 002</u>	<u>Skeleton 003</u>
Max. cranial length	193	-	-
Max. cranial breadth	135	-	-
Bizygomatic diam.	-	-	-
Basion-bregma height	145	-	-
Cranial base length	105	-	-
Basion-prosthion length	110	-	-
Maxillo-alveolar breadth	-	-	-
Maxillo-alveolar length	-	-	-
Biauricular breadth	135	-	-
Upper facial height	67.48	-	-
Min. frontal breadth	99.57	-	-
Upper facial breadth	111	-	-
Nasal height	50.98	-	-
Nasal breadth	29	-	-
Orbital breadth	42.59	-	-
Orbital height	36.38	-	-
Biorbital breadth	-	-	-
Interorbital breadth	24.23	-	-





Frontal chord	120	-	-
Parietal chord	117	-	-
Occipital chord	104	-	-
Foramen magnum length	40	-	-
Foramen magnum breadth	33.48	-	-
Mastoid length	38.75	22.39	-
Chin height	37.93	42	-
Height of mandibular body	-	39.57	-
Breadth of mandibular body	13	14.15	-
Bigonial width	95	102.33	-
Bicondylar breadth	-	119.49	-
Min. ramus breadth	42	38.89*	-
Max. ramus breadth	-	45.37*	-
Max. ramus height	-	54.51*	-
Mandibular length	-	117	-
Biauricular breadth	115	-	-



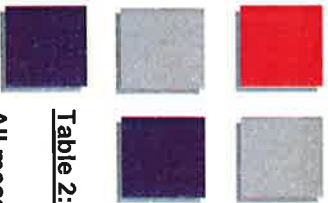


Table 2: Post-cranial measurements

All measurements in mm.

- skeletal element was absent or damaged and therefore measurements could not be obtained

* indicates right side

<u>Skeletal dimension</u>	<u>Skeleton 001</u>	<u>Skeleton 002</u>	<u>Skeleton 003</u>
Clavicle max. length	-	-	152
Clavicle ant.-post. diameter midshaft	9.76	8.51	7.13
Clavicle sup.-inf. diameter midshaft	12.49	10.51	11.03
Scapula height	180	-	-
Scapula breadth	-	-	-
Humerus max. length	320	322*	326*
Humerus epicondylar breadth	62	55.74*	52*
Humerus vertical diameter head	45	43.15*	38.20*
Humerus max. diameter midshaft	22	20.61*	21.47*
Humerus min. diameter midshaft	17	15.69*	14.21*
Radius max. length	-	255	264*
Radius ant.-post. diameter midshaft	-	10.48	12.06*
Radius med.-lat. diameter midshaft	-	14.19	13.52*
Ulna max. length	-	272*	-
Ulna ant.-post diameter	-	13.76*	15.96
Ulna med.-lat. diameter	-	14.92*	10.37



Ulna physiological length	-	245*	-
Ulna min. circumference	-	37*	-
Sacrum anterior length	-	-	120
Sacrum ant.-sup. breadth	-	-	-
Sacrum max. transverse diameter base	50.72	-	50.31
Os coxae height	-	-	201
Os coxae iliac breadth	-	-	151
Os coxae pubis length	-	-	75.59
Os coxae ischium length	-	-	84.86
Femur max. length	-	461*	-
Femur bicondylar length	-	457*	-
Femur epicondylar breadth	-	77*	-
Femur max. diameter femur head	46	43.52*	41.90*
Femur ant.-post. subtrochanteric diameter	27.16	24.63*	21.91*
Femur med.-lat. subtrochanteric diameter	32.55	29.92*	30.22*
Femur ant.-post. midshaft diameter	31.07	25.23*	25.04*
Femur med.-lat. Midshaft diameter	26.51	22.07*	25.76*
Femur midshaft circumference	90	81*	80*
Tibia length	410	383	-
Tibia physiological length	395	369	-

	80	70	-
Tibia max. prox. epiphyseal breadth			
Tibia max. distal epiphyseal breadth	50	50	-
Tibia max. diameter nutrient foramen	36	32.13	-
Tibia med.-lat. diameter nutrient foramen	26	22.76	-
Tibia circumference nutrient foramen	98	88	-
Fibula max. length	-	370*	-
Fibula max. diameter midshaft	13.59	19.19*	-
Calcaneus max. length	90	76	81
Calcaneus middle breadth	-	45	-



Table 3: Dental measurements

All measurements were taken in mm.

- dentition was absent or damaged and therefore measurements could not be obtained

* indicates right side. MD=mesiodistal, BL = buccolingual

<u>Maxilla</u>	<u>Skeleton</u>	<u>Skeleton</u>	<u>Skeleton</u>	<u>Mandible</u>	<u>Skeleton</u>	<u>Skeleton</u>	<u>Skeleton</u>
	<u>001</u>	<u>002</u>	<u>003</u>		<u>001</u>	<u>002</u>	<u>003</u>
MD11	-	-	-	MD I1	-	5.24	-
BL I1	-	7.50*	-	BL I1	-	6.08	-
MD I2	-	-	-	MD I2	-	5.69	-
BL I2	-	6.86	-	BL I2	-	6.23	-
MD C	-	8.03	-	MD C	6.73	7.04	-
BL C	-	8.37	-	BL C	8.24	8.62	-
MD PM1	-	6.87	-	MD PM1	7.91	7.11	-
BL PM1	-	9.62	-	BL PM1	8.47	8.52	-
MD PM2	7.19	6.65	-	MD PM2	-	7.20	-
BL PM2	9.25	8.87	-	BL PM2	-	8.12	-
MD M1	-	10.85	-	MD M1	10.86*	11.75	-
BL M1	11.30	11.91	-	BL M1	11.64*	11.52	-
MD M2	-	10.26	-	MD M2	-	10.52	-
BL M2	12.05	11.15	-	BL M2	-	10.71	-
MD M3	9.79	9.16	-	MD M3	-	11.62	-
BL M3	11.65	11.59	-	BL M3	10.68	10.68	-

