

Figure 2.1 Job-housing disparity for the Johannesburg (City of Johannesburg Metropolitan Municipality 2016)

CHAPTER TWO

Introduction

This chapter aims to form an understanding of the Robinson Deep mine tailings site within the larger spatial context for the development of an urban framework. The site opportunities and constraints will then be identified in terms of the urban framework and site analysis.

2.1 Urban analysis

According to the Johannesburg Spatial Development Framework (JSF) of Johannesburg for 2040, the City of Johannesburg has numerous urban issues. From these, a few problems were identified as applicable to the specific area and site (City of Johannesburg Metropolitan Municipality 2016).

1. Fragmented urban sprawl,
2. Pressure placed on the natural environment,
3. The housing and job mismatch (Figure 2.1),
4. Inefficient residential density and inefficient land use diversity.

2.1.1 Urban issues

“The apartheid practices of planning and urbanisation have led to the development of a spatial structure with many shortcomings.” (City of Johannesburg Metropolitan Municipality 2016:26). See Figure 2.2.

Urban sprawl in Johannesburg is due to apartheid planning, by placing most of the population on the city’s peripheral. So, too, has the post-apartheid era generated a car-orientated development. This has, in turn, lead to higher household and services costs (City of Johannesburg Metropolitan Municipality 2016). See Figure 3.2.

One of Johannesburg’s identifying characteristics of the development pattern is the job-housing mismatch. Formal jobs in Johannesburg are scattered in an area of approximately 75% of the urban area and are an asset for the city centre. However, residential density, especially for lower income housing, is on the outskirts of the urban

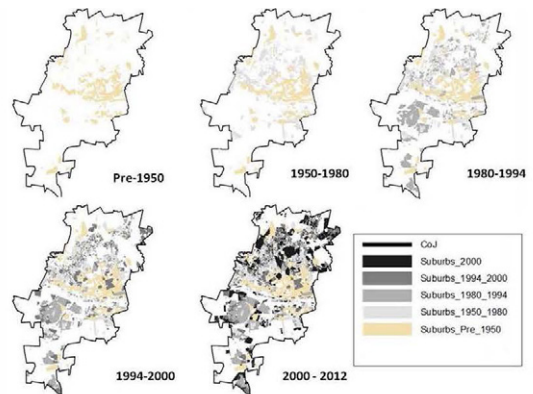


Figure 2.2 Urban sprawl over time (City of Johannesburg Metropolitan Municipality 2016)

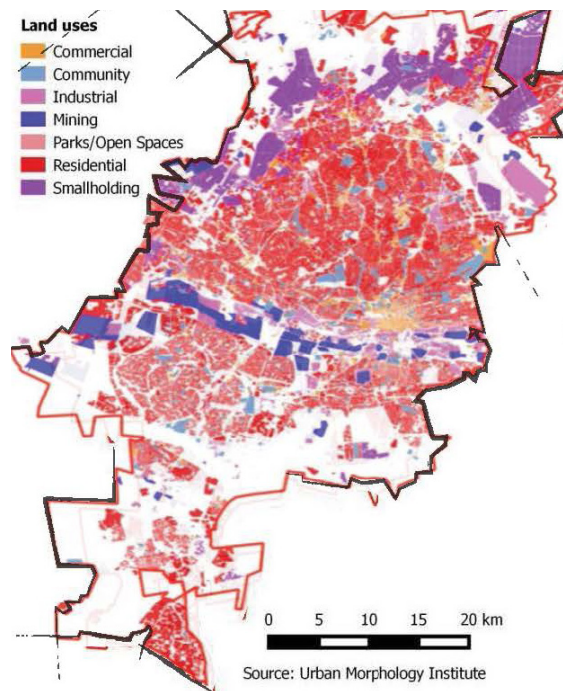


Figure 2.3 Land use diagram of Johannesburg (City of Johannesburg Metropolitan Municipality 2016)

area due to cheap, available land (City of Johannesburg Metropolitan Municipality 2016). See Figure 2.3.

2.1.2 Ecological issues

The south of Johannesburg is predominantly an industrial area with large derelict mine residue sites or tailings sites. These sites, as seen in orange in Figure 2.4, lie south of the M2 freeway and within the Klip River catchment (McCarthy et al 2007). The Klip River catchment is an important contributor in the socio-economic sector of the area. Industries include compost farming, irrigation of agricultural fields, and water recycling, with the Olifantsvlei and Bushkoppies sewage treatment works

discharging treated water into the wetlands. Recent studies have determined that this important wetland system is degrading due to heavy metals settling out and damaging unique and important species. The heavy metals are traced back to the mining activities and mining belt in the south of Johannesburg (McCarthy et al 2007). These tailings sites are poorly managed and result in non-compliance with general mine closure regulation. The sites lack signage to warn against the possible risk of these sites and inadequate storm water management leads to polluted water flowing to other areas. Accountable stakeholders abandoned these sites or companies declared insolvency in order to avoid the

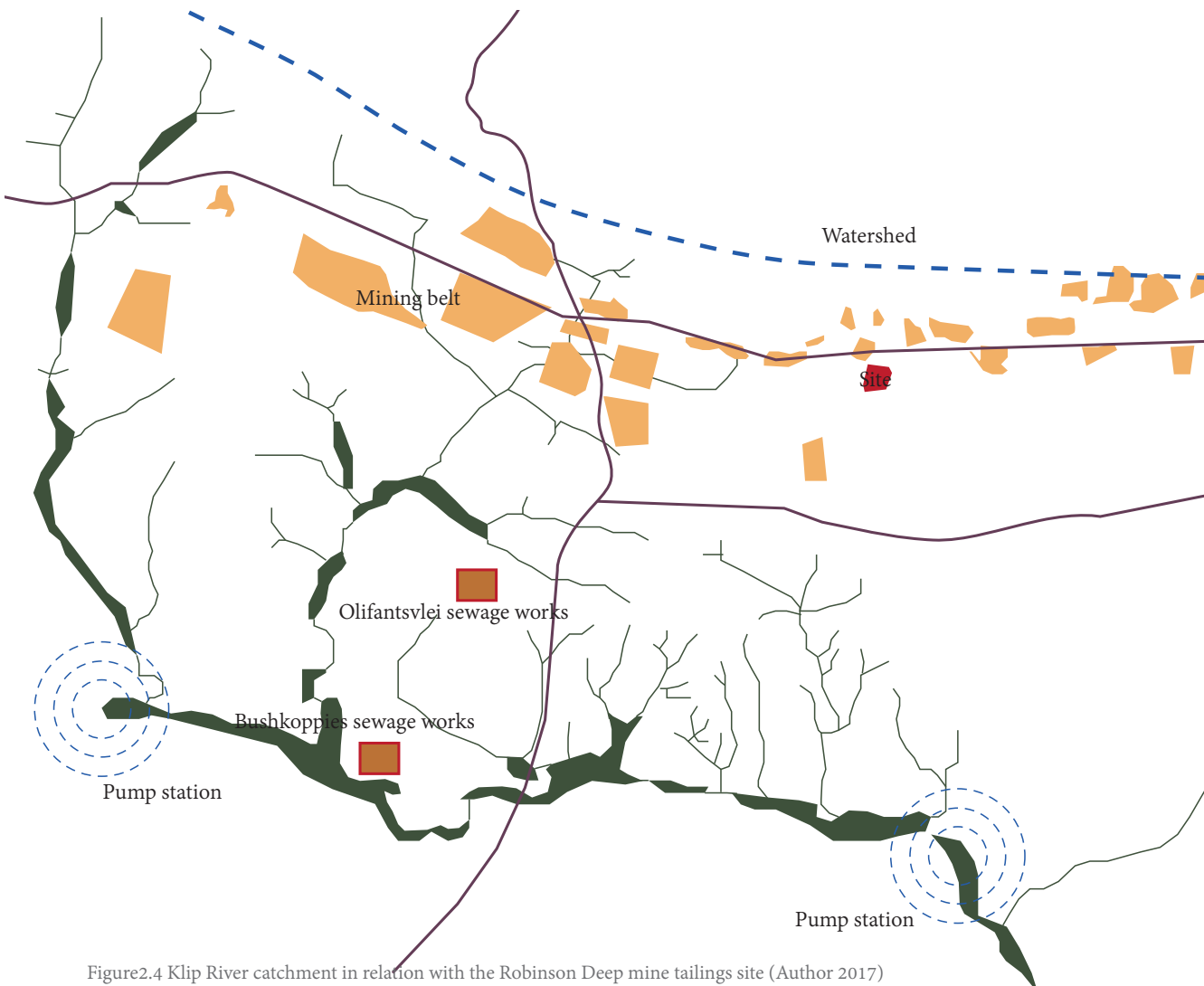


Figure 2.4 Klip River catchment in relation with the Robinson Deep mine tailings site (Author 2017)

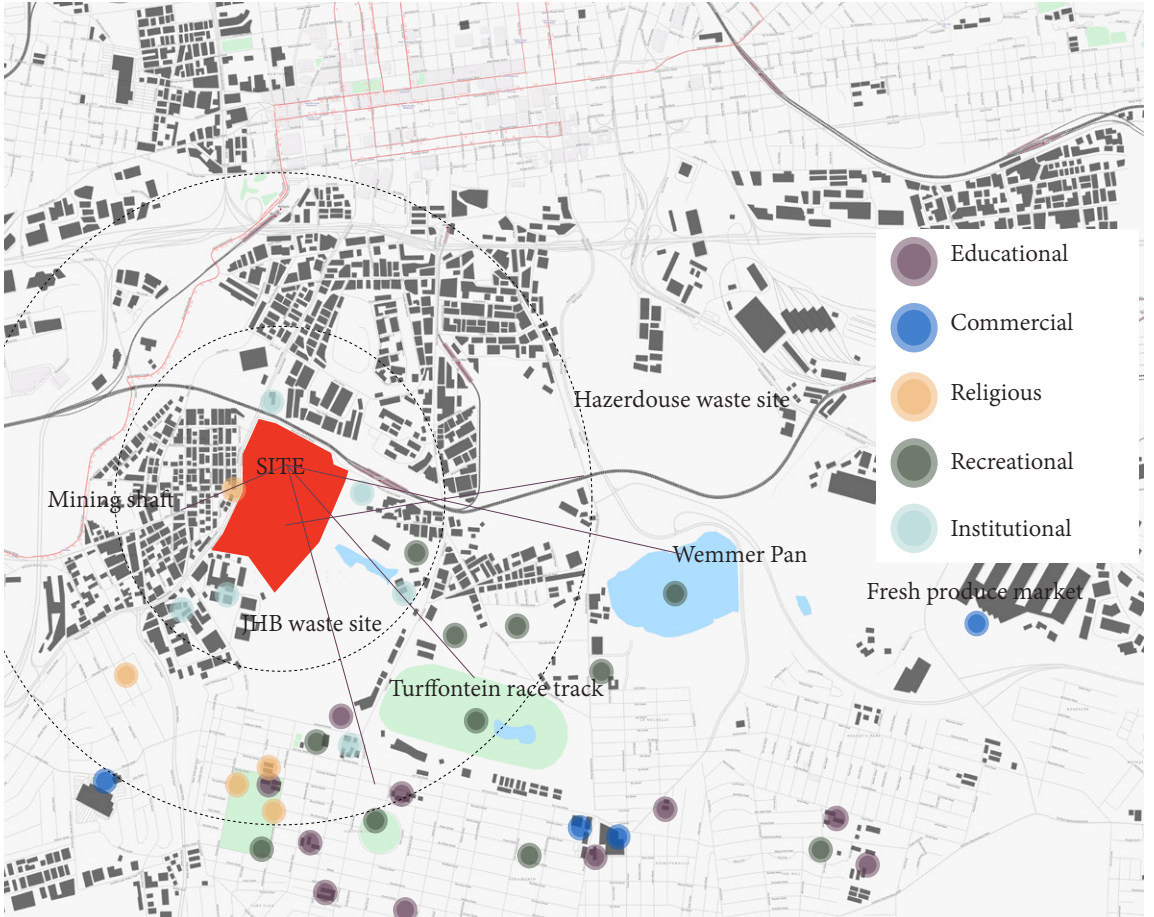


Figure2.7 Proximity of site to other important nodes (Author 2017)

2.2 Site Analysis

financial obligations of mine closures (Liefferink 2017). According to the Johannesburg Spatial Framework 2040 (JSF), the mine residue areas in the south of Johannesburg offer an opportunity to be developed into an east-west corridor as shown in Figure 2.6 (City of Johannesburg Metropolitan Municipality 2016). The site identified for this study lies south of the CBD next to Booyens Road and is centrally located in the mining belt. It covers an area of approximately 36 hectares. See Figure 2.7.

Known as the Robinson Deep mine site, it is located at the junction of the Opium, Booyens and Turffontein suburbs. The current surrounding land uses include industrial, commercial, residential, institutional and recreational.

The man-made nature of the site and the processes that formed it created a changing landscape in terms of the land form. As seen in Figure 2.8, older land forms are visible on previous aerial photos of the site and, with newer landforms created by illegal dumping or new

mining waste brought to the site, the processes involved in forming the site are variable and ongoing.

The potential for the site to be rehabilitated with the use of eco-systems services is recognised with the existing water bodies present on site. The transportation node just north of the site provides a portal for users from other locations. Furthermore, the proximity of the site to the CBD, makes this site ideal for future development, including habitation.

The site exhibits stable zones on marginal areas as shown in Figure 2.8 to the east and south, which is also the only area with permanent vegetation. However, the vegetation is predominantly invasive, including Eucalyptus and pampas grass. Its management should adhere to the National Environmental Management Act of 107 of 1998. In the case of Eucalyptus species in urban areas, according to its invasive classification of 1b, landowners bear no responsibility to remove the tree. If the trunk circumference is more than one metre it is preferred that the tree remains (Invasive Species South

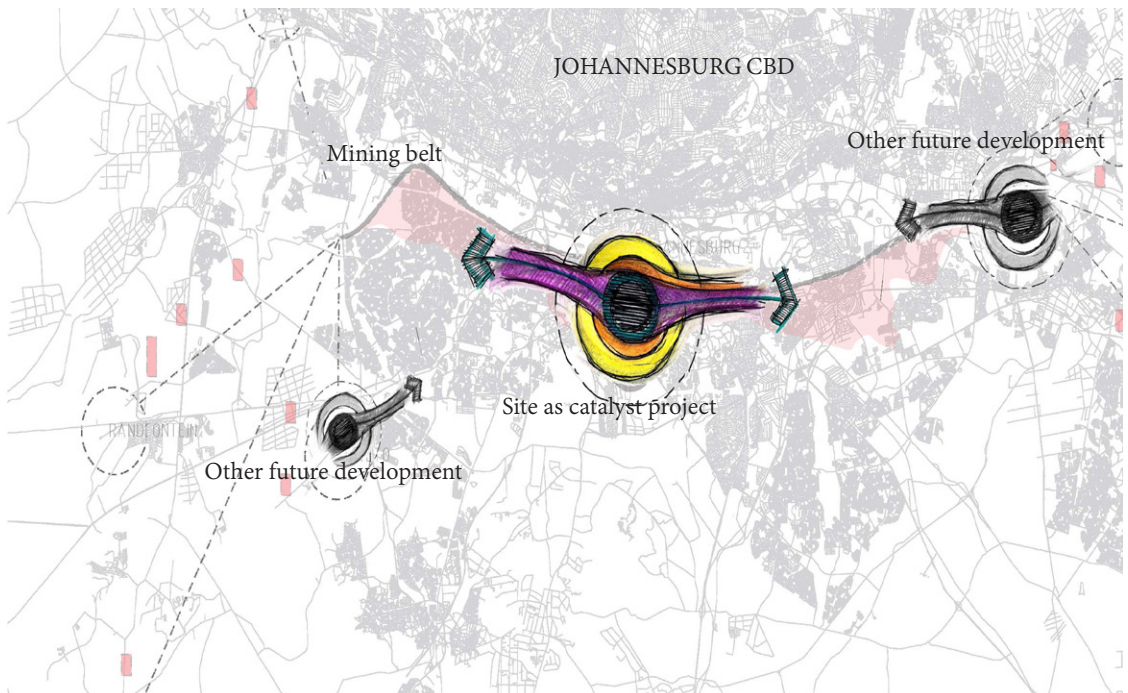
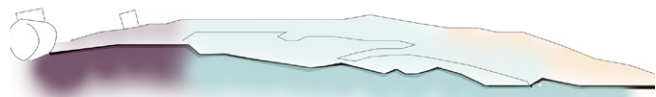


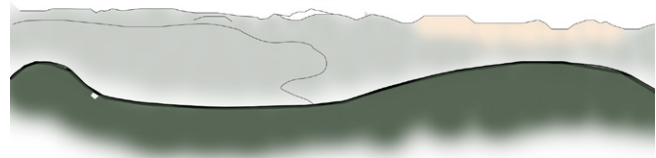
Figure 2.6 Proposed activation of mining-belt (De Villiers, 2017)



View 1



View 2



View 3

Original land form



Processed land form



Residual land form



Beautiful land form



Figure 2.8 Land form of existing heaps (Author 2017)



Figure 2.9 Pampas grass on the left and Eucalyptus on site (Author, 2017)

Africa 2017). The Eucalyptus species does, however, prohibit undergrowth and smaller specimens could be removed and the wood sold or re-worked. Pampas grass, *Cortaderia selloana*, is also found on site. This is also a Class 1b invasive. It does bear health risks caused by the inflorescence that flowers from February to April. The pollen is a silica-like substance and, when inhaled,

may cause respiratory problems (Invasive Species South Africa 2017). It is recommended that these species be removed off site and properly destroyed.

There is also a working PPC depot on site that is utilising the toxic material on site for premix. This business is an opportunity to expand on for the urban area.

“A city’s life comes from its connectivity -Dupuy (1991)”

2.3 Urban development: Re-connecting

(Salingaros 2003:2)

Based on the concepts of Corridors of Freedom and a Polycentric City as identified in the Johannesburg Spatial Development Plan for 2040, an urban framework was developed in this study for the Robinson Deep site.

Corridors of Freedom (CoF) is based on Transit-Orientated Development (TOD). This TOD, in summary as coined by (Calthorpe 1992), is a development that focuses on higher residential density supported by commercial, office and recreational spaces (City of Johannesburg Metropolitan Municipality 2016).

A Polycentric City is a city model where the CBD is supported by sub-metropolitan centres with connecting transport arteries. These arteries are well serviced and edged by high-density residential and commercial properties (City of Johannesburg Metropolitan Municipality 2016).

From this information, it was identified that the site

may be developed as a principal sub-metropolitan centre as shown in Figure 2.10, well connected with different transport mediums. This urbanisation of the site will support the current city centre as a new business district. The Booyens Station was also recognised in the Turffontein Spatial Development Framework as a potential transportation hub (City of Johannesburg Metropolitan Municipality 2016). However, this study proposes that the existing transportation infrastructure be extended onto and past the site and to include the Gautrain line and Bus Rapid Transport (BRT) bus routes with a station and bus stop approximately central to the site. This will aid in “new” feet travelling to and through the site.

Multi-zoned development will assist in alleviating the current mismatched job-housing development, identified as one of the main issues associated with Johannesburg urban areas (City of Johannesburg

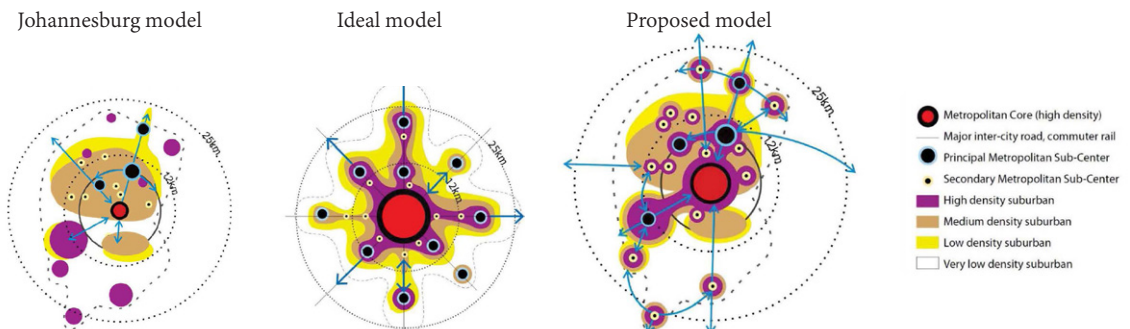


Figure 2.10 Polycentricity model : Current Johannesburg scenario, ideal model and proposed model (City of Johannesburg Metropolitan Municipality 2016)

Metropolitan Municipality 2016). An additional 5 000 to 7 000 people may reside within the 36-hectare (ha) area with a possible 10 000 commuters per day that travel to and from the transit development on site. A planned 7,5-ha recreational area located along the eastern edge of the site will also be partly utilized by the proposed water purification system. This system will reduce the acid mine drainage and treat the toxic soil so that the proposed urban vision is feasible. The recreational space will act as threshold space for the landfill reserve area. The urban vision is foreseen to be implemented in three main phases as follows;

3.3.1 Phase one – Stockpiling (approximately 1-5 years)

In phase one, it is foreseen that a majority of the material on the southern side of the site will be excavated to an estimated depth of 500mm and stockpiled on the northern part to facilitate an INCO Sulphur dioxide leaching process supported by a constructed wetland as described in Chapter 3. This process will leach out cyanide and the heavy metals on site to be disposed of in the hazardous waste site a kilometre north of site. The cleaned stockpiled material will be removed over time by the existing PPC depot for the use in premises. In addition, the extension of the facilities is proposed to provide a brick making facility that will supply the future development on site. The establishment of erosion controls on the southern part of site will be implemented in conjunction with the excavation for the stockpiling to ensure the control of dust and erosion. The use of berms and G-tech grids for the establishment of indigenous grass as erosion control is proposed.

The pampas grasses will also be eradicated at this stage and discarded at the bio-hazardous site two kilometres

north of site. The eradication of the pampas grass will not be done in the flowering months to ensure that the seeds are not spread across site.

3.3.2 Phase two – Establishment of buildings (Approximately 5-15 years)

The first building development is proposed to occur on Booyens Road in conjunction with the establishment of the main vehicular routes on site. The edge development will be predominantly commercial and light industrial to establish work opportunities for individuals residing in the area. The establishment of a skills development centre will feature a nursery and building skills training for individuals. The INCO Sulphur dioxide leaching process will continue on the now smaller stockpile heap. The proposed routing of the BRT to an onsite transit hub that includes a market space, which will attract users to the site. The site now features a skills development centre, commercial activities, and a recreational park.

The Eucalyptus species on site under the one-metre circumference will be removed and the wood will be used in the skills development centre. The Eucalyptus plantation will be replaced by endemic pioneer species as space becomes available.

3.3.3 Phase three – Principle Metropolitan Robinson Deep Sub-centre (15-45 years)

In this phase, the remaining residential and commercial buildings are to be erected. The purpose of the INCO Sulphur dioxide leaching system and wetlands will be to supply the irrigation needs for the park. The cleaning of top-up water for the system will come from a mining shaft, one kilometre west of the site.

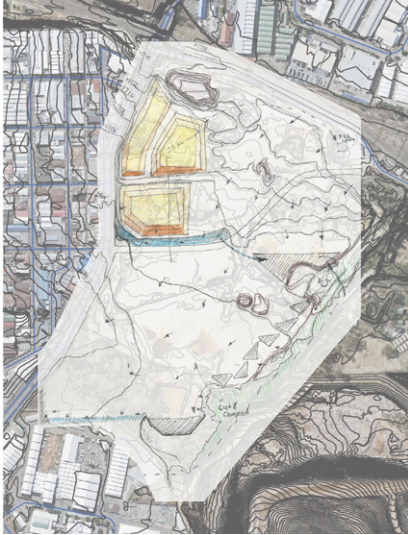


Figure 2.11 Phase one - Stockpiling (Author 2017)



Figure 2.12 Phase two - built form (Author 2017)



Figure 2.12 Phase three - Principle Metropolitan Robinson Deep sub-center (Author 2017)

2.4 Site possibilities

According to the Council for Scientific and Industrial Research (CSIR), a minimum requirement of 0,5 hectare of recreational space per 1000 people is needed in urban areas (City of Johannesburg Metropolitan Municipality 2016). The highlighted area, as seen in Figure 3.12, is approximately 7 ha which can cater for 14 000 people and is in excess recreational space that can carry other neighboring developments. The landfill reserve to the south-east side of site is foreseen to be a closed off reserve where an entrance fee will contribute to the maintenance and security of the reserve.

The proximity of the site to the urban edge may have mutual benefits. According to Diane E. Pataki, urban green spaces reduce greenhouse-gas emissions, remove air and water pollutants, cool local climate and

improve public health (Pataki 2011). The use of eco-service systems will help to reduce the negative effects of urbanisation for a healthier urban area. So, too, will the commercial planned activities on the urban edge stimulate passive surveillance within the park and bring “feet” to the park.

A ridge present on site to the eastern side creates a visual boundary and acts to scale down the landfill heap. This ridge is also seen as a possible connector from the current train station to the site. The patterns on site that have been formed by various processes, such as the movement of pedestrians, weather patterns, and previous slurry dams, are evident in all aspects of site as seen in Figure 3.12.

2.5 Conclusion

The area, see Figure2.12, now referred to as the site, lends itself, in its synthetic nature, to the idea of process and pattern. It is observed that pattern can be generated by a variety of methods, be it natural form, man-made or a combination of the these to create a striking landscape.

The cleaning of the site and those processes are proposed to happen within the site and form part of the threshold/ recreational space planned for the proposed urban vision.



Figure2.13 Ridge on site (Author 2017)