TOPOGRAPHY & VISUAL INPUT FOR THE SASOL ASH BACKFILLING PROJECT

SASOL MINING (PTY) LTD

OCTOBER 2013

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Report Title: **TOPOGRAPHY & VISUAL INPUT FOR THE SASOL ASH BACKFILLING PROJECT**

Project Number: **SAS1691**

Name	Responsibility	Signature	Date
Andy Pirie	Report Writer		October 2013
Bradly Thornton	Reviewer		October 2013

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1 INTRODUCTION

The ash backfilling project is located in the Metsimaholo Local Municipality in Free State Province directly west of the town of Sasolburg (Figure 2, Appendix A)

Sasol Mining (Pty) Ltd ("Sasol Mining") intends to backfill underground mining voids at their defunct Sigma Colliery with an ash slurry in order to stabilise old underground mine workings and reduce the risk of subsidence. Sigma Colliery commenced operations in 1952 holding mineral rights to coal deposits in the Sasolburg district. Underground mining methods were the primary method of extracting these reserves including board-and-pillar, rib pillar, long wall and high extraction methods. Underground mining was scaled down and ceased by 1999.

As a result of the underground mining activity, subsidence of the surface was identified as a major risk. An Assessment Report on Surface Areas of Old Sigma Workings was compiled in 2012 and analysed the probability of incident occurrence on the Sigma working properties, their current preventative or migratory measures, the proposed next steps and immediate actions required. This Report informed that some properties / areas, such as the Parys road (R59), are rated as a very high risk due to incidences which can lead to possible injury. Sigma Colliery backfilled mine workings located beneath the Sasolburg-Parys Road (R59) and certain privately owned farms to minimise the risk in the area.

This project is aimed at backfilling additional high risk mine voids with ash from Infrachem. The project will be undertaken in order to stabilise old underground mine workings which are deemed to have a high potential risk for land subsidence. The ash backfilling process will utilise several pipelines located above-ground to transport the ash slurry (comprising 20% fine ash and 80% water) from the Sasol Ash pump station at Infrachem, to the mine out voids areas.

2 SCOPE OF WORK

A full topography and visual assessment was not deemed necessary due to the proposed pipeline routes being located in an already disturbed landscape. The scope of work was therefore a desktop study to provide input for the EIA.

3 METHODOLOGY

At a desktop level, aerial photography was analysed to characterise the landscape and to identify potential visual receptors. A Digital Elevation Model (DEM) with a spatial resolution of 5 m was created using ArcGIS 3D Analyst Extension, with 1 m and 5 m contour relief data as inputs. The resultant DEM was used as input to create slope and viewshed models. The viewshed model was created in order to establish the degree of visibility that the proposed pipeline is likely to have. The viewshed model was run on a 1 m pipeline height, and did not account for vegetation and manmade structures which may conceal the pipeline from visual receptors. Findings for the Topography and Visual Assessment (T&VA) are discussed in terms of:

- Topography;
- Sense of place;
- Visual Absorption Capacity (VAC);
- Visibility and visual receptors;
- Visual exposure; and
- Visual intrusion.

Lastly, recommendations are provided to mitigate the visibility of the proposed pipeline.

4 FINDINGS

4.1 Topography

The landscape is dominated by maize, wheat and livestock farming in the central, western and southern areas; urban built-up areas to the east and previous mining activities to the north and east (Figure 3, Appendix A). The general topography of the landscape in which the proposed pipeline is located can be described as undulating and sloping towards the Vaal Barrage (Figure 4, Appendix A).The DEM and slope model indicated that mining activities have significantly altered the topography and surface water flow in the north and east (Figure 4 and Figure 5, Appendix A). Two gradual valleys carrying the Leeuwspruit and Rietspruit streams, run parallel to each other in a south-east north-west direction towards the Vaal River. Elevation within these river valleys varies from around 1430 m at the valley bottoms to 1490 m at the valley tops. Slopes are mostly flat across the landscape except for isolated pockets of steeper slopes along the banks of the Vaal Barrage and where mining activities have taken place (Figure 5, Appendix A).

Years of underground mining at the Sigma Colliery has resulted in large subsided areas with the potential of further subsidence occurring in the future. Ash backfilling along the R59 near Sasolburg has yielded positive results in stabilising the topography (ARQ, 2003). Subsidence is a risk to households, farmers, heritage resources and the environment. Ash filling the underground voids is therefore expected to have a positive impact on the topography of the landscape.

4.2 Sense of Place

According to Lynch (1992), sense of place "is the extent to which a person can recognise or recall a place as being distinct from other places – as having a vivid, unique, or at least particular, character of its own".

The landscape is typical of the South African Highveld with gradual rolling hills and valleys dominating the landscape. Old mining activities, agriculture, and industrial buildings encapsulate the landscape evoking a feeling of a landscape that has largely been disturbed. The landscape can be described as ordinary with a weak sense of place.

Figure 1: Landscape of the northern section of the proposed pipeline

4.3 Visual Absorption Capacity (VAC)

The Visual Absorption Capacity (VAC) is the potential of the landscape to conceal the proposed project as a result of topography, vegetation or synthetic features (Oberholzer, 2005).

The primary land cover of the region is maize and wheat crops with interspersed secondary grassland. Trees are present around most buildings in the landscape which have a potential high VAC. The general VAC of in the region is low, however, the undulating topography of the region can be considered as having a moderate to high VAC. Overall, the VAC of the landscape is moderate and will conceal the proposed pipeline to a certain extent.

4.4 Visibility, Visual Receptors and Visual Exposure

The visibility of a project is the geographic area from which a project or object is visible (Oberholzer, 2005) and is illustrated by the viewshed model (Figure 6, Appendix A). The viewshed model only considered the topography of the area and did not take into account vegetation or manmade structures that may potentially conceal the pipeline. The viewshed model can therefore be considered a worst case scenario and assumes that the entire pipeline will be present in the area for the duration of the project, even though the pipeline will be constructed in sections.

Visual exposure is the relative visibility of a project or feature in the landscape (Oberholzer, 2005). Visual exposure of objects decreases exponentially as the distance between visual receptors and the object of visual concern increases. Visual exposure is anticipated to decrease dramatically as one moves further away from the pipeline, as the pipeline is relatively small in diameter (300 mm) with a height of 1 m above the ground. The visual exposure is expected to be in the order of the following:

- High between 0 – 50 m;
- Medium to high between 50 – 100 m;
- Medium between 100 – 200 m; and
- Low between 200 m – 500 m.

The viewshed indicated that the proposed pipeline may potentially be seen by a number of visual receptors. These include houses and holiday homes located towards the north and north-west, farm houses in the west, and a school and Sasolburg residents in the east. Furthermore, the R59 being a major road connecting the N1 to Sasolburg could potentially be visually impacted upon.

The visual exposure of the pipeline is expected to be low to negligible on the houses and holiday homes in the north and north-west as they are located more than 250 m from the pipeline, with most being concealed by trees. Farm houses in the west are expected to have a medium to high exposure, while motorists travelling along the R59 will experience close up views and high visual exposure. Sasolburg residents and the school are likely to receive a low to negligible visual exposure as trees are present on the periphery of the town and school.

4.5 Visual Intrusion

Visual intrusion is the level of compatibility or congruence of a project with the particular qualities of the area, or its 'sense of place' (Oberholzer, 2005).

Due to the proposed pipeline being located in a disturbed landscape, with existing pipelines and infrastructure present, it is expected that the proposed pipeline will have a low visual intrusion on the surrounding landscape.

5 RECOMMENDATIONS AND MITIGATION MEASURES

In terms of topography, it is recommended that ash backfilling takes place. The Sigma Colliery area has subsided and it is expected that ash filling the underground voids will stabilise the topography and have a positive effect as long as it is undertaken with the methodology as proposed by IGS in their Sigma Underground Mine: Proposed Backfilling Methodology report (IGS, 2013).

In terms of visual, it is recommended that reflective pipe fittings should be avoided as far as possible. It is further recommended that the height of the pipeline should not be increased beyond 1 m. Increasing the height of the pipeline will result in the pipeline becoming more visible in the landscape. Lastly, vegetation on either side of the cleared pipeline route should be left intact beyond the fire break. Vegetation is one of the best mitigation measures to conceal infrastructure and will greatly reduce the visibility of the pipeline.

6 REFERENCES

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Appendix A: Maps

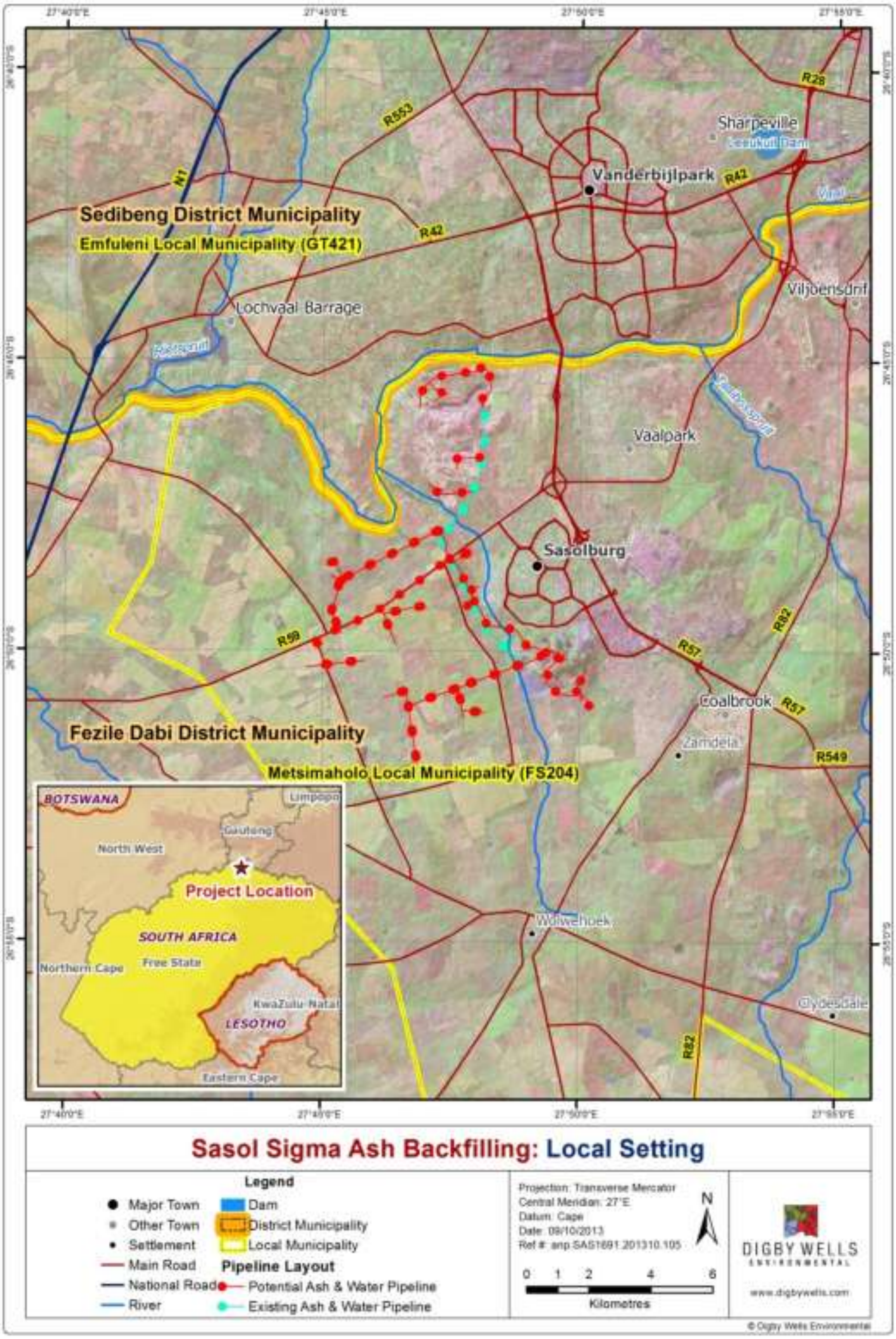

Figure 2: Local setting

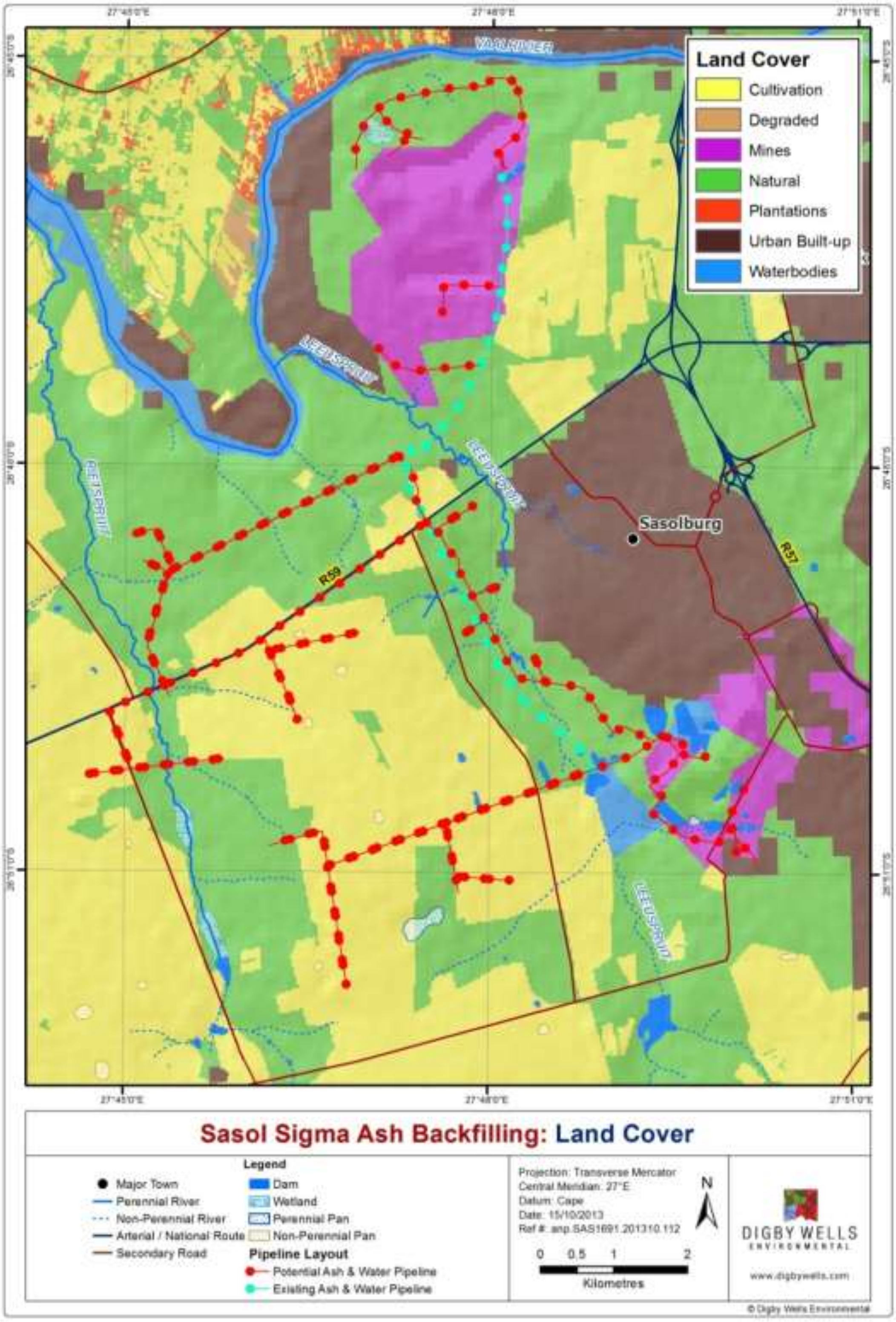

Figure 3: Land cover

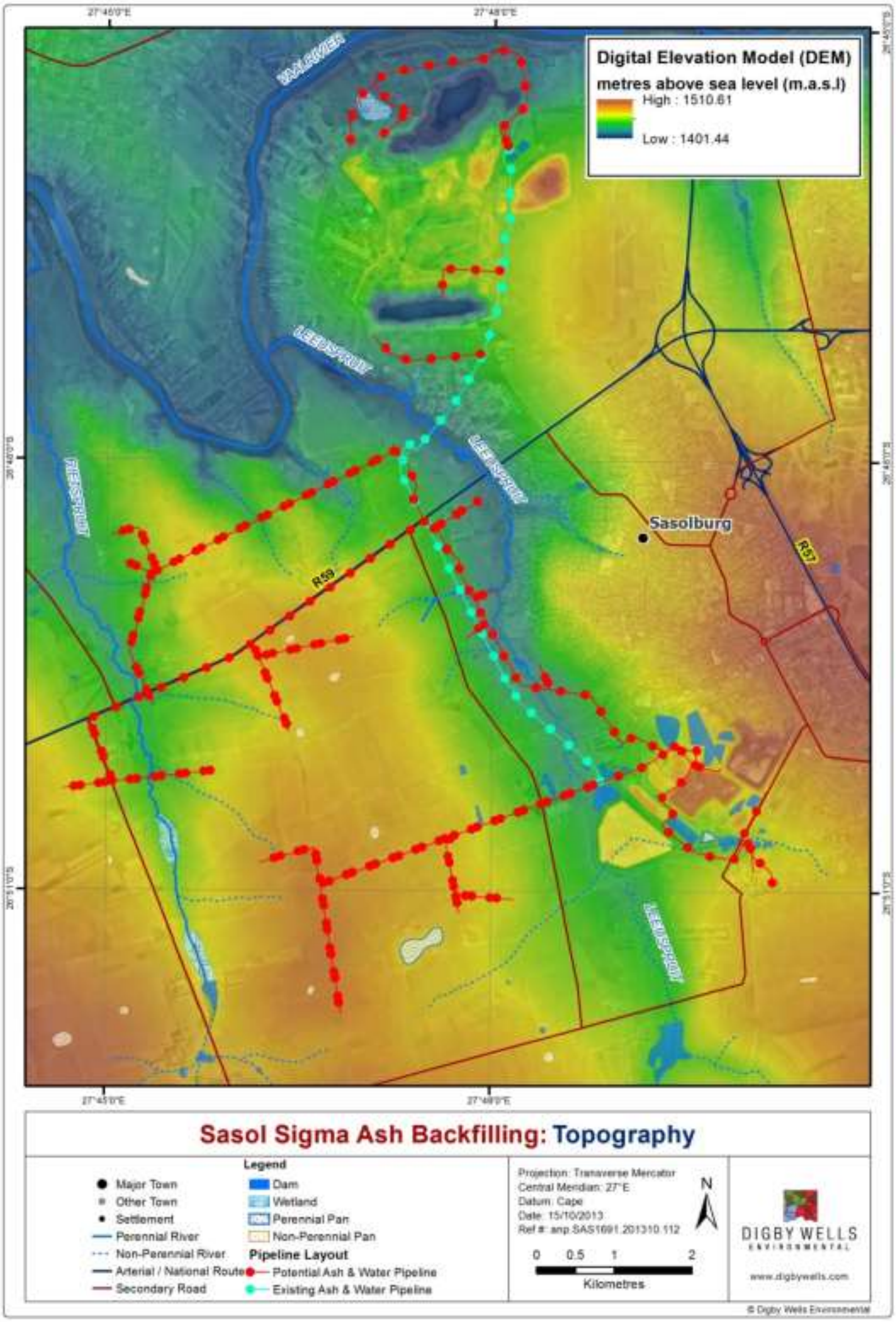

Figure 4: Topography

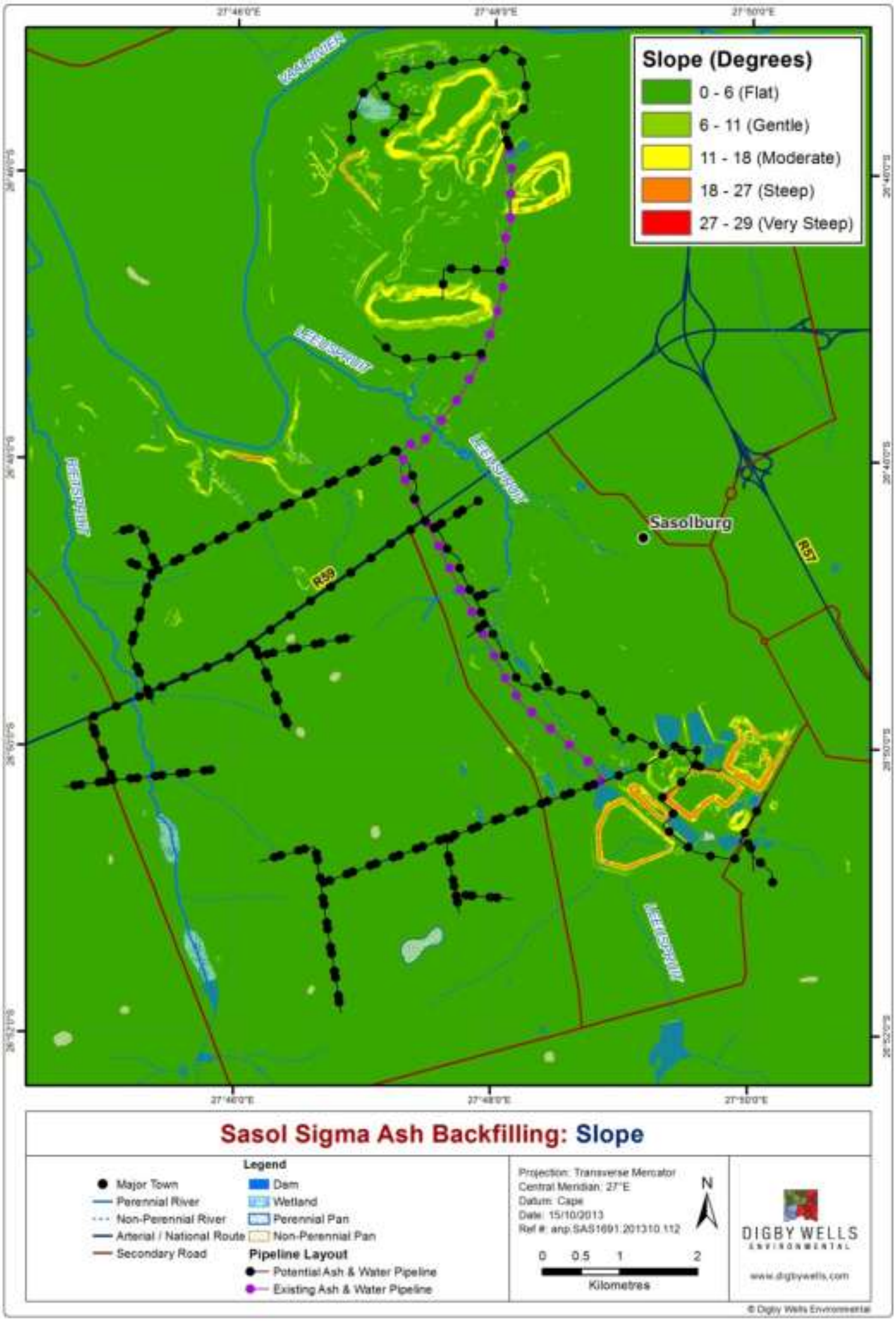

Figure 5: Slope

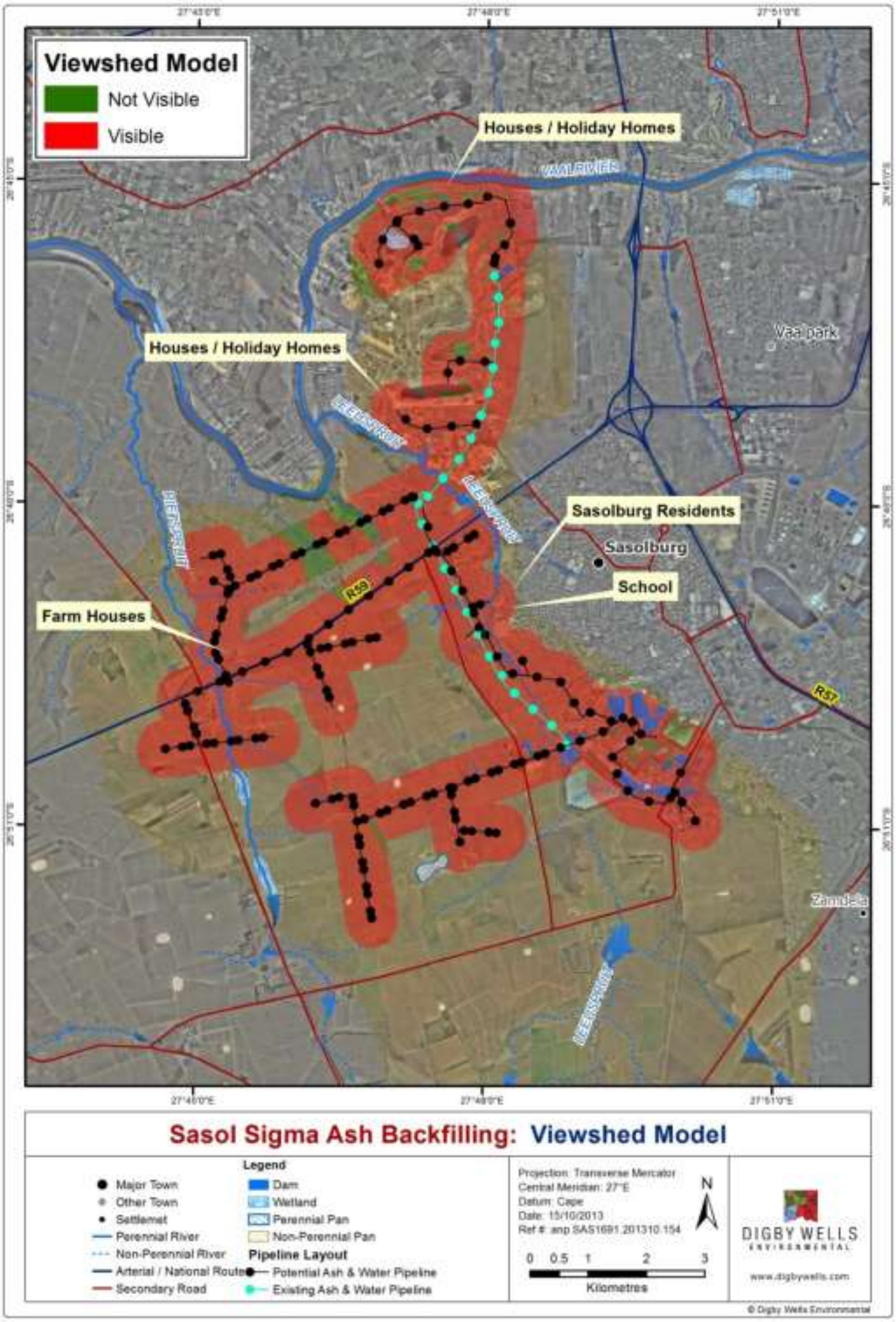

Figure 6: Viewshed model