



PROPOSED DEVELOPMENT OF THE G14 PIPELINE BY RAND WATER

Heritage Impact Assessment for the proposed development of the G14 Pipeline between Forest Hill and Turffontein Nek, Southern Johannesburg, Johannesburg Metropolitan Municipality, Gauteng Province.

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DECLARATION OF INDEPENDENCE

The report has been compiled by PGS Heritage, an appointed Heritage Specialist for Enkanyini Projects. The views stipulated in this report are purely objective and no other interests are displayed in the findings and recommendations of this Heritage Impact Assessment.

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Report Title	<i>Heritage Impact Assessment for the Proposed Development of the G14 Pipeline by the Rand Water Board between Forest Hill and Turffontein Nek, Southern Johannesburg, Johannesburg Metropolitan Municipality, Gauteng Province.</i>		
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EXPLANATION OF ABBREVIATIONS USED IN THIS DOCUMENT

<i>Abbreviations</i>	<i>Description</i>
AIA	Archaeological Impact Assessment
ASAPA	Association of Southern African Professional Archaeologists
CMP	Conservation Management Plan
CRM	Cultural Resource Management
EIA	Environmental Impact Assessment
EMPR	Environmental Management Programme Report
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HSA	Heritage Scoping Assessment
LIA	Late Iron Age
LSA	Later Stone Age
MSA	Middle Stone Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PGS	PGS Heritage
PHRA	Provincial Heritage Resources Authority
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System

EXECUTIVE SUMMARY

PGS Heritage was appointed by Enkanyini Projects to undertake a Heritage Impact Assessment (HIA) for the proposed development of the G14 Pipeline by the Rand Water Board between Forest Hill and Turffontein Nek, Southern Johannesburg, Johannesburg Metropolitan Municipality, Gauteng Province.

This Heritage Impact Assessment follows on a Heritage Scoping Assessment conducted by PGS Heritage for Enkanyini Projects.

The study commenced with an archival and historical desktop study that was used to compile a historic layering of the study area within its regional context. A historic overview of the study area and surrounding landscape was compiled which indicates that the study area is located within an area with a rich and diverse heritage. The historic overview has also provided some information on the urban historical context of the direct surroundings of the study area as well as a brief history of the utilisation of this general area by the Rand Water Board for infrastructural development including the Forest Hill Reservoirs. The desktop study also included an assessment of four historical maps which clearly show the development of the area through time as well as previous assessments that have been conducted in the area in the past. The past research in the surrounding area provides further evidence for the rich archaeological and historical heritage of the surrounding landscape including Late Iron Age stonewalled sites, historic farmsteads and buildings as well as cemeteries.

A detailed walkthrough of the study area was conducted during the Scoping Phase, during which the following heritage sites and heritage concerns were highlighted:

- Historic midden material was identified on the surface of an area where the proposed pipeline will be built. The material identified here includes glass and imported ceramic fragments. Some of the glass fragments could be identified as sections of a mineral water bottle (codd type) belonging to the mineral water manufacturer known as *A. Kan and Company* which operated between 1904 and 1910 (Lastovica & Lastovica, 1990).
- The proposed G14 pipeline entails the replacement of an existing pipeline that was installed in 1936. It is evident therefore that the original pipeline is older than 60 years as well. However, as the pipeline in itself is of no heritage significance, no further discussion on impact risk and mitigation were undertaken on this matter.

An impact risk calculation was undertaken on the expected impact of the proposed G14 pipeline development on the identified historic midden site, which indicated that the proposed development of the pipeline poses a Moderate Impact Risk to FHL001. The following mitigation measures are therefore required:

- A permit application must be lodged with the South African Heritage Resource Agency to allow for the disturbance to an archaeological site.
- Archaeological monitoring during construction activities in the general proximity to the site.

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage sites located during the fieldwork do not necessarily represent all the heritage sites present within the area. This may be due to vegetation or the fact that archaeological sites can be found in subterranean contexts with no evidence for the presence of such archaeological sites on the surface. Should any such heritage features or objects not included in the inventory be located or observed, a heritage specialist must immediately be contacted. Such observed or located heritage features and/or objects may not be disturbed or removed in any way, until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well.

Furthermore, the South African Palaeontological Sensitivity Map of SAHRA indicates that the proposed pipeline development is located in an area classified as Blue (Low Significance) and as a result *“no palaeontological studies are required however a protocol for finds is required”* (www.sahra.org.za). The following will have to be compiled during the mitigation phase of the project and before construction commences:

- A paleontological protocol must be written by a professional palaeontologist and included in the EMP.

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1. INTRODUCTION

PGS Heritage was appointed by Enkanyini Projects to undertake a Heritage Impact Assessment (HIA) for the proposed development of the G14 Pipeline by the Rand Water Board between Forest Hill and Turffontein Nek, Southern Johannesburg, Johannesburg Metropolitan Municipality, Gauteng Province.

1.1 Scope of the Study

The aim of the study is to identify possible heritage sites and finds that may occur in the proposed development area. The Heritage Impact Assessment (HIA) aims to inform the Environmental Impact Assessment (EIA) in the development of a comprehensive Environmental Management Plan (EMP) to assist the developer in managing the identified heritage resources in a responsible manner in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

1.2 Specialist Qualifications

This Heritage Impact Assessment Report was compiled by PGS Heritage, the staff of which has a combined experience of nearly 40 years in the heritage consulting industry and have extensive experience in managing Heritage Scoping Assessment (HSA) and Heritage Impact Assessment (HIA) processes. Mr. Polke Birkholtz, project manager and heritage specialist, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a professional archaeologist and is a member of the Cultural Resource Management (CRM) Section of ASAPA. He has more than 16 years experience in the industry.

1.3 Assumptions and Limitations

The following assumptions and limitations exist:

- Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage sites located during the fieldwork do not necessarily represent all the heritage sites present within the area. This may be due to vegetation or the fact that archaeological sites can be found in subterranean contexts with no evidence for the presence of such archaeological sites on the surface.

- Should any such heritage features or objects not included in the inventory be located or observed, a heritage specialist must immediately be contacted. Such observed or located heritage features and/or objects may not be disturbed or removed in any way, until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well.

1.4 Legislative Context

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation:

- i. National Environmental Management Act (NEMA) Act 107 of 1998
- ii. National Heritage Resources Act (NHRA) Act 25 of 1999
- iii. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
- iv. Development Facilitation Act (DFA) Act 67 of 1995

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources:

- i. National Environmental Management Act (NEMA) Act 107 of 1998
 - a. Basic Environmental Assessment (BEA) – Section (23)(2)(d)
 - b. Environmental Scoping Report (ESR) – Section (29)(1)(d)
 - c. Environmental Impacts Assessment (EIA) – Section (32)(2)(d)
 - d. EMP (EMP) – Section (34)(b)
- ii. National Heritage Resources Act (NHRA) Act 25 of 1999
 - a. Protection of Heritage Resources – Sections 34 to 36; and
 - b. Heritage Resources Management – Section 38
- iii. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
 - a. Section 39(3)

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA states that “no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority...”. The NEMA (No 107 of 1998) states that an integrated EMP should (23:2 (b)) “...identify, predict and evaluate the actual and potential impact on the environment,

socio-economic conditions and cultural heritage”. In accordance with legislative requirements and EIA rating criteria, the regulations of SAHRA and ASAPA have also been incorporated to ensure that a comprehensive and legally compatible HIA report is compiled.

1.5 Terminology and Abbreviations

Archaeological resources

- i. material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- ii. rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including a 10m buffer area;
- iii. wrecks, being any vessel or aircraft, or any part thereof which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;
- iv. features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value.

Development

This means any physical intervention, excavation or action other than those caused by natural forces, which may according to the heritage agency result in a change to the nature, appearance or physical nature of a place or influence its stability & future well-being, including:

- i. construction, alteration, demolition, removal or change in use of a place or a structure at a place;
- ii. carrying out any works on or over or under a place;
- iii. subdivision or consolidation of land comprising a place, including the structures or airspace of a place;

- iv. constructing or putting up for display signs or boards;
- v. any change to the natural or existing condition or topography of land; and
- vi. any removal or destruction of trees, or removal of vegetation or topsoil

Fossil

Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Heritage resources

This means any place or object of cultural significance

Later Stone Age

The archaeology of the last 20 000 years, associated with fully modern people.

Late Iron Age (Early Farming Communities)

The archaeology of the last 1000 years up to the 1800's associated with ironworking and farming activities such as herding and agriculture.

Palaeontology

Any fossilised remains or fossil trace of animals or plants which lived in the geological past and any site which contains such fossilised remains or trace.

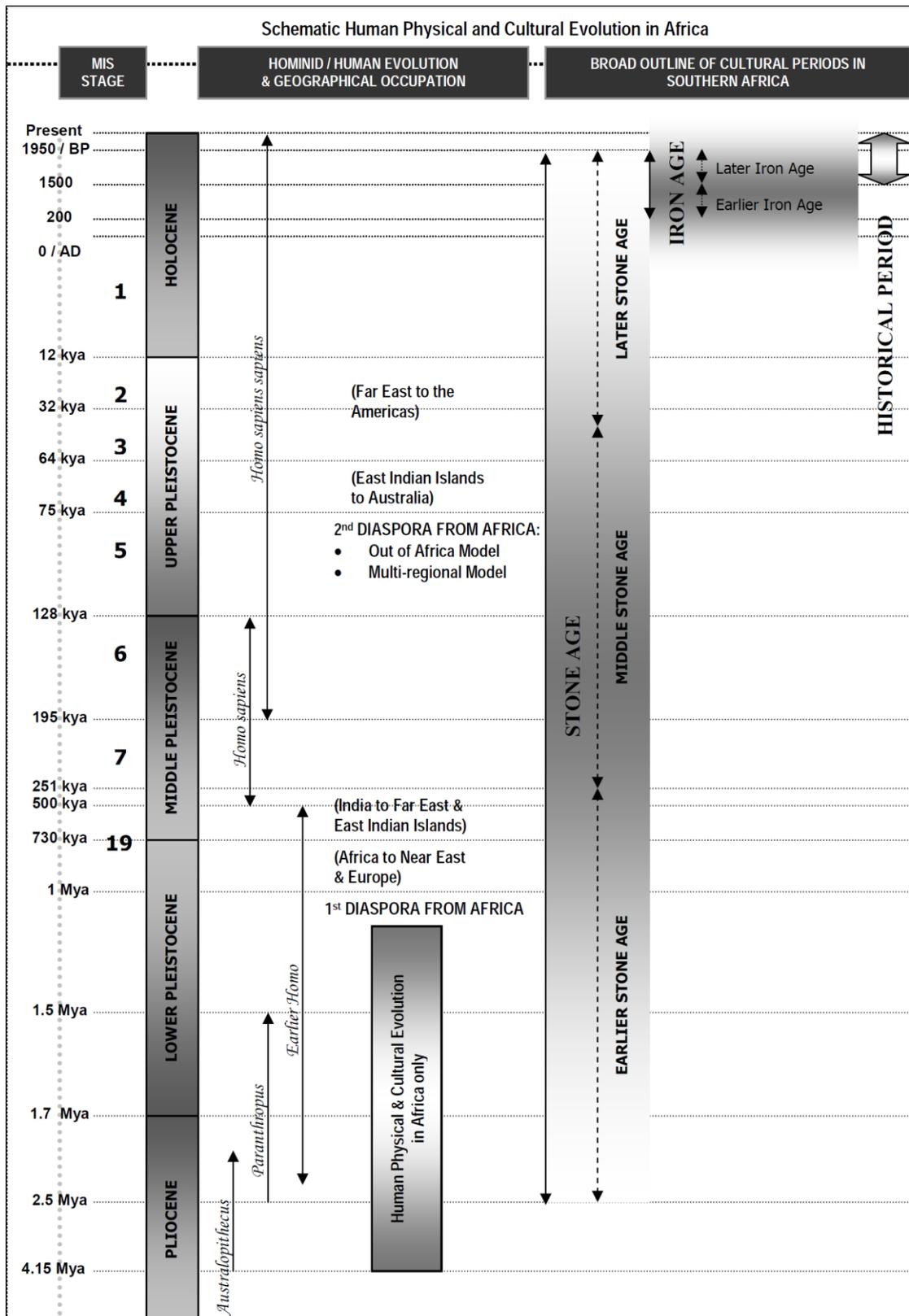


Figure 1 - Human and Cultural Time line in Africa (Morris, 2008)

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Site Location and Description

Coordinates	Starting Point: S 26° 15' 36.7" E 28° 02' 25.5"	Ending Point: S 26° 15' 44.7" E 28° 01' 54.4"
Property	Portions of the farm Turffontein 100 IR.	
Location	The study area is located in Rosettenville Outlying, south of Johannesburg, Johannesburg Metropolitan Municipality, Gauteng Province. It is situated adjacent to Rifle Range Road (M38) and is located 687m north of the N12 and 2.1km south of the Turffontein Racecourse.	
Extent	The length of the proposed pipeline is roughly 1,100 m.	
Land Description	The pipeline is proposed within an area known as Rosettenville Outlying, and is to be constructed through the residential areas known as Haddon and Forest Hill. As a result the study area can be described as primarily developed with small sections of undeveloped land.	

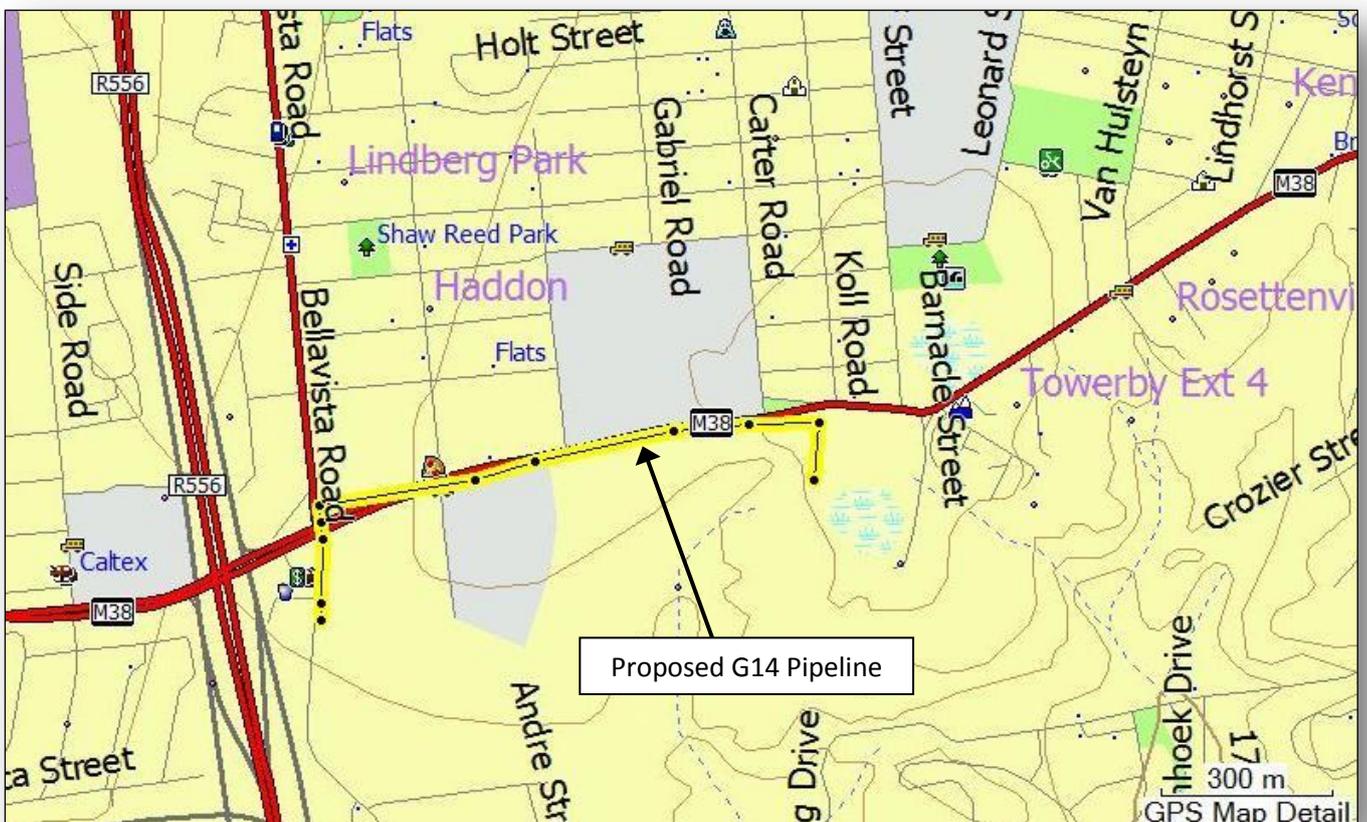


Figure 2–The study area within its regional context.

2.2 Technical Project Description

The proposed development entails the replacement of the existing G14 pipeline between Forest Hill and Turffonteinnek with a new pipeline. The length of the proposed pipeline will be roughly 1,100 m and starts from a point on the western boundary of the Forest Hill Reservoir Site of the Rand Water Board in the east to a point on the eastern end of Amanda Avenue in the west.

The following description of the proposed development was obtained from the Rand Water Planning Brief 2013/05 Rev0:

The proposed development comprises the replacement of "... approximately 1100 metres of the G14 ø735mm Forest Hill – Turffonteinnek pipeline that was installed in 1939. The proposed new ø1200mm G14 pipeline will connect to the ø1200mm C5 pipeline on the south-eastern corner of the Forest Hill reservoir site and run around the southernmost reservoir to connect to the ø900mm reservoir outlet pipe down-stream of the two reservoir outlet valves. The existing ø900mm outlet pipeline will be retained up to Rifle Range Road (length about 180 metres). The proposed ø1200mm G14 pipeline will then continue in a westerly direction along the southern side of Rifle Range Road and its M38 deviation to the intersection with Amanda Street and connect to the ø1220mm C11 Butcher's Hill – Turffonteinnek pipeline on the eastern side of Amanda Street. The existing G14 pipeline is a riveted lead caulked jointed pipeline that runs from the north-eastern side of the Forest Hill reservoir site along the southern side of Rifle Range Road and connects to the ø1200mm G16 Turffonteinnek – Stafford pipeline on the northern side of the M38 deviation of Rifle Range Road. The M38 deviation of Rifle Range Road runs over the existing ø735mm G14 pipeline so that the existing pipeline is for about 250 metres beneath the M38 deviation of Rifle Range Road. There are no water supply points off the G14 pipeline. The Glenanda meter is off the C11 pipeline."

In terms of the need for the proposed development, the Planning Brief Document continues as follows:

The G14 forms an important link in the Zwartkopjes – Forest Hill system by connecting the ø1200mm C5 and ø1220mm C11 over the relatively short length of 1130 metres as it assists to hydraulically stabilize flows from the Zwartkopjes pumping station along the C11 pipeline to Stafford. The Forest Hill reservoir provide storage capacity to equalize any hourly peaks that can arise from the Johannesburg Water system and thus provide a more stable pumping environment for the Zwartkopjes pumps. This G14 link also allows water flow Turffonteinnek ↔ Forest Hill which assists both Forest Hill and Stafford in the event of either the C11 or the C5 pipeline from Butcher's Hill is out of commission. The G14 link is also

essential to enable the renovation of the C11 Butcher's Hill – Turffonteinnek that is still outstanding.

The proposed pipeline replaces the existing pipeline between the Forest Hill and Turffontein Nek. As indicated in the historic overview, the oldest components of the Forest Hill Facility may date to the early 1920s. While the Planning Brief Document of Rand Water refers to a section of the pipeline located within the Forest Hill Facility, this was not provided by Enkanyini Projects as part of the footprint to be assessed during the field survey. The footprint area provided by Enkanyini Projects is represented by the red line in Figure 3 whereas the actual foot survey conducted by PGS Heritage is depicted in the track log in Figure 14. As a result it is not certain at present which footprint area is correct. This said, as the proposed pipeline is a replacement of an existing pipeline, no impacts on any older than 60 year structures and reservoirs are expected.



Figure 3—Google Earth image depicting the layout of the proposed G14 pipeline. The pipeline is depicted in red.

3 ASSESSMENT METHODOLOGY

3.1 Methodology for Assessing Heritage Site Significance

PGS Heritage was appointed by Enkanyini Projects to undertake a Heritage Impact Assessment (HIA) for the proposed development of the G14 pipeline by the Rand Water Board between Forest Hill and Turffontein Nek, Southern Johannesburg, Johannesburg Metropolitan Municipality, Gauteng Province. This followed on a Heritage Scoping Report conducted by PGS Heritage for Enkanyini Projects.

The applicable maps, tables and figures are included as stipulated in the NHRA (no 25 of 1999) and the National Environmental Management Act (NEMA) (no 107 of 1998).

The methodological approach to this study consisted of the following three steps:

Step I – Desktop Studies: The background information to the field survey leans greatly on the archival and historical cartographic material assessed as part of the study as well as a study of the available literature. Utilising these data sets it was possible to provide a historic timeline and historic context to the study area and surroundings.

Step II – Physical Survey: A walkthrough of the pipeline route was conducted on 15 September 2014 and 28 October 2014 by a professional archaeologist (Polke Birkholtz) and field assistant (Derrick James). This fieldwork was conducted during the Heritage Scoping Assessment.

Step III – Report: The final step involved the recording and documentation of relevant heritage resources, as well as the assessment of resources regarding the heritage impact assessment criteria and report writing, as well as mapping and recommendations.

The assessment of significance of heritage sites was based on five main criteria:

- site integrity (i.e. primary vs. secondary context),
- amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter)
 - Low - <10/50m²
 - Medium - 10-50/50m²
 - High - >50/50m²

- uniqueness and
- potential to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

A - No further action necessary;

B - Mapping of the site and controlled sampling required;

C - No-go or relocate development position

D - Preserve site, or extensive data collection and mapping of the site; and

E - Preserve site

Site Significance

Site significance classification standards prescribed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used for the purpose of this report (see **Table 1**).

Table 1: Site significance classification standards as prescribed by SAHRA

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	Grade 4A	High/Medium	Mitigation before destruction
Generally Protected B (GP.B)	Grade 4B	Medium	Recording before destruction
Generally Protected C (GP.C)	Grade 4C	Low	Destruction

3.2 Methodology for Impact Assessment

In order to ensure uniformity, a standard impact assessment methodology has been utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors, along with the equivalent quantitative rating scale for each of the aforementioned criteria, is given in **Table 2**.

Table 2: Quantitative rating and equivalent descriptors for the impact assessment criteria

RATING	SIGNIFICANCE	EXTENT SCALE	TEMPORAL SCALE
1	VERY LOW	<i>Isolated corridor / proposed corridor</i>	<u>Incidental</u>
2	LOW	<i>Study area</i>	<u>Short-term</u>
3	MODERATE	<i>Local</i>	<u>Medium-term</u>
4	HIGH	<i>Regional / Provincial</i>	<u>Long-term</u>
5	VERY HIGH	<i>Global / National</i>	<u>Permanent</u>

A more detailed description of each of the assessment criteria is given in the following sections.

Significance Assessment

The significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these, since their importance in the rating scale is very relative. For example, 10 structures younger than 60 years might be affected by a proposed development, and if destroyed the impact can be considered as VERY LOW in that the structures are all

of Low Heritage Significance. If two of the structures are older than 60 years and of historic significance, and as a result of High Heritage Significance, the impact will be considered to be HIGH to VERY HIGH.

A more detailed description of the impact significance rating scale is given in **Table 3** below.

Table 3: Description of the significance rating scale

RATING		DESCRIPTION
5	VERY HIGH	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	HIGH	Impact is of substantial order within the bounds of impacts which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	MODERATE	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	LOW	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	VERY LOW	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity is needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	NO IMPACT	There is no impact at all - not even a very low impact on a party or system.

Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in the table below..

Table 4: Description of the spatial significance rating scale

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of possible impacts, and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50 km from the proposed site / corridor.
3	Local	The impact will affect an area up to 5 km from the proposed site.
2	Study Area	The impact will affect an area not exceeding the boundary of the study area.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the site.

Temporal/Duration Scale

In order to accurately describe the impact, it is necessary to understand the duration and persistence of an impact in the environment.

The temporal or duration scale is rated according to criteria set out in **Table 5**.

Table 5: Description of the temporal rating scale

RATING		DESCRIPTION
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium-term	The environmental impact identified will operate for the duration of life of the project.
4	Long-term	The environmental impact identified will operate beyond the life of operation of the project.
5	Permanent	The environmental impact will be permanent.

Degree of Probability

The probability or likelihood of an impact occurring will be outlined in below.

Table 6: Description of the degree of probability of an impact occurring

RATING	DESCRIPTION
1	Practically impossible
2	Unlikely
3	Could happen
4	Very likely
5	It's going to happen / has occurred

Degree of Certainty

As with all studies, it is not possible to be 100% certain of all facts, and for this reason a standard “degree of certainty” scale is used, as discussed in **Table 7**. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making.

Table 7: Description of the degree of certainty rating scale

RATING	DESCRIPTION
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.

Quantitative Description of Impacts

To allow for impacts to be described in a quantitative manner, in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus the total value of the impact is described as the function of significance, spatial and temporal scale, as described below:

Impact Risk = (SIGNIFICANCE +*Spatial*+ Temporal) X Probability

3

5

An example of how this rating scale is applied is shown below:

Table 8: Example of Rating Scale

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	Low	Local	Medium Term	Could Happen	Low
Impact on heritage structures	2	3	3	3	1.6

Note: The significance, spatial and temporal scales are added to give a total of 8, which is divided by 3 to give a criterion rating of 2.67. The probability (3) is divided by 5 to give a probability rating of 0.6. The criteria rating of 2.67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to five classes as described in the table below.

Table 9: Impact Risk Classes

RATING	IMPACT CLASS	DESCRIPTION
0.1 – 1.0	1	Very Low
1.1 – 2.0	2	Low
2.1 – 3.0	3	Moderate
3.1 – 4.0	4	High
4.1 – 5.0	5	Very High

Therefore, with reference to the example used for heritage structures above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a low impact.

4 CURRENT STATUS QUO

4.1 Description of Study Area

The study area is located in an urban setting with schools, houses and shops located near the proposed development area. It is located either within or in direct proximity to the residential suburbs of Forest Hill, Haddon and Oakdene.



Figure 4 – General view of the pipeline footprint near the eastern end of the study area.



Figure 5 – General view of the crossing of Rifle Range Road and Amanda Avenue.



Figure 6 – View of the proposed pipeline route along Rifle Range Road (M38).



Figure 7 – Another view of the proposed pipeline route along Rifle Range Road.

5 DESKTOP STUDY FINDINGS

5.1 Archival and Historic Maps of the Study Area and Surrounding Landscape

A total of four historic and archival maps were assessed as part of this study. The aim of this is to assess the historic layering and context of the study area and at the same time to establish whether any possible heritage features are depicted on these maps.

5.1.1 Heidelberg Sheet of the Major Jackson Map Series

A section of the Heidelberg Sheet of the Major Jackson map is shown below. This map was compiled during the South African War and is dated to June 1902 (National Archives, Maps, 1/1896).

It is evident from the map that at the time the study area and surrounding landscape were essentially still undeveloped and not yet part of the urban sprawl of Johannesburg. A wagon road is shown in approximately the same locality where Rifle Range Road was later established.

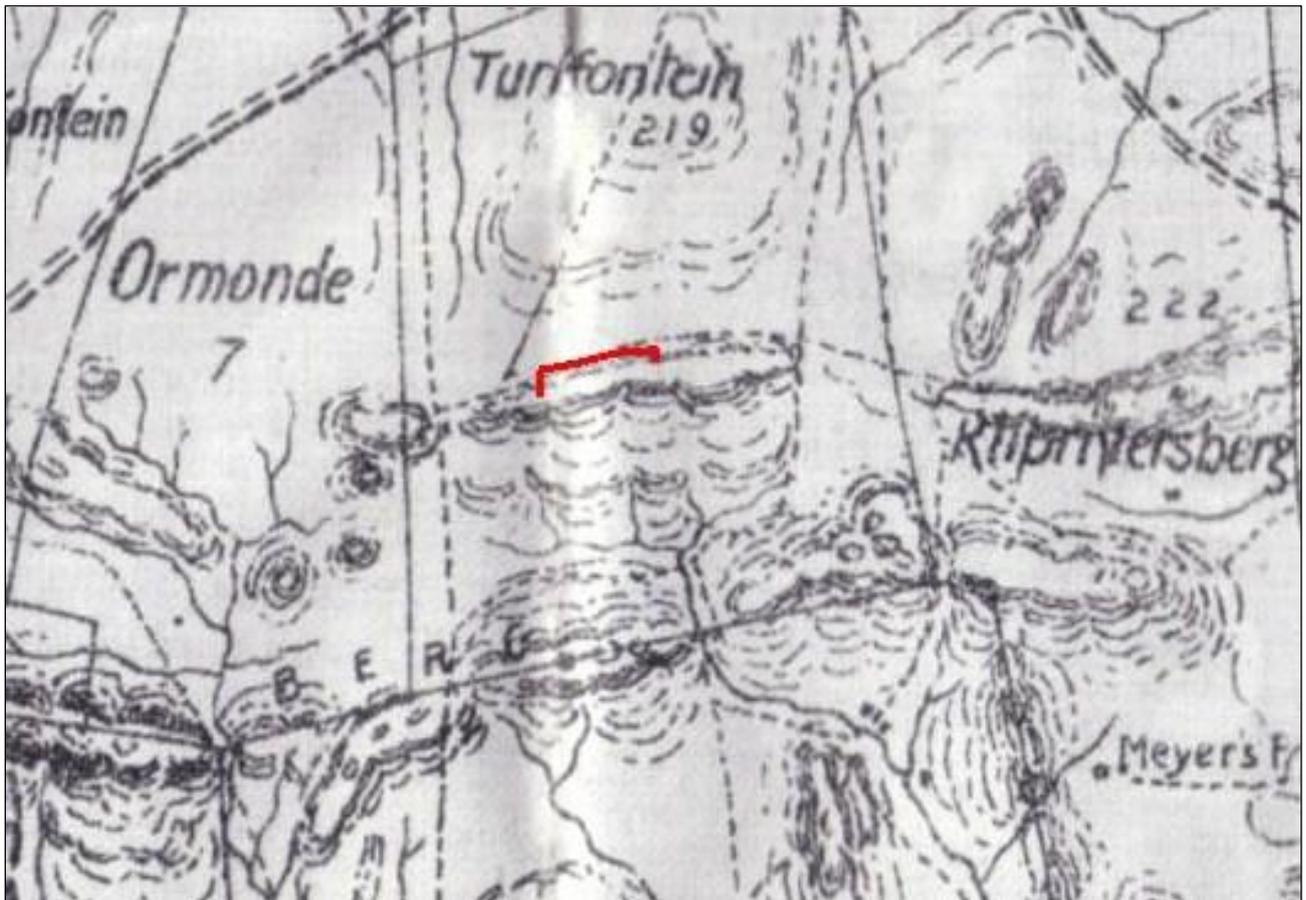


Figure 8 - Section of the Heidelberg Sheet of the Major Jackson Map Series that was compiled in June 1902 (National Archives, Maps, 1/1896). The proposed development is depicted in red.

5.1.2 Witwatersrand Magisterial District Map

This archival map is titled the “Witwatersrand Magisterial District Parts II, III & IV Shewing Electoral Divisions of Park IV” was compiled in 1906 (National Archives, Maps, 2/555).

The following observations can be made from the map:

- The map depicts a road in proximity to the current location of Rifle Range Road.
- The map depicts an area referred to as Forest Hill. The depiction of this suburb on the 1906 map confirms the indication in the historic overview that it was established in 1897.
- The map also refers to the company Turffontein Estates Ltd which appears to have been the developers/owners of the land in this area.
- Of some significance is the depiction of the municipal boundary in black dotted line a short distance south of the present study area. This indicates that at the time the study area was located on the southern periphery of Johannesburg, and may be the reason why a historic rubbish dump was located here (see Fieldwork Findings below).

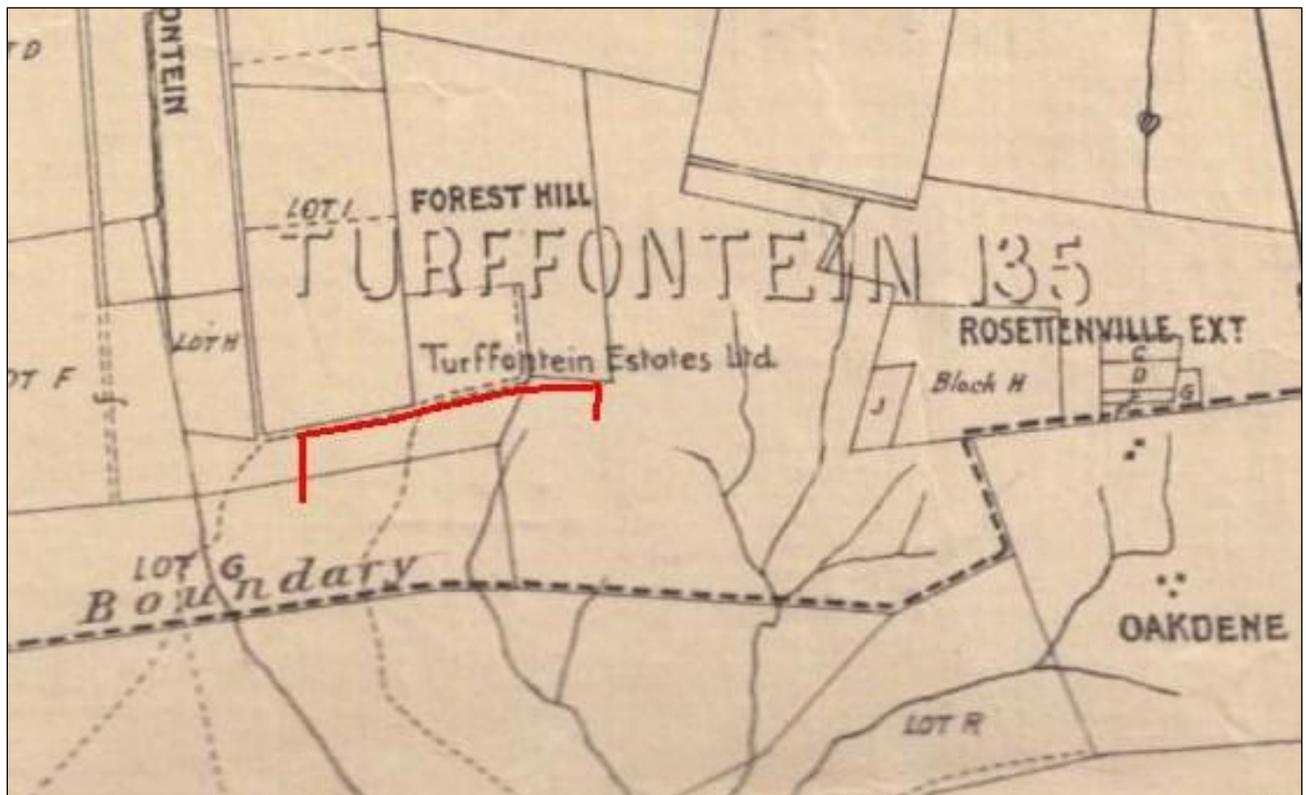


Figure 9 - Section of the Magisterial District map that was compiled in 1906 (National Archives, Maps, 2/555). The proposed development is depicted in red.

5.1.3 First Edition of the 2628AC Topographical Sheet

The relevant section of the First Edition of the 2628AC Topographical Sheet is depicted below. The sheet was surveyed and drawn in 1944 by the Trigonometrical Survey Office with Cadastral Information supplied by the Surveyor-General's Office.

The following observations can be made from the map:

- The landscape surrounding the study area has developed considerably in the period between 1906 and 1944. This is especially true for land to the north of the present study area.
- A school (Die Fakkkel High School) is depicted directly north of the study area.
- The residential suburbs of Haddon and Forest Hill are clearly shown.
- A cluster of three unknown buildings are depicted just south of the eastern end of the study area. The function or origin of these buildings is not presently clear.

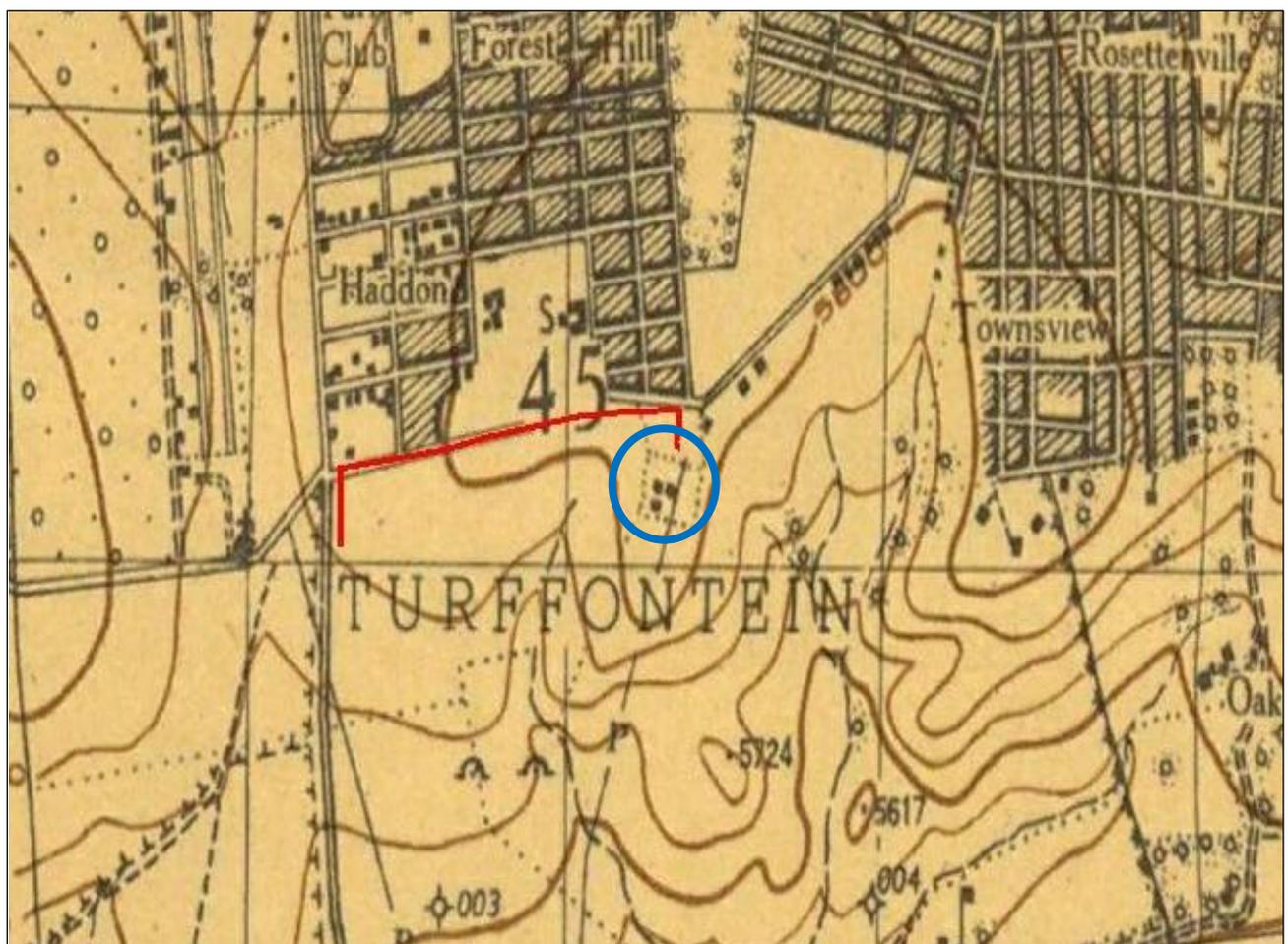


Figure 10 – A section of the First Edition of the 2628AC Topographical Sheet that was compiled in 1944 is shown. The proposed development is depicted in red with the cluster of buildings marked in blue.

5.1.4 Second Edition of the 2628AC Topographical Sheet

The relevant section of the Second Edition of the 2628AC Topographical Sheet is depicted below. This sheet was based on aerial photographs taken in 1952 and was surveyed in 1957. It was drawn in 1959 by the Trigonometrical Survey Office. The following observations can be made from the map:

- In general terms it is evident that further urban and residential development had taken place between 1944 and c. 1957.
- The Forest Hill Facility is also clearly depicted for the first time on this map. See blue marker.
- A rubbish dump is depicted to the west of the study area (see purple marker). Although this rubbish dump is not the one identified within the study area, its depiction here supports the use of this area along the then southern periphery of the city of Johannesburg for the discard of domestic rubbish.
- A cemetery is shown a short distance south-west of the study area. This appears to be the cemetery of the victims of the Turffontein Concentration Camp referred to in the historic overview. The cemetery is marked in green.

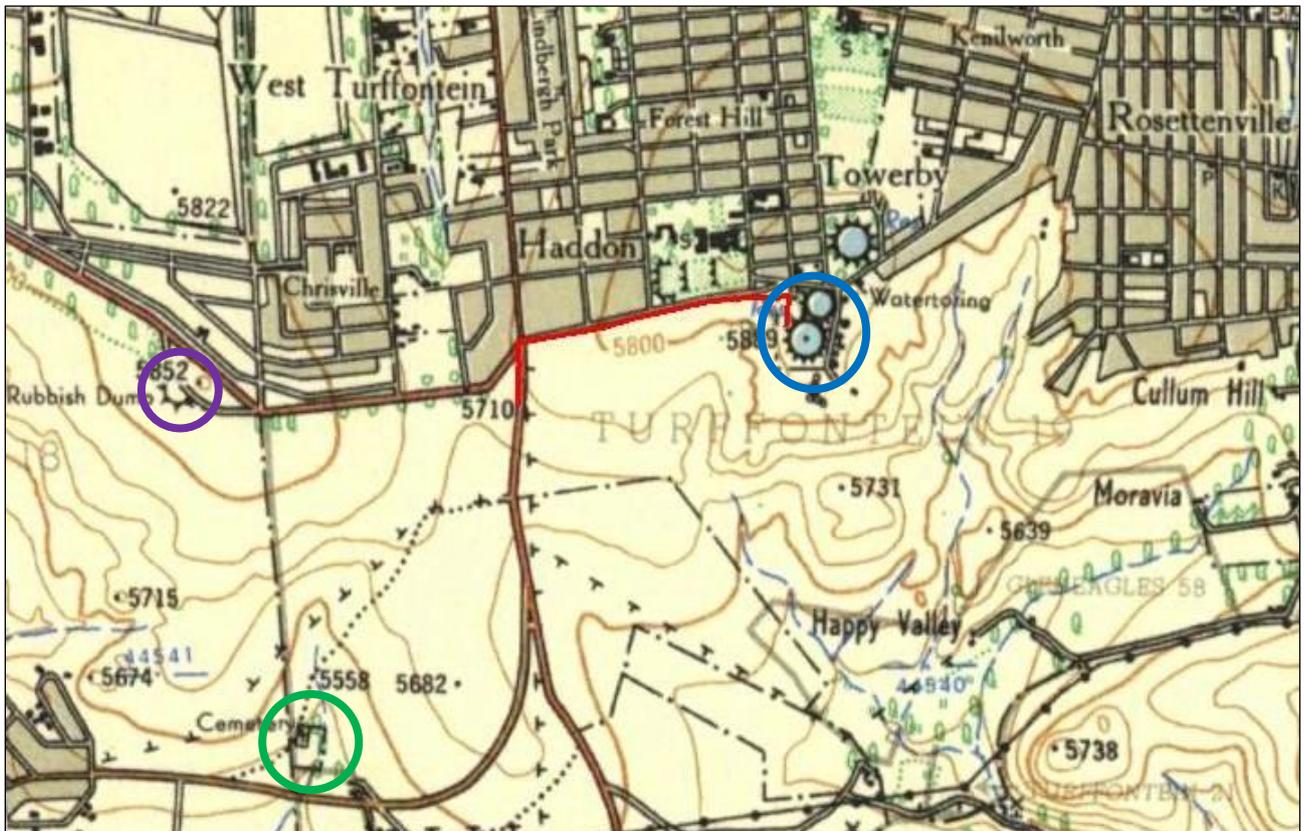


Figure 11 – A section of the Second Edition of the 2628AC Topographical Sheet that was surveyed in 1957 is shown. The proposed development is depicted in red.

5.2 Historic Overview of Study Area and Surrounding Landscape

DATE	DESCRIPTION
2.5 million to 250 000 years ago	<p>The Earlier Stone Age is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these is known as Oldowan and is associated with crude flakes and hammer stones. It dates to approximately 2 million years ago. The second technological phase is the Acheulian and comprises more refined and better made stone artefacts such as the cleaver and bifacial hand axe. The Acheulian dates back to approximately 1.5 million years ago.</p> <p>According to Partridge (1964) a number of Early Stone Age lithics had been identified at Northcliff. This area is located roughly 4.3km north-west of the study area. Bergh (1999) indicates that an Early Stone Age site is located at Aasvoëlkrans, which appears to be located in the same area as Northcliff.</p>
250 000 to 40 000 years ago	<p>The Middle Stone Age (MSA) is the second oldest phase identified in South Africa's archaeological history and is associated with flakes, points and blades manufactured by means of the so-called 'prepared core' technique.</p> <p>Some of the closest well-known Middle Stone Age sites to the present study area are at Melville Koppies (roughly 10.9 km north-west of the present study area) and Linksfield (roughly 11.7 km north of the present study area).</p>
40 000 years ago to the historic past	<p>The Later Stone Age is the third archaeological phase identified and is associated with an abundance of very small artefacts known as microliths.</p> <p>A number of Later Stone Age sites are known from the Johannesburg area, albeit none of these known sites are located close to the present study area. These known sites include Melville Koppies, Linksfield, Aasvoëlkrans, Glenverness, Pietkloof and Zevenfontein (Bergh, 1999). Of these, the sites at Melville Koppies (10.9 km to the north-west) and Linksfield (11.7 km to the north) also appear to be the nearest to the present study area.</p>
AD 450 – AD 750	<p>The Mzonjani facies of the Kwale Branch of the Urewe Tradition represents the earliest known Iron Age period from the general vicinity of the study area. The decoration on the ceramics from this facies is characterised by punctates on the rim and spaced motifs on the shoulders of vessels (Huffman, 2007).</p>
AD 1450 – AD 1650	<p>The Ntsuanatsatsi facies of the Blackburn Branch of the Urewe Ceramic Tradition represents the second known Iron Age period within the surroundings of the study area. The decoration on the ceramics from this facies is characterised by a broad band of stamping in the neck, stamped arcades on the shoulder and appliqué (Huffman, 2007).</p> <p>Huffman (2007) suggest that the Ntsuanatsatsi facies can be directly linked to the early Bafokeng who regarding this theory were the first Mbo Nguni people to leave present-day KwaZulu-Natal.</p>
AD 1500 - AD 1700	<p>The Olifantspoort facies of the Moloko Branch of the Urewe Ceramic Tradition is the second Iron Age facies to be identified within the</p>

	<p>surroundings of the study area. The Olifantspoort facies can likely be dated to between AD 1500 and AD 1700. The key features of the decoration used on the ceramics from this facies include multiple bands of fine stamping or narrow incision separated by colour (Huffman, 2007).</p> <p>The type site for this facies is located on the farm Olifantspoort 328 JQ, which is situated roughly 90 km north-west of the study area.</p> <p>After an archaeological team under Professor R.J. Mason of the University of the Witwatersrand identified a number of stonewalled settlements on the farm Olifantspoort by using aerial photographs, archaeological field research and excavations were undertaken during 1971 at eight of these sites located on the farm Olifantspoort as well as another site located on an adjacent farm. These sites were numbered 20/71, 21/71, 26/71, 27/71, 28/71, 60/71, 61/71, 62/71, 64/71 and 65/71. The focus of the research turned to Site 20/71 which proved to be a very large stonewalled site. A total of 85 huts as well as a number of middens were excavated here during the 1971 season alone. As many as 80 individual rock engraving panels were identified in the vicinity of the site. These engravings all depict settlement plans (Mason, 1973). A copper mine was also identified on the farm (Steel, 1987). In the following year sites 2/72 and 29/72 were added and researched, with sites 38/73 and 47/73 added the year after. A few years later in 1984 an Olifantspoort site was identified at Broederstroom and in 1985 another Olifantspoort site was identified at Ifafi (Huffman, 2007).</p> <p>The Olifantspoort facies holds an important position in the sequence of the Moloko or Sotho-Tswana group. The earliest facies to be associated with the Moloko is the Icon facies (AD 1300 – 1500), with sites found across large sections of what is today the Limpopo Province. The Icon facies resulted in three different and parallel Iron Age facies, namely the Madikwe facies (AD 1500 – 1700) (which in turn led to the Buispoort facies between AD 1700 and 1850), the Letsibogo facies (AD 1500 – 1700) and thirdly the Olifantspoort facies. The Olifantspoort facies developed into the Thabeng facies (AD 1700 – 1850) (Huffman, 2007). It is therefore evident that the Olifantspoort facies represents a key pillar in our understanding of the origins and sequence of the Sotho-Tswana people of today (Huffman, 2007).</p>
AD 1650 – AD 1850	<p>The Uitkomst facies of the Blackburn Branch of the Urewe Ceramic Tradition represents the third Iron Age period to be identified for the surroundings of the study area. This facies can likely be dated to between AD 1650 and AD 1820. The decoration on the ceramics associated with this facies is characterised by stamped arcades, appliqué of parallel incisions, stamping and cord impressions and is described as a mixture of the characteristics of both Ntsuanatsatsi (Nguni) and Olifantspoort (Sotho) (Huffman, 2007).</p> <p>The type-site is Uitkomst Cave, which is situated approximately 44.7 km north-west of the study area.</p> <p>The site was excavated by Professor R.J. Mason of the University of the Witwatersrand as part of a project to excavate five cave sites in the Witwatersrand-Magaliesberg area. These five sites are Glenferness, Hennops River, Pietkloof, Zwartkops and Uitkomst. Uitkomst was chosen as the type site for the particular Iron Age material excavated at these sites as the Uitkomst deposit was found to be well stratified and the site “...illustrates</p>

	<p><i>the combination of a certain kind of pottery with evidence for metal and food production and stone wall building found at the open sites...</i>" (Mason, 1962:385).</p> <p>The Uitkomst pottery is viewed as a combination of Ntsuanatsatsi and Olifantspoort, and with the Makgwareng facies is seen as the successors to the Ntsuanatsatsi facies. The Ntsuanatsatsi facies is closely related to the oral histories of the Early Fokeng people and represents the earliest known movement of Nguni people out of Kwazulu-Natal into the inland areas of South Africa. Regarding this theory, the Bafokeng settled at Ntsuanatsatsi Hill in the present-day Free State Province. Subsequently, the BaKwena lineage had broken away from the Bahurutshe cluster and crossed southward over the Vaal River to come in contact with the Bafokeng. As a result of this contact a Bafokeng-Bakwena cluster was formed, which moved northward and became further 'Sotho-ised' by coming into increasing contact with other Sotho-Tswana groups. According to this theory, this eventually resulted in the appearance of Uitkomst facies type pottery which contained elements of both Nguni and Sotho-Tswana speakers (Huffman, 2007). Huffman states that that the Uitkomst facies is directly associated with the Bafokeng (Huffman, 2007). However, it worth noting that not all researchers agree with this preposition of the Bafokeng origins. In their book on the history of the Bafokeng, Bernard Mbenga and Andrew Mason indicate that the research of Prof. R.J. Mason and Dr. J.C.C. Pistorius "...would indicate that the Bafokeng originated from the Bahurutshe-Bakwena-Bakgatla lineage cluster. Tom Huffman holds a different view..." (Mbenga & Mason, 2010).</p> <p>A large number of stonewalled sites of the Uitkomst facies are known from across the Klipriviersberg south of Johannesburg. With the present study located in proximity to this mountain range, it is clear that a number of Uitkomst sites would be located in the general vicinity of the present study area. While no such sites were observed anywhere near the study area, 21 stonewalled Late Iron Age sites were identified during an archaeological survey of the Klipriviersberg Nature Reserve (NMCH, 1999). This nature reserve is 1.8 km south of the study area.</p>
AD 1700 – AD 1840	<p>The Buispoort facies of the Moloko branch of the Urewe Ceramic Tradition is the next phase to be identified within the study area's surroundings. It is most likely dated to between AD 1700 and AD 1840. The key features on the decorated ceramics include rim notching, broadly incised chevrons and white bands, all with red ochre (Huffman, 2007).</p>
AD 1823 – AD 1827	<p>After leaving present-day KwaZulu-Natal the Khumalo Ndebele (more commonly known as the Matabele) of Mzilikazi migrated through the general vicinity of the study area before reaching the central reaches of the Vaal River in the vicinity of Heidelberg in 1823 (www.mk.org.za).</p> <p>Two different settlement types have been associated with the Khumalo Ndebele. The first of these is known as Type B walling and was found at Nqabeni in the Babanango area of KwaZulu-Natal. These walls stood in the open without any military or defensive considerations and comprised an inner circle of linked cattle enclosures (Huffman, 2007). The second settlement type associated with the Khumalo Ndebele is known as</p>

	<p>Doornspruit, and comprises a layout which from the air has the appearance of a 'beaded necklace'. This layout comprises long scalloped walls (which mark the back of the residential area) which closely surround a complex core which in turn comprises a number of stone circles. The structures from the centre of the settlement can be interpreted as kitchen areas and enclosures for keeping small stock.</p> <p>It is important to note that the Doornspruit settlement type is associated with the later settlements of the Khumalo Ndebele in areas such as the Magaliesberg Mountains and Marico and represent a settlement under the influence of the Sotho with whom the Khumalo Ndebele intermarried. The Type B settlement is associated with the early Khumalo Ndebele settlements and conforms more to the typical Zulu form of settlement. As the Khumalo Ndebele passed through the general vicinity of the study areas shortly after leaving Kwazulu-Natal, one can assume that their settlements here would have conformed more to the Type B than the Doornspruit type of settlement. It must be stressed however that no published information could be found which indicates the presence of Type B sites in the general vicinity of the study area.</p> <p>No sites associated with this period of the archaeological history of the surroundings of the study area are presently known.</p>
1832	At the time a Zulu impi of King Dingane moved through the general vicinity of the study area on their way to attack the Matabele of Mzilikazi who were settled along the Magaliesberg Mountains (Bergh, 1999).
1836	The first Voortrekker parties started crossing the Vaal River (Bergh, 1999).
1839 - 1840	<p>These years saw the early establishment of farms by the Voortrekkers in the general vicinity of the study area. The district of Potchefstroom was also established in 1839 (Bergh, 1999), of which the study area in all likelihood formed part.</p> <p>The remains of a small number of historic farmsteads from the mid to late 19th centuries are known from the general vicinity of the present study area. Furthermore, a Voortrekker cemetery containing the graves of members of the Meyer and Viljoen families is located roughly 8.2 km to the east of the study area.</p>
1857	The district of Pretoria was established in this year (Bergh, 1999). The study area now fell within this district.
1866	The district of Heidelberg was established in this year. The study area now fell within this district (Bergh, 1999). It remained within the district of Heidelberg until 1902.
1886	Gold was discovered on the central Witwatersrand during early 1886. George Harrison Park, on Main Reef Road, commemorates this discovery and is located 7.2 km to the north-west. Johannesburg was founded as a direct result of the discovery of gold as increasing numbers of adventurers and gold seekers streamed to the new gold discoveries. A large number of mining companies were also established during this period.

	<p>Closer to the study area, a gold-bearing reef known as Ras Reef was discovered during this time across the southern end of the farm Turffontein, and was identified in close proximity to the present day suburbs of Turffontein and Forest Hill.</p> <p>During the period between November and December 1886 a stamp battery was erected on Ras Reef by Sam Wemmer and George Goch (Gray, 1937). This was the first ever stamp battery erected on the Witwatersrand gold reef areas after the discovery of the Main Reef earlier in the same year (Brodie, 2008). The battery is believed to have been erected in proximity to Wemmer Pan, located roughly 3.1 km north-east of the present study area.</p>
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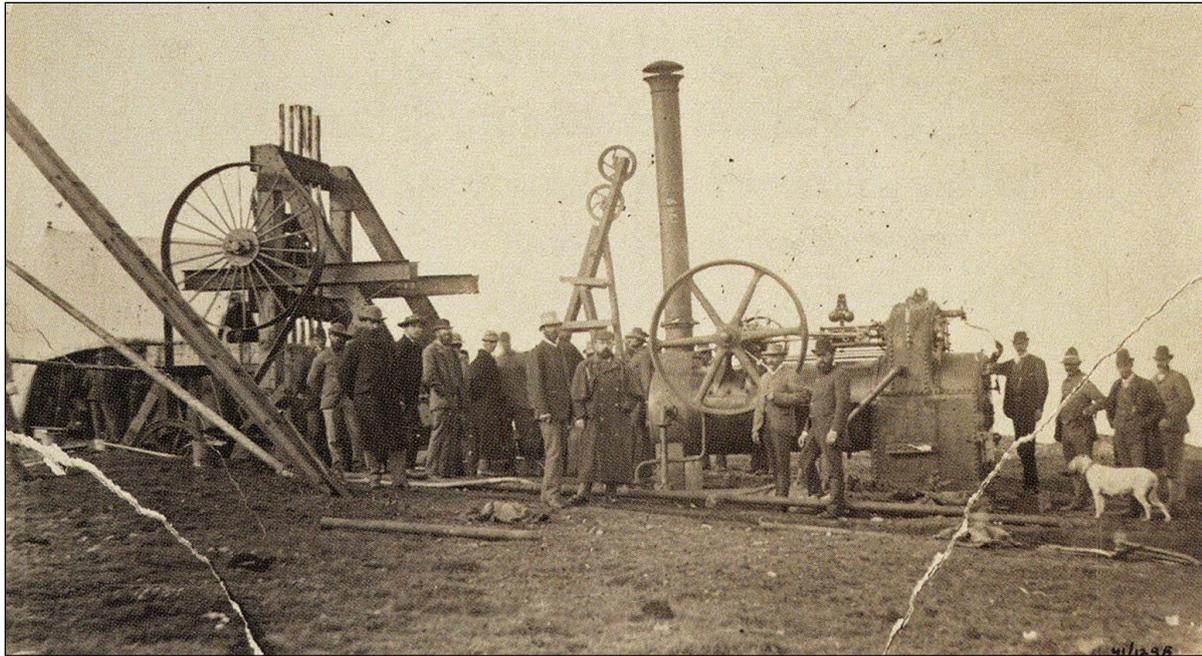


Figure 12- The first ever stamp battery erected on the Witwatersrand gold reefs. This battery was erected between November and December 1886 by Sam Wemmer and George Goch in proximity to where Wemmer Pan is located today (Brodie, 2008:177).

<p>1889 - 1897</p>	<p>In this year a portion of the farm Turffontein which had been acquired by Walter Casey was surveyed and laid out as a new township. When stands were eventually offered for sale in 1896 and 1897, Turffontein or Casey's Township as it was also known was marketed as "...the most charming suburb in Johannesburg." (Brodie, 2008:178).</p>
<p>1896</p>	<p>The suburb of Forest Hill was established in this year (Johannesburg One Hundred Years, 1986).</p>
<p>1899 - 1902</p>	<p>The South African War (also known as the Anglo Boer War) took place during this time. No events or activities from this tumultuous period can be directly associated with the present study area.</p> <p>The closest landmark which can be associated with the South African War is the Concentration Camp at the Turffontein Race Course where approximately 5,000 Boer Women and Children were held by the British military. Some 700 persons died in this camp during the war</p>

	<p>(www.joburg.org.za). The race course is 2.3 km north of the study area.</p> <p>Furthermore, it is known that those who passed away in the camp were buried on the farm Klipriviersberg belonging at the time to Piet Meyer. During the Second World War this cemetery was vandalised by anti-Ossewa Brandwag groups. In 1961 an extensive newly built memorial was officially opened at the cemetery (www.joburg.org.za). This cemetery is located roughly 1.3 km south-west of the present study area.</p>
1902	The Witwatersrand District was established by the British Authorities at the end of the war (Bergh, 1999). The study area now fell within this district.
1909	The Johannesburg District was established (Bergh, 1999). The study area now fell within this district.
c. 1910	<p>One of the earliest known associations between the Rand Water Board and the study area formed part of one of the earliest water supply programmes undertaken by the Rand Water Board during their early days of existence.</p> <p>After the Rand Water Board had acquired the water rights along the Klip River Valley from the Vierfontein Syndicate, it sunk a series of boreholes on the farm Zwartkopjes as well as neighbouring farms south of Johannesburg. Water raised from these boreholes was pumped to the Zwartkopjes Pumping Station from where it was re-pumped by high-lift reciprocating pumps to a reservoir on Turffontein Nek. From this point the water gravitated to a reservoir at Simmer and Jack for supply to the East Rand and to a central pumping station at Village Main for re-pumping to the Yeoville Reservoir for the supply of the central area (Rand Water Board, 1953).</p> <p>The geographic place name of Turffontein Nek refers to the area in proximity to the western end of the present study area. In fact, the development proposed here represents the replacement of the Forest Hill – Turffontein Nek pipeline. It is therefore evident that if the reservoir at Turffontein Nek still existed today it would have been located in proximity to the present study area. However, no such reservoir could be identified within or in proximity to the present study area.</p>
c. 1914	While the exact establishment date for the suburb of Oakdene is not presently known, it appears to have been around in 1914. See for example National Archives, TPB, 1057, TA8207.
1919	The Technical High School for Boys was established in 1919 on Union Ground and during the same year was moved to Forest Hill. The school became an academic high school for boys and girls in 1926 and is today still known as the Forest High School (Johannesburg City Council, 1951). The school is located 880 m north of the present study area.
1921	A reservoir at Forest Hill already existed by this time. By 1923 the Forest Hill reservoir is included on a diagram of the pipeline network of the Rand Water Board. This diagram shows a pipeline linking Forest Hill with Turffontein Nek, and of course a pipeline from the Zwartkopjes Pumping Station to the south over Turffontein Nek to the Village Main Reef Pumping Station (Rand Water Board, 2004).

1938	<p>Roofs covering the reservoirs at Forest Hill and Signal Hill (Germiston) were completed by Rand Water. In fact, the reservoir at Forest Hill became one of the first owned by Rand Water to be covered in this way. This process of providing roofs for the Board's existing reservoirs were commenced with in 1937 and was aimed at limiting pollution to drinking water caused by exposure to the elements. For example, at the time Johannesburg was still plagued by locust swarms which represented a real threat to uncovered reservoirs (Tempelhoff, 2003).</p>
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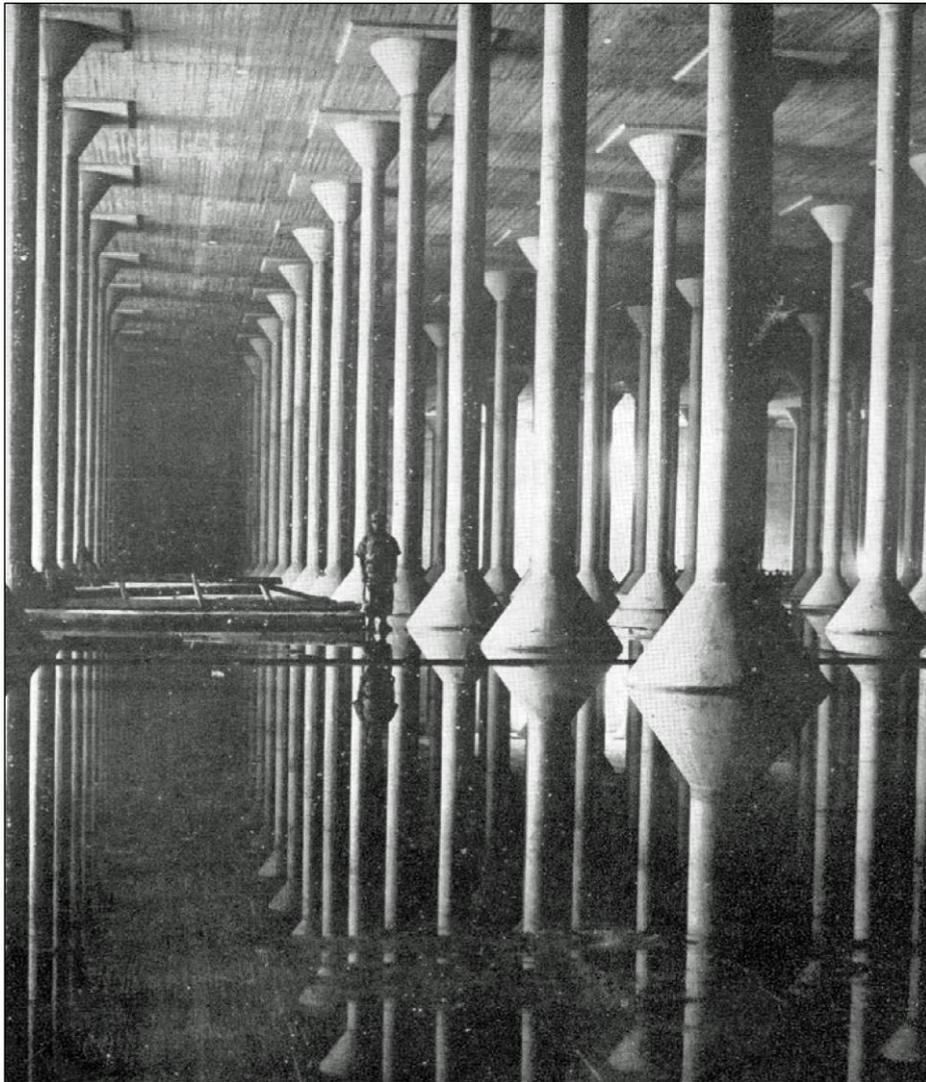


Figure 13- The covered reservoir at Forest Hill as photographed in c. 1938 (Tempelhoff, 2003:186).

c. 1946	<p>Die Fakkkel Hoërskool appears to have been established in c. 1946. This is said as the earliest archival references to school which could be located all date to this year. See for example National Archives, TOD, 2883, ES6/200/2. This school is located on Rifle Range Road with the school boundary located roughly 17 m from the present study area.</p>
c. 1975	<p>The Frances Vorweg Special School appears to have been established in 1975 (National Archives, OEK, 40, R5/6/2). This school is located directly adjacent to the present study area.</p>

5.3 Previous studies listed on the South African Heritage Resources Information System

According to the South African Heritage Resources Information System (SAHRIS) database, at least five previous archaeological and /or heritage assessment studies were conducted in the surroundings of the present study area. These will be discussed individually below.

- Huffman, T. N. February 1997. **Archaeological Survey of the Baralink Node Development**. An unpublished report by the University of the Witwatersrand – Archaeological Resources Management. On file at SAHRA (9/2/228/0001).

This report was conducted for the Baralink node development and occurs about 5 km south – west of the present study area. This report mentions to occurrence of several religious sites and one possible site associated with the South African (Anglo Boer) War. The religious sites are considered significant as they will hold value to the local community. The single Anglo-Boer war site was considered of little significance.

- Huffman, T. N. November 1999. **Archaeological Survey of Klipriviersberg: Part One**. An unpublished report by the University of the Witwatersrand – Archaeological Resources Management. On file at SAHRA (9/2/200/0005).

This report observed the Kliprivierberg area which is located about 4 km east of the present study area. It is stated in the report that Late Iron Age stone-walled settlements are known to occur throughout this area. The report explains that these settlements belong to what are called Group I and Group III built by BaFokeng, a division of Sotho-Tswana. The Group I sites date from AD 1500 to 1700, and the type developed into Group III which dates from about AD 1700 to 1840. Group II however, can be associated with Western Sotho-Tswana and the BaKwena in particular. Group II sites were contemporaneous with Group III and dates to AD1650 and the 1820's and generally occur in the Suikerbosrand area whereas Groups I and III are situated more in the Klipriviersberg area.

In the findings of this report, Huffman states that a few Group I sites occur but most the sites are Group III. Most these sites have been damaged by roads and pipelines and therefore of little significance. One group II site was located which contains one burnt daga (i.e. wattle and daub) structure in a residential bay. It was mentioned that there were also possibly two graves in another embayment of the Group II site. Huffman suggests that this site be preserved. Historical sites such as rectangular foundations of stone-walled buildings and an old mining trench were also located, however considered of little significance.

- Huffman, T. N. May 2002. **Archaeological Assessment of Stone-Walled Settlements on the Meyersdal Nature Estate, Klipriviersberg, Alberton.** An unpublished report by the University of the Witwatersrand – Archaeological Resources Management. On file at SAHRA (9/2/200/0001).

This report observed a section of the Klipriviersberg area which is located about 4 km east of the present study area. This report mentioned the presence of stone-walled settlements which, according to the report have been known in the area for some years. The report explains that these settlements belong to what are called Group I and Group III built by BaFokeng, a division of Sotho-Tswana. The Group I Sites date from AD 1500 to 1700, and the type developed into Group III which dates from about AD 1700 to 1840. This report discusses the findings of the assessment. It is mentioned that several sites were located of which some of them included middens (ancient rubbish dumps) as well as one site including stone platforms for grainbins. It is also mentioned that one site's interior has since been used as a dump for building rubble.

- Huffman, T. N. September 2006. **Archaeological Assessment of Portion 164 and Remainder of Portion 52 of the Farm Turffontein 100 IR, Johannesburg.** An unpublished report by the University of the Witwatersrand – Archaeological Resources Management. On file at SAHRA (9/2/266/0003)

This report observed a section of land on the farm Turffontein which is located approximately 1 km north from the present study area. The only significant finding that this report mentioned is that of an old building believed to date to when Turffontein was a working farm and therefore older than 60 years. Other than this one site, the report claims that no significant archaeological or historical sites occur in this area.

- Natural Cultural History Museum. June 1999. **A Survey of Cultural Resources in the Klipriviersberg Nature Reserve, Johannesburg District.**

This Report observed the farm Rietvlei 101IR (part of the Klipriviersberg Nature Reserve) which occurs about 2 km south of the present study area. Various archaeological sites were mentioned in this report. Various Stone Age tools were located, however as they are surface material and probably not in the original context were considered of little significance. Late Iron Age stone-walled sites were identified throughout the area. Some of these sites showed extensive stone-walling, terracing, pottery and faunal remains. These sites form part of the Tswana settlement of the larger geographical area and probably date to within the last 300 years. Historic sites such as a cemetery and an old farmstead are also recorded. Lastly, contemporary religious sites were also identified.

6 FIELDWORK FINDINGS

A systematic walkthrough of the study area was undertaken by a fieldwork team comprising an archaeologist and field assistant. The archaeologist carried a hand-held GPS, and the recorded track log is depicted below. One heritage site was identified within the study area. The site was given a unique site number comprising a prefix identifying the geographic locality (in this case FHL for Forest Hill) as well as a number. As such the identified site was numbered FHL001. A short description of the site will be provided below.



Figure 14 – This Google Earth image depicts the recorded track logs as well as the site that was identified.

The identified site was plotted on the Google Earth map which also depicts the proposed pipeline position and layout. Based on the information that is currently available the identified site is located either directly within or in close proximity to the proposed pipeline route.

6.1 Site FHL001

Site Coordinates:

S 26° 15' 34.0" S 26° 15' 33.9"
E 28° 02' 17.0" E 28° 02' 18.5"

Site Description:

A surface occurrence of historic artefacts was identified over an area roughly 40m in extent. The site is located along the strip of land south of Rifle Range Road (M38) and north of a brick boundary wall.

The artefacts observed here include fragments of glass bottles as well as imported ceramics. A number of the glass bottle fragments contain evidence for embossing which suggests that within this geographic context these artefacts date from either the late 19th or early 20th century. Furthermore, at least three glass artefacts (representing a minimum number of at least two individual bottles) were found which could be positively identified as part of bottles (likely of the codd type) used to keep aerated mineral water. These bottles typically date to the period between the last decade of the 19th century and first decade of the 20th century. One aerated mineral water brand could also be identified, namely *Alfred Kan & Company*. This company manufactured mineral water between 1904 and 1910 (Lastovica & Lastovica, 1990). However, it must be noted that these authors indicate that the company may have operated a few years before or after these dates as well. The only information that could presently be located about Alfred Kan is that he was Chinese (Transvaal Law Reports, 1903) and could be associated with Johannesburg from at least the turn of the previous century.

Furthermore, two glass fragments from the site could be identified as originating from a single beer bottle which would have had the following embossed on it "THIS BOTTLE IS THE PROPERTY OF THE SOUTH AFRICAN BREWERIES". The South African Breweries was established in 1895. Bottles used by the company during the late 19th and early 20th centuries had this inscription embossed on it and had the patented Riley screw stopper as closures.

Those artefacts which could be positively dated indicate that the site is more than likely older than 100 years which means that it is interpreted as an archaeological site by the National Heritage Resources Act. Although it would be difficult to accurately contextualise the site within its modern setting, it is possible that the artefacts observed here formed part of a midden (rubbish heap) located on the

periphery of the historic town of Johannesburg. This suggestion is supported by the 1906 Magisterial Map which indicates that the study area was located a short distance within the municipal boundary of Johannesburg at the time. Furthermore, the theory that the peripheral areas of Johannesburg would have historically been used for the discard of the town's domestic waste is supported by the indication of a rubbish dump a short distance to the west of the proposed development on the Second Edition of the 2628AC Topographical Sheet that was surveyed in 1957. Of course, the rubbish dump may also have been directly associated with the adjacent Forest Hill suburb that was established in 1897 (Johannesburg One Hundred Years, 1986). It is of course also known that during the early development of Johannesburg the municipal removal of domestic rubbish from houses would either not have existed or alternatively would not have been widespread. As a result informal rubbish heaps would have been established either within residential properties or on the outskirts of residential areas. With the site located directly south-west of the original Forest Hill suburban boundaries the possible association of the midden with this suburb becomes evident.

It is possible that the archaeological material found on site may have been exposed and brought to the surface during the construction of the original G14 pipeline. However, it is of course possible that intact deposits of the rubbish dump may be located underground. This can only be ascertained for certain during the actual construction of the replacement pipeline.

It has come to the attention of the author of this report that sections of the same rubbish dump were exposed during the construction of the brick wall directly south of the pipeline footprint in this area. That a historic rubbish dump is known from the Forest Hill area is also indicated on the internet (www.antiquebottles.co.za). Whether the site referred to on this website is the same as the one identified here is not presently certain.

In summary, a surface occurrence of historic glass and imported ceramic fragments were identified along a 40 m section of the proposed pipeline replacement route. Many of these artefacts could be dated to at least 100 years ago, which indicates that the site must be viewed as an archaeological site and falls under the protection of National Heritage Resources Act. A historic rubbish dumps is known to have been exposed a short distance to the south and south-east of the present occurrence, and it seems highly likely for this historic rubbish dump to have extended to the area where the surface occurrence of material was identified along the pipeline replacement footprint. At present it is not known if the surface material found here was exposed during the construction of the original G14 pipeline through

the same site or whether it represents an in-situ surface occurrence of the midden. This can only be established once construction takes place.

Site Significance:

The site is more than likely older than 100 years and as a result is defined as an archaeological site by the National Heritage Resources Act 25 of 1999. In terms of Section 35(4) of the Act the site may not be disturbed or destroyed without a permit.

Although the archaeological context of the site is uncertain, it has the potential to reveal information about the lives of early residents of Johannesburg. As a result the site is graded as Grade 4B which equates to a Medium Significance. This indicates that mitigation is required before the site can be disturbed, altered or destroyed.



Figure 15 – General view of the area where the archaeological material was observed.



Figure 16 – Fragment of an aerated mineral water bottle of the company A. Kan & Company that was observed on the surface of the site. Scale is in 1cm increments.



Figure 17 – An example of a complete aerated mineral water codd bottle from the author’s collection and which can be associated with the company of Alfred Kan. The similarities between this bottle and the glass fragment from the site can clearly be seen.

7 IMPACT OF PROPOSED DEVELOPMENT ON HERITAGE RESOURCES

In this section the impact of the proposed development of the G14 pipeline on the site that was identified in the proximity to the footprint area will be calculated.

7.1 Risk Calculation for the Impact of the Proposed Development on Site FHL001

As shown above, the site is located in very close proximity if not directly within the proposed pipeline route. In this section the impact of the proposed pipeline development on site FHL001 will be established.

$$\text{Impact Risk} = \frac{(\text{Significance} + \text{Spatial} + \text{Temporal})}{3} \times \frac{\text{Probability}}{5}$$

$$\text{Impact Risk} = \frac{(3 + 2 + 3)}{3} \times \frac{4}{5}$$

IMPACT RISK = 2.13

Table 10: Risk Calculation for Development Impact on Site FHL 001

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	Medium	Study Area	Medium-Term	Very Likely	Moderate
Impact on FHL 001	3	2	3	4	2.13

This calculation has revealed that the impact risk of the proposed development on site FHL 001 falls within Impact Class 3, which represents a Moderate Impact Risk. As a result, mitigation measures would be required.

8 MITIGATION MEASURES AND GENERAL RECOMMENDATIONS

8.1 Mitigation measures required for identified heritage sites

An impact risk calculation was undertaken on the expected impact of the proposed G14 pipeline development on the identified historic midden site, which indicated that the proposed development of the pipeline poses a Moderate Impact Risk to FHL001. The following mitigation measures are therefore required:

- A permit application must be lodged with the South African Heritage Resource Agency to allow for the disturbance to an archaeological site.
- Archaeological monitoring during construction activities in the general proximity to the site.

8.2 General recommendations

Furthermore, the South African Palaeontological Sensitivity Map of SAHRA indicates that the proposed pipeline development is located in an area classified as Blue (Low Significance) and as a result “*no palaeontological studies are required however a protocol for finds is required*” (www.sahra.org.za). As a result, a paleontological protocol must be written by a professional palaeontologist.

9 CONCLUSIONS

PGS Heritage was appointed by Enkanyini Projects to undertake a Heritage Impact Assessment (HIA) for the proposed development of the G14 Pipeline by the Rand Water Board between Forest Hill and Turffontein Nek, Southern Johannesburg, Johannesburg Metropolitan Municipality, Gauteng Province.

This Heritage Impact Assessment follows on a Heritage Scoping Assessment conducted by PGS Heritage for Enkanyini Projects. The study commenced with an archival and historical desktop study that was used to compile a historic layering of the study area within its regional context. A historic overview of the study area and surrounding landscape was compiled which indicates that the study area is located within an area with a rich and diverse heritage. The historic overview has also provided some information on the urban historical context of the direct surroundings of the study area as well as a brief history of the utilisation of this general area by the Rand Water Board for infrastructural development including the Forest Hill Reservoirs. The desktop study also included an assessment of four historical maps which clearly show the development of the area through time as well as previous assessments that have been conducted in the area in the past. The past research in the surrounding area provides further evidence for the rich archaeological and historical heritage of the surrounding landscape including Late Iron Age stonewalled sites, historic farmsteads and buildings as well as cemeteries.

A detailed walkthrough of the study area was conducted during the Scoping Phase, during which the following heritage sites and heritage concerns were highlighted:

- Historic midden material was identified on the surface of an area where the proposed pipeline will be built. The material identified here includes glass and imported ceramic fragments. Some

of the glass fragments could be identified as sections of a mineral water bottle (codd type) belonging to the mineral water manufacturer known as *A. Kan and Company* which operated between 1904 and 1910 (Lastovica & Lastovica, 1990).

- The proposed G14 pipeline entails the replacement of an existing pipeline that was installed in 1936. It is evident therefore that the original pipeline is older than 60 years as well. However, as the pipeline in itself is of no heritage significance, no further discussion on impact risk and mitigation were undertaken on this matter.

An impact risk calculation was undertaken on the expected impact of the proposed G14 pipeline development on the identified historic midden site, which indicated that the proposed development of the pipeline poses a Moderate Impact Risk to FHL001. The following mitigation measures are required:

- A permit application must be lodged with the South African Heritage Resource Agency to allow for the disturbance to an archaeological site.
- Archaeological monitoring during construction activities in the general proximity to the site.

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage sites located during the fieldwork do not necessarily represent all the heritage sites present within the area. This may be due to vegetation or the fact that archaeological sites can be found in subterranean contexts with no evidence for the presence of such archaeological sites on the surface. Should any such heritage features or objects not included in the inventory be located or observed, a heritage specialist must immediately be contacted. Such observed or located heritage features and/or objects may not be disturbed or removed in any way, until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well.

Furthermore, the South African Palaeontological Sensitivity Map of SAHRA indicates that the proposed pipeline development is located in an area classified as Blue (Low Significance) and as a result “*no palaeontological studies are required however a protocol for finds is required*” (www.sahra.org.za). The following will have to be compiled during the mitigation phase before construction commences:

- **A paleontological protocol must be written by a professional palaeontologist and included in the EMP.**

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Google Earth

All the satellite depictions used in this report are from Google Earth.

