ISCOR
Flat steel

ISCOR VANDERBIJLPARK STEEL

ENVIRONMENTAL MASTER PLAN

SPECIALIST REPORT

LAND USE AND LAND CAPABILITY

BY

VAN RENSSEN & FORTUIN
CONSULTING ENGINEERS

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DOCUMENT IVS/SR/032
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MASTER PLAN SPECIALIST REPORT: LAND USE AND LAND CAPABILITY

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EXECUTIVE SUMMARY

Iscor Vanderbijlpark Steel (IVS) is situated within an area zoned as industrial type 2. This zoning type permits industrial activity, together with the disposal of residue generated as a result of that activity. IVS comprises of an area of approximately 2451 ha.

To the north-west and north-east of the Works are the Cyferpan and Kiewiet Areas. Cyferpan was historically an area in which sunflowers and mielies were cultivated. Within the Kiewiet area effluent irrigation was practised, borrow pits were developed and there was a shooting range. These activities have all ceased. The Cyferpan and Kiewiet areas have been joined by a strip of land to the north of Dams 1-4. This combined area, of approximately 780 ha, is now utilised for the farming of game.

This pastureland is managed by Ferroland, and Black Wildebeest, Springbok, Blesbok, Red Hartebeest, Zebra and Ostriches are farmed within this area. Both natural and planted (artificial) pastures have been established. The dominant soil types occurring in this area are the Hutton, Avalon and Bainsvlei forms. The stock watering provision within this area is supplied by means of small earthen dams. This combined area is fenced with an electrified two metre high 20-wire fence.

To the west of the Works area are the agricultural holdings of Rietkuil, Louisrus, Rosashof, Drakeville, Steel Valley and Linkholm. Historically these areas were agricultural small holdings. The zoning of the entire area to the west of the Works is classified as "undetermined". Although localised portions of this area have high agricultural potential the area as a whole is not suited for the cultivation of crops due to shallow effective soil depths, high clay content and the low mean annual rainfall. Large portions of these areas have been purchased by Iscor, and approximately 950 ha to the west of the Works is utilised for game and cattle farming. The game and cattle are farmed separately.

To the south and south-east of IVS is the NW7 industrial area. This area has the same zoning as IVS, namely industrial type 2. Bophelong and the town of Vanderbijlpark lie beyond this industrial area to the south.

The residential areas of Vanderbijlpark CW4 and Boipatong are situated to the south-east of the Works area. North of this, and adjacent to IVS, is a relatively large area zoned for

industrial, business and commercial activity. The remainder of the area to the north of this, apart from the South African Railway servitude into the Works, is zoned for agricultural use. To the north and north-east of the Works are areas zoned for places of education and brick-making activity respectively.

1. INTRODUCTION

Iscor is the largest steel producer on the African continent. The steel is produced at four steel mills, namely Vanderbijlpark and Saldanha (Flat Steel Products), Newcastle and Vereeniging (Long Steel Products).

During 1999 Ockie Fourie Toxicologists (OFT) were appointed by Iscor Vanderbijlpark Steel (IVS) to perform an environmental Master Plan study. Van Renssen & Fortuin Consulting Engineers (VRF) were subsequently appointed by OFT as sub-consultants to assist in the specialist fields of surface water, geo-technical investigations and land use and land capability assessments. This report provides the findings of the land capability specialist report.

The necessity for the land capability report stems from the need to evaluate the potential of various portions of IVS's property to sustain vegetation or agriculture. In addition to these aspects, it is necessary to ascertain the measures that should be applied to contaminated and polluted soils in order to rehabilitate them. There is no generic solution for the rehabilitation of soils and several options, applicable for different areas, need to be proposed.

The scope of work for this study is to:

- describe the soils in terms of the Taxonomic Soil Classification system;
- determine the existing and potential use of the soils in agricultural terms;
- determine the amelioration potential of affected soils;
- determine the vegetative rehabilitation potential and methodology where required.

It is essential that this document be read in conjunction with the other specialist reports to better understand the complexities and integration of environmental impacts and strategies at the Works. In addition to these specialist reports, an integration report and a summary report are available to provide the proper integration of the environmental issues relating to the Works.

2. METHOD OF ANALYSIS

2.1 Literature Review

The initial phase of the analysis involved the reviewing of studies and investigations performed at IVS in the past. A comprehensive list of the documents reviewed is provided in **Appendix 1**. This list provides the first phase of evaluation as to the relevance of the information in each of these documents to the Master Plan investigation. The brief notes in this appendix include references to any information, data or maps relating to the taxonomic soil classification system, agricultural potential, amelioration potential of affected soils and the vegetative rehabilitation potential of these soils.

2.2 Identification of Priority Areas

Various priority areas have been identified during the literature review phase of this project. These areas include:

- Kiewiet and Northern Veld Areas;
- Louisrus North and South;
- Linkholm, Steelvalley and Rietkuil;
- Cyferpan; and the
- Existing residue deposit.

These areas will be reviewed individually in this document. Initially an overview of the land use and zoning in and immediately surrounding IVS is provided. This is followed by a review of the regional plant types found within the area to the west of IVS.

3. LAND USE AND ZONING

Figure 1 is a map showing IVS, together with the immediately surrounding area. This map shows that IVS is zoned as industrial type 2. This zoning type permits industrial activity, together with the disposal of residue generated as a result of that activity.

To the north-west of the Works is the Cyferpan area. To the west of the Works area are the agricultural holdings of Rietkuil, Louisrus, Rosashof, Drakeville, Steel Valley and Linkholm. The zoning of all of these areas is classified as "undetermined".

To the south and south-east of IVS is the NW7 industrial area. This area has the same zoning as IVS, namely industrial type 2. Bophelong and the town of Vanderbijlpark lie beyond this industrial area to the south.

The residential areas of Vanderbijlpark CW4 and Boipatong are situated to the south-east of the Works area. North of this, and adjacent to IVS, is a relatively large area zoned for industrial, business and commercial activity. The remainder of the area to the north of this, apart from the South African Railway servitude into the Works, is zoned for agricultural use. To the north and north-east of the Works are areas zoned for places of education and brick-making activity respectively.

4. PLANT TYPES WITHIN VANDERBIJLPARK AREA

The grass types which occur naturally in this region are typically short and mixed.

Table 1: Natural Veld in farmlands west of IVS

Scientific Name	Common name (English)
Themeda triandra	No English name
Heteropogon contortus	Spear grass
Cymbopogon plurinodus	Narrow leaved turpentine grass
Elionurus muticus	Wire grass
Eragrostis chloromelas	Curly leaf
Cynodon dactylon	Couch grass

Most of the grass types in this area are perennial, but as a result of the activities of the previous land owners several annual grass types have been introduced to the region. These are listed in **Table 2**.

Table 2: Annual Grasses in farmlands west of IVS

Scientific Name	Common name (English)
Tragus berteronianus	Common carrot seed grass
Aristida congesta	Tassle three-awn or spreading three-awn grass
Chloris virgata	Feathered chloris

Trees that have been planted in the area include those listed in the following table:

Table 3: Trees in farmlands west of IVS

Scientific Name	Common name (English)
Eucalyptus globules	Bloekom
Many species	Populier
Acacia karroo	Soetdoring
Sophora japonica	Heuningpeul
Melia azedarach	Sering
Widdringtonia (x 3)	Seder
Pinus spp (x many)	Denne

Various poisonous plants are also found within this area, and these are listed in **Table 4**.

Table 4: Poisonous Plants in farmlands west of IVS

Scientific Name	Common name (English)
Nerium oleander	Oleander / Rosebay
Opuntia	?
Canna	Canna
Lantana camara	Lantana

The historically cultivated lands that have been converted to pastures, were established by planting the grasses listed in **Table 5**.

Table 5: Planted Pastures in farmlands west of IVS

Scientific Name	Common name (English)
Digitaria eriantha	Finger grass
Panicum maximum	Guinea grass
Panicum coloratum	White buffalo grass
Chloris gayana	Rhodes grass
Antephora pubescens	Wool grass
Eragrostis curvula	Wheeping love grass
Cynodon dactylon	Couch grass
Eragrostis tef	Teff
Eleusine coracana	Goose grass
Urochloa panicoides	Garden signal grass

The various priority areas will now be reviewed individually.

5. KIEWIET AND NORTHERN VELD AREAS

This area consists of the catchment area of Burnes Memorial canal, which has now been decommissioned, as well as the Kiewiet area. The Burnes Memorial canal was replaced by the Hattingh during 2001/2002. The two reports relevant to the land capability of this area were produced by Deon Kruger (Ferroland) and Envirogreen (1999d). The latter report is contained in **Appendix 2**.

The Kiewiet area is indicated in **Figure 1**. This figure also shows historic activities that occurred within the area. The Kiewiet area comprises of an area of approximately 385 ha. Surface water flows into the eastern and western catchments from this area since the watershed falls within it. Surface water is not managed within this area, and overland flow occurs through the pastures. Surface water exits the Kiewiet area at two points. The first is at the south-eastern extremity of the Kiewiet area, where the water passes under the access road leading to the Northern Gate of IVS (adjacent to the Frikkie Meyer Boulevard). Secondly, overland flow from the Kiewiet Area flows over the western boundary of this area into the CRMF.

The Kiewiet area is utilised as a pastureland for game farming, and is managed by Ferroland. Black Wildebeest, Springbok, Blesbok, Red Hartebeest, Zebra and Ostriches are farmed within this area. Within the Kiewiet area effluent irrigation was practised, borrow pits were developed and there was a shooting range. These activities have all ceased.

Both natural and planted (artificial) pastures have been established. The stocking ratio for the natural veld is one large stock animal per six hectares, while the stocking ratio for the planted pastures is one large stock animal per three hectares. The stock watering provision within this area is supplied by means of small earthen dams. During 2001/2002 the Kiewiet and Cyferpan areas were joined by a thin strip of land north of Dams 1-4. The combined area of the Kiewiet and Cyferpan areas is approximately 780 ha, and is fenced with an electrified two metre high 20-wire fence.

5.1 Taxonomical Classification System

The soils in the Burnes Memorial canal catchment were classified according to the Taxonomical Classification System for South Africa (Macvicar, 1991). The dominant soil forms in this area are the Glenrosa, Hutton, Avalon and Mispah forms. **Table 6** provides more details on the soil types.

Table 6: Dominant soil types occurring in the Northern Veld Areas

Soil Type	Diagnostic Horizons	Effective Depth
Glenrosa	Orthic A / Litocutanic B	< 300mm
Hutton	Orthic A/ Red Apedalic B / unspecified	> 300mm
Avalon	Orthic A / Yellow Apedalic B / Soft Plintic B	> 300mm
Mispah	Othic A / Hard Rock	< 300mm

The dominant soil types occurring in the Kiewiet area are the Hutton, Avalon and Bainsvlei forms. The location of the soil types within the northern veld and Kiewiet areas is shown in **Figure 2**.

5.2 Agricultural Potential

The Burnes Memorial catchment and the Kiewiet areas are impacted areas. This is due to historic effluent irrigation, seepage from the effluent evaporation facilities, and the deposition of various residues on the ground surface. The soils to not have any irrigation potential, and the effective soil depth for much of the area is relatively shallow. The ground is therefore not suitable for the cultivation of crops.

5.3 Amelioration Potential

The effluent irrigation within the Kiewiet area ended in 1982. The salts deposited in this area are being leached by rain water. The area has been established as a pastureland, and it is recommended that this land use is retained. In the Burnes Memorial catchment all material with contamination potential should be placed on lined surfaces, or dumped on the existing residue dump.

5.4 Vegetative Rehabilitation Potential

Agricultural lime and organic material can be incorporated into the soil in order to remediate it. The establishment of a mother crop (e.g. triticum sp) is recommended to stabilise the topsoil growth medium from an erosion perspective in the short term. The mother crop will also create a micro-habitat for the establishment of the perennial seedlings during the following growth season. Thereafter, it is recommended to introduce perennial grass species at the beginning of the following growth season. It is further recommended that the success of the remediation and amelioration of the soil, and the establishment of a sustainable vegetation cover, be monitored for a period of two seasons to ensure a free flow drainage system.

6. LOUISRUS SOUTH

Historically this area consisted of various agricultural holdings. Currently the area belongs to IVS, and is administered by Ferroland. The area is utilised for cattle farming. This area's zoning is classified as "unspecified". The reports relevant to the land capability of Louisrus include two reports produced by Envirogreen (1997a; 1999b).

6.1 Taxonomical Classification System

The soils were classified according to the Taxonomical Classification System for South Africa (Macvicar, 1991). The dominant soil forms in this area are the Avalon and Arcadia forms. **Table 2** provides more details on the soil types. The geographic location of these soil types is shown in **Figure 7**.

Table 7: Dominant soil types occurring in the Louisrus South area

Soil Type	Diagnostic Horizons	Effective Depth
Avalon	Orthic A / Yellow Brown Apedale B / Soft Plintic B	450 to 600 mm
Arcadia	Vertic A / Unspecified	> 600mm

6.2 Agricultural Potential

The Arcadia soil form has the capability of storing water for relatively long periods of time, due to the high clay content, but most of the water is not available for plant uptake. Drainage is poor and over-saturation is a common phenomenon during the rain season. The effective depth, that was measured to be in excess of 600mm, is very favourable. This is however cancelled out by the high clay content of the soil that induces a constraint on ideal physical conditions for normal plant growth. It is recommended that the soil is not cultivated but rather utilized for natural pastures. Should it be decided to cultivate the soil it is recommended that sunflower, and to a lesser extent maize and grain sorghum, be planted.

The Avalon soil is characterized by a moist regime throughout the greater part of the year with good aeration and drainage properties and can be utilized for the cultivation of any crop. The effective depth is measured to just above the soft plintic B layer. With the effective depth being in excess of 400mm in combination with relatively low acceptable clay content levels gives this soil type has a high rating concerning its agricultural potential. This soil is however very susceptible to soil erosion and the correct implementation of water control measures is necessary. In case of the orthic A and

yellow apedale B having relatively low clay contents it is likely that the root zone could become compacted, which will ultimately inhibit normal plant growth.

6.3 Amelioration Potential

Envirogreen (1997a) found in that in the top 5 mm of the soil, the electrical conductivity and SAR value suggest that no plant species will be able to survive due to the negative influence of excess salts in the soil solution. Evidence of inorganic contamination deeper in the soil is present, but not to the same degree. It is recommended that the top 100 mm of the whole of the Louisrus South area be ameliorated with organic material. It is recommended that this process be monitored for a period of two seasons.

6.4 Vegetative Rehabilitation Potential

The areas characterised by Arcadia form can and should be utilised for natural pastures rather than cultivation. Although the effective soil depth is favourable for cultivation purposes, the high clay content of the soil will inhibit normal plant growth.

The Avalon soils can be utilised for either cultivation purposes or for natural pastures. The agricultural and vegetative potential associated with these soil types is high.

7. LOUISRUS NORTH

Historically this area consisted of various agricultural holdings. Currently the area belongs to IVS, and is administered by Ferroland. The area is utilised for cattle farming. This area's zoning is classified as "unspecified". The reports relevant to the land capability of Louisrus include two reports produced by Envirogreen (1999b; 1999c).

7.1 Taxonomical Classification System

The soils were classified according to the Taxonomical Classification System for South Africa (Macvicar, 1991). The dominant soil forms in this area are the Bainsvlei and Arcadia forms. **Table 8** provides more details on the soil types. The location of these soils is shown in **Figure 2**.

Table 8: Dominant soil types occurring in the Louisrus North area

Soil Type	Diagnostic Horizons	Effective Depth
Arcadia	Vertic A / Unspecified	> 300mm
Bainsvlei	Orthic A / Red Apedalic B / Soft Plinthic B	< 300mm

7.2 Agricultural Potential

The Arcadia (high clay content) and Bainsvlei (effective depth < 300mm) soils have low agricultural potentials for dry land or irrigation cultivation.

7.3 Amelioration Potential

There are no indications of any inorganic contamination of the soil potentially caused by water emanating from IVS.

7.4 Vegetative Rehabilitation Potential

No vegetative rehabilitation is envisaged.

8. LINKHOLM & STEELVALLEY

The two reports relevant to Linkholm and Steelvalley were produced by Envirogreen (1999b) and Heydenrych *et al.* (1997).

8.1 Taxonomical Classification System

The soils were classified according to the Taxonomical Classification System for South Africa (Macvicar, 1991). The dominant soil forms in this area are the Dresden, Westleigh and Rensburg forms. **Table 9** provides more details on the soil types. The location of these soils is shown in **Figure 2**.

Table 9: Dominant soil types occurring in the Linkholm and Steelvalley areas

Soil Type	Diagnostic Horizons	Effective Depth
Dresden	Orthic A / Hard Plinthic B	0 to 350mm
Westleigh	Orthic A/ Soft Plinthic B	300 to 375mm
Rensburg	Vertic A / G-horizon	300 to 450mm

8.2 Agricultural Potential

The soils in the Linkholm and Steelvalley areas have, due to the relatively shallow effective depth, a low to medium agricultural potential.

8.3 Amelioration Potential

Heydenrych et al. (1997) proposed that organic material be incorporated into the soils in the top 300 mm on the banks of the canal which passes through the Linkholm and Steelvalley areas. This canal transferred stormwater from the dump before the construction of the Du Preez dam in the north-western corner of the CRMF. The location the Linkholm and Steelvalley areas is shown in **Figure 1** and **Figure 2**.

8.4 Vegetative Rehabilitation Potential

It is recommended that these areas be vegetated by means of natural pastures.

9. RIETKUIL 551 AND 552

Historically this area consisted of various agricultural holdings. Currently the area belongs to IVS, and is administered by Ferroland. The area is utilised as pastureland for game farming, and Black Wildebeest, Springbok, Blesbok, Red Hartebeest, Zebra and Ostriches are farmed within this area. This area's zoning is classified as "unspecified". The reports relevant to the Rietkuil area include four reports produced by Envirogreen (1998a; 1998c; 1999a; 1999b) and one by Johan Badenhorst (1999).

9.1 Taxonomical Classification System

The soils were classified according to the Taxonomical Classification System for South Africa (Macvicar, 1991). The dominant soil forms in this area are the Bainsvlei, Westleigh, Avalon, Arcadia and Pinedene forms. **Table 10** provides more details on the soil types. The location of these soils is shown in **Figure 1**.

Table 10: Dominant soil types occurring in the Rietkuil 551 and 552 areas

Soil Type	Diagnostic Horizons	Effective Depth
Bainsvlei	Orthic A / Red Apedalic B / Soft Plinthic B	> 400mm
Westleigh	Orthic A / Soft Plinthic B	< 400mm
Avalon	Orthic A / Yellow Brown Apedalic B / Soft Plinthic B	> 400mm
Arcadia	Vertic A / Unspecified	> 600mm
Pinedene	Orthic A / Yellow Apedalic B / Unspecified (wet)	> 400mm

9.2 Agricultural Potential

The presence of impermeable plinthic layers and high clay content vertic layers reveals that the soils in Rietkuil 551 and 552 are not suitable for irrigation purposes. The soils in this area range from low to high agricultural potential.

9.3 Amelioration Potential

The investigation by Envirogreen indicated that the soils adjacent to the canal, and in areas where historic irrigation took place, have been contaminated by the effluent water. The primary reason for soils becoming contaminated is that there is insufficient drainage in these areas. Where adequate drainage is available, the impact on the soils is much smaller. It is therefore proposed that no vegetative rehabilitation be undertaken until adequate drainage is provided by means of grassed waterways, the removal of ponding areas and the sloping of land where necessary.

9.4 Vegetative Rehabilitation Potential

It is recommended that these areas be vegetated by means of natural pastures.

10. RIETKUIL 554

The reports relevant to the Rietkuil area include two reports produced by Envirogreen (1999a; 1999b) and one by Johan Badenhorst (1999).

10.1 Taxonomical Classification System

The soils were classified according to the Taxonomical Classification System for South Africa (Macvicar, 1991). The dominant soil forms in this area are the Westleigh and Arcadia forms. **Table 11** provides more details on the soil types. The location of these soils is shown in **Figure 1**.

Table 11: Dominant soil types occurring in the Rietkuil 554 area

Soil Type	Diagnostic Horizons	Effective Depth
Westleigh	Orthic A / Soft Plinthic B	300 to 400mm
Arcadia	Vertic A / Unspecified	> 400mm

10.2 Agricultural Potential

The Westleigh soil form is characterised by a shallow effective depth. This soil is liable to become saturated with water very quickly due to its shallow effective depth. This can be very negative during a wet growth season. In the case of a normal growth season the Westleigh soil form is not capable of storing significant quantities of plant available water. This will have a negative effect on the crop yield, and it is therefore recommend that the soil should be utilised for pastures. If the land is to be cultivated then sunflower and grain sorghum are recommended.

The Arcadia soil form has the capability of storing water for relatively long periods of time due to the high clay content, but most of the water is not available for plant uptake. Drainage is poor and over saturation is a common phenomenon during the rain season. The effective depth, that was measured to be in excess of 400 mm, is very favourable. This is however cancelled out by the high clay content of the soil, which induces a constraint on ideal physical conditions that will enhance normal plant growth. It is recommend that the soil is not cultivated, but rather utilised for natural pastures. Should it be decided to cultivate the soil it is recommended that sunflower, and to a lesser extent maize and grain sorghum, be planted.

10.3 Amelioration Potential

There is no evidence of any inorganic pollution in the soils of the Rierkuil 554 area. No amelioration activities are therefore recommended.

10.4 Vegetative Rehabilitation Potential

It is recommended that these areas be utilised for the planting of natural pastures.

11. RIETKUIL 583

This area is situated immediately north of the Rietspruit canal. Historically this area consisted of agricultural holdings. Currently the area belongs to IVS, and is administered by Ferroland. The area is utilised as pastureland for game farming, and Black Wildebeest, Springbok, Blesbok, Red Hartebeest, Zebra and Ostriches are farmed within this area. This area's zoning is classified as "unspecified". The reports relevant to the Rietkuil area include three reports produced by Envirogreen (1998a; 1998c; 1999a; 1999b) and one by Johan Badenhorst (1999).

11.1 Taxonomical Classification System

The soils were classified according to the Taxonomical Classification System for South Africa (Macvicar, 1991). The dominant soil forms in this area are the Bainsvlei and Arcadia forms. **Table 12** provides more details on the soil types. The location of these soils is shown in **Figure 1**.

Table 12: Dominant soil types occurring in the Rietkuil 583 area

Soil Type	Diagnostic Horizons	Effective Depth
Bainsvlei	Orthic A / Red Apedalic B / Soft Plintic B	> 300mm
Arcadia	Vertic A / Unspecified	> 300mm

11.2 Agricultural Potential

The potential yield of a certain crop is largely dependent on the effective depth of the soil, the clay content and annual rainfall. Both the Bainsvlei and Arcadia soil forms can be regarded as having a high agricultural potential due to the effective depth exceeding 300 mm in both cases. Both soils are however not suitable for irrigation purposes.

11.3 Amelioration Potential

From a soil remediation perspective the primary aim would be to dilute the negative effect caused by the excess salts present by creating a zone where the electrical conductivity (saturated base extract) does not exceed 450 mS/m. These conditions would sustain normal plant growth and will dilute the pollutants through normal plant uptake.

A potential amelioration action would include the incorporation of organic material into the soil. This will increase the buffer capacity of the soil matrix and ensure a significant dilution effect of inorganic pollutants.

11.4 Vegetative Rehabilitation Potential

The following actions are recommended:

- That organic material be incorporated into the soil to a depth of 300 mm deep.
- It is recommended that fertilisers be incorporated into the soil 300 mm deep.
- The establishment of a mother crop (*e.g. triticum sp*) is recommended to stabilise the topsoil growth medium from a potential erosion perspective in the short term. The mother crop would also create a micro-habitat for the establishment of the perennial seedlings during the following growth season if normal crop production is stopped.
- Thereafter, it is recommended to introduce perennial grass species at the beginning of the following growth season if it is not desirable to continue normal crop production.

It is recommended that the success of the remediation and amelioration of the soil, and establishment of a sustainable vegetation cover be monitored for a period of at least two seasons to ensure a free flow drainage system.

12. CYFERPAN

The Cyferpan area was historically utilised for the cultivation of sunflowers and mielies. The area has however been joined to the Kiewiet area by means of a thin strip of land to the north of Dams 1-4. This provides a combined area on 780 ha for the farming of game. Within this area the natural and planted pastures constitute 400 and 380 ha respectively. The reports relevant to the Cyferpan area include three reports produced by Envirogreen (1997b; 1998b; 1999b).

12.1 Taxonomical Classification System

The soils were classified according to the Taxonomical Classification System for South Africa (Macvicar, 1991). The dominant soil forms in this area are the Bainsvlei and Arcadia forms. **Table 13** provides more details on the soil types. The location of these soils is shown in **Figure 1**.

Table 13: Dominant soil types occurring in the Cyferpan area

Soil Type	Diagnostic Horizons	Effective Depth
Bainsvlei	Orthic A / Red Apedale B / Soft Plinthic B	450 – 600mm
Arcadia	Vertic / Unspecified	> 600mm

12.2 Agricultural Potential

The Bainsvlei soil form's effective depth stretches onto the soft plinthic B layer and is between 450 – 600mm. This soil form is characterised by a relatively moist regime for most of the year and can be utilised for cultivation of any crop. With the effective depth in excess of 400mm the soil has a very high rating in terms of agricultural potential. The only negative aspect of this type of soil is the possibility of compaction of the root zone, especially where the clay content of the orthic A and red apedale B is relatively low. The Bainsvlei soil is also very susceptible to soil erosion, and the implementation of water control measures is therefore necessary.

The Arcadia soil form has the capability of storing water for relatively long periods of time, due to the high clay content, but most of the water is not available for plant uptake. Drainage is poor and over saturation is a common phenomenon during the rain season. The effective depth, that was measured to be in excess of 600mm, is very favourable. This is however cancelled out by the high clay content of the soil which induces a constraint on the ideal physical conditions that will enhance normal plant growth. It is recommended that the soil is not cultivated but rather utilized for natural pastures. Should

it be decided to cultivate the soil, it is recommended that sunflower, and to a lesser extent maize and grain sorghum, be planted.

The Avalon soil is characterized by a moist regime throughout the year with good aeration and drainage properties, and can be utilized for the cultivation of any crop. The effective depth is measured to just above the soft plintic B layer. With the effective depth being in excess of 400mm, in combination with relatively low acceptable clay content levels, this soil type has a high rating in terms of its agricultural potential. The soil is however susceptible to soil erosion and the correct implementation of water control measures is necessary. The orthic A and yellow apedale B have relatively low clay contents and it is likely that the root zone could become compacted, which will ultimately inhibit normal plant growth.

12.3 Amelioration Potential

The presence of the existing waste residue dump and Dams 1-4 adjacent to the Cyferpan area has resulted in parts of the Cyferpan area being impacted areas. It is therefore recommended that the top of the soil profile be ameliorated with organic material. Further, after the amelioration process has been implemented the area should be monitored for two seasons. This can be successfully achieved by means of obtaining soil samples, analysing them, and thereby quantifying the amelioration progress to date.

12.4 Vegetative Rehabilitation Potential

It is recommended that the soil is not utilised for cultivation purposes, but that it is utilised for natural pastures.

13. EXISTING RESIDUE DEPOSIT

This dump was started in 1943, and was used as a depository for solid residues and sludges over the years. It comprises an area of 179 ha, with a current volume of 26.7 million m³. It has attained a maximum height of 40 m. The dump is unlined, and the different materials disposed to it are not segregated. The material is transported to the dump by rail, and is subsequently placed by wheeled vehicles. The dump has a high infiltration rate. Runoff from the uncapped dump will be contaminated, as surface water comes into contact with the waste body.

Two phases of rehabilitation of the dump have been planned. Initially the dump will be operated for a further eight years. During this period progressive rehabilitation of the dump will take place. This 8-year plan relates to a final rehabilitated volume of approximately 35.4 million m^3. While this progressive rehabilitation is occurring a new waste site within the CRMF will be developed. This new waste site will facilitate residue deposition on a lined facility for another 12 years, i.e. a total of 20 years.

The reports relevant to the rehabilitation of the existing residue deposit include two reports produced by Knight Piésold (1998; 1999).

13.1 Topsoiling

Although the residue on the waste site cannot be classified in terms of a soil classification system, the residue deposit must be capped in accordance with the DWAF Minimum Requirements. The Minimum Requirements for Waste Disposal by Landfill stipulates a 450 mm compacted layer of clayey soil and a 200 mm layer of topsoil as part of the capping layers for a hazardous waste landfill site. In the studies performed four possible borrow pit sites have been identified. They are:

1. The Kiewiet area;
2. An area to the north of IVS. A railway line cuts through the middle of this area with another line passing through the north-western portion of the site. The area is elevated above the natural ground level because of the deposition of fill material;
3. This area is located to the north of IVS. It is bounded to the south by an Eskom power line, and to the east by a tarred road. The Insiza Stadium is built on a koppie to the north-east of the site.
4. The agricultural holdings located to the west of IVS.

These areas will be investigated in more detail when the rehabilitation is to be initiated. The waste site will be vegetated as follows:

13.2 Vegetation

13.2.1 Soil Amelioration

Soils will be sampled to determine lime and fertiliser requirements prior to vegetating the area. These nutrients will be added at the start of the growing season following the completion of the earthworks and harrowed where possible, on contour, to a depth of about 5 cm. The objective of the fertiliser programme, which will be conducted annually for three years, will be to raise the soil pH to at least 5,5 if conditions are acidic, and the phosphate level to 10 ppm to prevent nitrogen deficiency. As recommended in the soil study report KCl will be applied to enhance potassium levels of the soil (to 90 ppm). At sowing 350 kg/ha of fertiliser 2:3:2 (22) will be applied.

The soil study recommendations will also be followed to ensure correct Ca:Mg ratios by means of liming, and to prevent aluminium toxicity or zinc deficiencies. The soils will be sampled annually to determine fertiliser requirements for a period of five years after rehabilitation. The necessary fertiliser will be applied during the growing season for this period as discussed under maintenance.

13.2.2 Vegetating

After fertilisation the whole area will be seeded by broadcasting, during favourable weather conditions, and rolled on contour with a Cambridge roller. **Table 14** provides the seed mix that will be used.

Table 14: Seed Mix for Rehabilitation (dependant on outcome of soil analysis)

SEED	COMMON NAME	KG/HA
Cynodon dactylon	Kweek	4
Digitaria eriantha	Smuts finger grass	6
Chloris gayana	Rhodes grass	6
Medicago sativa	Lucerne (inoculated with bacteria and molybdenum)	4
Eragrostis tef	Teff	1
Total		**21**

The primary purpose of the vegetation is to prevent erosion, improve soil structure and assist in micro-organism re-establishment. The berms and contours will be vegetated with the rehabilitation seed mixture. Waterways will be hand planted with star grass (*Cynodon aethiopicus*) and cotton wool grass (*Imperata cylindrica*). *Hypharrenia hirta* will be hand planted at 25m centres between contour drains. After the first season, the area will be maintained by cutting if required. The re-establishment of grass commonly occurring in the area will be assisted in the rehabilitation zone by means of mulching. Mulching with 0.5 t/ha of locally cut mulch in the first to third year will help establish local species.

Acacia karoo, Celtis africana, Rhus lancea and *Combretum erythrophyllum* will be planted and specifically clustered in sheltered "valleys" or lower lying areas. Acacia is a legume and will contribute to nitrogen fixation in soils. These trees will be obtained at > 2m height with a stem diameter or 2cm. Excavations will be made to 0.5m depth for the trees and 1m will be backfilled before planting with compost containing topsoil and fertiliser mixed in. Styler liner pipes will be planted with the trees and used for watering and fertilising in future. If areas are identified where toxins in the dump hold a threat to tree survival, bentonite and attapulgite will be used to isolate 2m by 2m excavated compartments for the trees. These will be filled with fertilised topsoil. A 0,5m radius around tree trunks will be packed with loose rock or planted with *Cynodon dactylon* to prevent high or hot burning fires from destroying young trees in the dry season.

Phragmites and *Typha* will be hand planted at 2m centres in waterways around the toe of the dump where these will increase evapotranspiration and assist with salt, metal and acid removal by phyto-remediation. *Phragmites* will be controlled to prevent excessive restriction of flow in waterways. If cutting is required on the dump the cut mulch will be added to the wetlands as a carbon source for sulphate reduction and metal immobilisation. *Imperata cylindrica* sprigs will be hand planted at 5m centres.

Invasive species will be managed during rehabilitation, and for an additional 20 year period thereafter.

13.2.3 Maintenance

Fertilisation will take place with 350 kg/ha of 2:3:2 (22) fertiliser broadcasted six weeks after seeding to be followed by annual fertilising if soil analysis indicate the

requirement (this recommendation is dependent on soil analysis and field conditions). Fertiliser will be applied additionally in areas where vegetation cover shows stress or where cover is not increasing. In areas where vegetation cover shows severe stress or depletion, *Cynodon dactylon* and *aethiopicus* sprigs will be hand planted and watered weekly in addition to the increased fertilisation until successfully established.

Seeding and planting of locally occurring legumes (for nitrogen fixing) on the dump will commence three to four years (when Lucerne starts dying off) after initial seeding with Lucerne. *Trifolium repens* and *stolonferous Indigofera* spp will be hand planted at 50m centres and in clusters of 4 to 5 plants in areas where vegetation shows depletion. *Trifolium* and *Indigofera* have less insect plagues than Lucerne and should enhance succession.

Monthly dump inspections should be undertaken. These will be undertaken to identify risks of erosion of the dump cover or instabilities and vegetation stress. Regular repairs to contour drains and erosion prevention will be undertaken if and where required. Fertilising and hand planting of areas where erosion is a risk will take place. Regular watering (> 10 litres/tree/week) of trees as well as hand planted sprigs should occur until they are well established. If rainfall exceeds 20mm for any given week, then watering will not be required. Continuous fire control and prevention will be implemented to protect the dump vegetation cover during the initial 5 years. Trial patches can be burnt after 5 years to ensure fire resistance of vegetation in the long term. Cutting of grass cover will take place around trees to reduce the risk of fire killing the trees.

Locally cut mulch will be placed during the season when the grass is in seed and in areas where the grass has a representative species account, is required. Addition of carbon sources like the hay cut around the trees to constructed wetlands to enhance sulphated reduction and metal immobilisation. Long term access will be monitored and species like *Acacia mellifera* and *Dichrostachys cinerea* can be planted to limit access to the dump if required.

Transects will be set up across the dump to monitor vegetation cover after germination and years 1, 2, 3, 5, 10, 15 and 20 (during summer). Arial photography and satellite imagery can be used to monitor vegetation cover thereafter (late summer and late winter). These will help detect vegetation depletion (if any) along with the transects so

that additional seeding or fertilising (if required) can be undertaken before erosion becomes a risk in the next rainy season.

Vegetation species surveys will be undertaken annually in demarcated trial areas. This will ensure that the ecological succession, diversification of species naturally occurring and the self-propagation of Fabaceae (legumes) and trees occur at satisfactory rates. If not, hand planting and mulching will be undertaken. Invasive species on the dump site will be noted and reported during vegetation surveys and will be controlled.

14. CONCLUSIONS

The area immediately surrounding IVS consists of areas zoned for industrial, commercial, agricultural and residential activities. The entire area to the west of the site has a zoning classified as "undetermined". IVS, which is zoned as industrial type 2, is therefore operating within a diverse environment in terms of land use.

The agricultural areas to the west of the Works, as well as the Cyferpan and Kiewiet areas, generally have a low agricultural potential. These areas have been developed as pastures for game and cattle farming, and this land use should be maintained.

Some of the soils in the agricultural areas to the west of the Works, as well as the Cyferpan and Kiewiet areas, have been contaminated by surface or groundwater from IVS. These areas need to be remediated. It is important that this remediation is consistent with the remediation occurring within the site.

15. REFERENCES

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7. Envirogreen, 1999b. Credentials of Laboratory, Analytical References and Consolidated Mapping of Inorganic Pollution at Iscor Vanderbijlpark.
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11. Iscor, 2001. http://www.iscor.com
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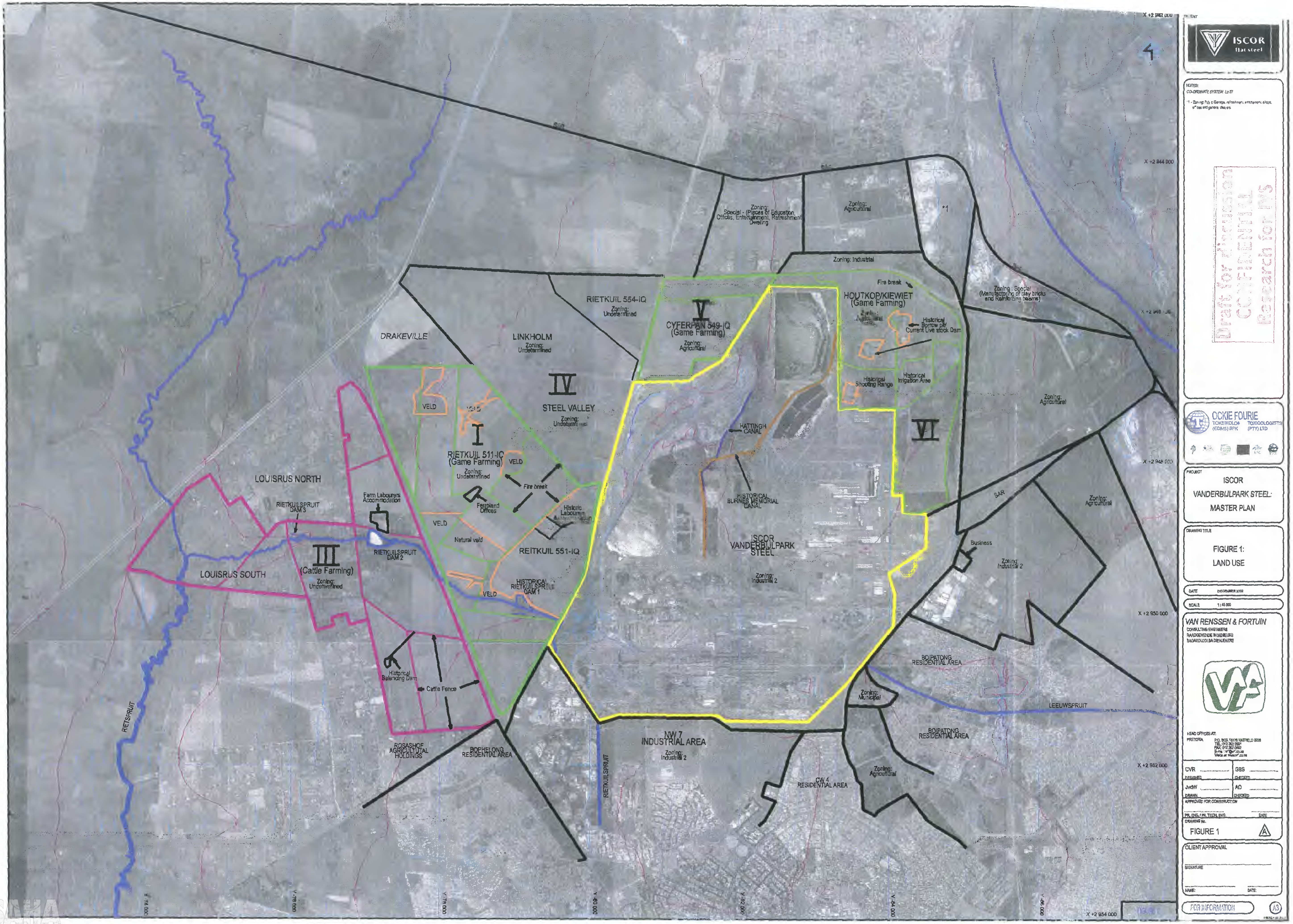
14. Knight Piésold, 1999. Rehabilitation and Repair of Existing Waste Disposal Site - Operational Manual.


LOUISRUS NORTH
LOUISRUS SOUTH
III
(Cattle Farming)
Zoning: Undetermined
RIETKUILSPRUIT DAM 3
RIETKUILSPRUIT DAM 2
Farm Labourers Accommodation
Historical Balancing Dam
Cattle Fence
DRAKEVILLE
LINKHOLM
Zoning: Undetermined
RIETKUIL 554-IQ
Zoning: Undetermined
IV
STEEL VALLEY
Zoning: Undetermined
I
RIETKUIL 511-IQ
(Game Farming)
Zoning: Undetermined
VELD
Fire break
Farmland Offices
Natural veld
REITKUIL 551-IQ
HISTORICAL RIETKUIL SPRUIT DAM 1
V
CYFERPAN 549-IQ
(Game Farming)
Zoning: Agricultural
Zoning: Special - (Places of Education, Offices, Entertainment, Refreshment Dwelling
Zoning: Agricultural
Zoning: Industrial
HOUTKOP/KIEWIET
(Game Farming)
Historical Borrow pit Current Live stock Dam
Historical Shooting Range
Historical Irrigation Area
VI
Zoning: Special (Manufacturing of clay bricks and Reinforcing beams)
HATTINGH CANAL
HISTORICAL BURNES MEMORIAL CANAL
ISCOR VANDERBULPARK STEEL
Zoning: Industrial 2
Business
Zoning: Industrial 2
Zoning: Agricultural
SAR
BOIPATONG RESIDENTIAL AREA
Zoning: Municipal
LEEUWSPRUIT
NW 7 INDUSTRIAL AREA
Zoning: Industrial 2
CW 4 RESIDENTIAL AREA
Zoning: Agricultural
ROSASHOF AGRICULTURAL HOLDINGS
BOPHELONG RESIDENTIAL AREA
RIETKUILSPRUIT
RIETSPRUIT
X +2 944 000
X +2 948 000
X +2 950 000
X +2 952 000
X +2 954 000
CLIENT
ISCOR flat steel
NOTES:
CO-ORDINATE SYSTEM Lo 27
Draft for Discussion
CONFIDENTIAL
Research for IMS
OCKIE FOURIE
TOKSIKOLOë (EDMS) BPK
TOXICOLOGISTS (PTY) LTD
PROJECT
ISCOR
VANDERBIJLPARK STEEL:
MASTER PLAN
DRAWING TITLE
FIGURE 1:
LAND USE
DATE DECEMBER 2002
SCALE 1:45 000
VAN RENSSEN & FORTUIN
CONSULTING ENGINEERS
RAADGEWENDE INGENIEURS
HEAD OFFICES AT:
PRETORIA
CVR
DESIGNED
GBS
CHECKED
JvdW
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CHECKED
APPROVED FOR CONSTRUCTION
PR. ENG. / PR. TECH. ENG.
DATE
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FIGURE 1
CLIENT APPROVAL
SIGNATURE
NAME:
DATE:
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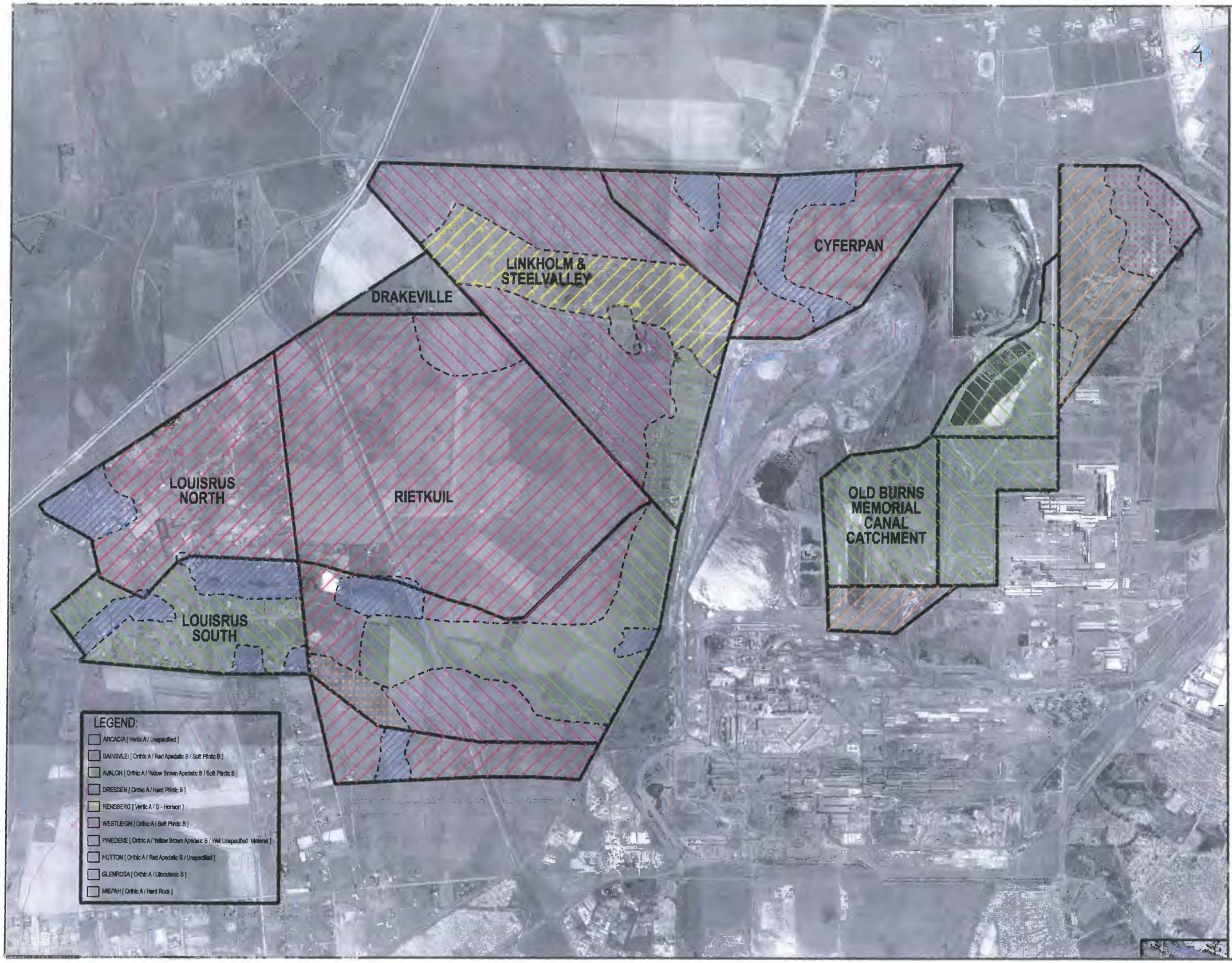

CLIENT: ISCOR flat steel

NOTES:

OCKIE FOURIE TOKSIKOLOË (EDMS) BPK TOXICOLOGISTS (PTY) LTD

PROJECT: ISCOR VANDERBIJLPARK STEEL: MASTER PLAN

DRAWING TITLE: FIGURE 2: DOMINANT SOIL FORMS

DATE: DECEMBER 2008

SCALE: 1 : 45 000

VAN RENSSEN & FORTUIN
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Web site: www.vrf.co.za

CVR | GBS
DRAWN: JvdW | CHECKED: AO
APPROVED FOR CONSTRUCTION
PR. ENG. OR TECH. ENG. | DATE
DRAWING No.: FIGURE 2 | A

CLIENT APPROVAL
SIGNATURE
NAME: | DATE:

FOR INFORMATION | A3

APPENDIX 1: LITERATURE REVIEW

1. HECKETTS SOUTH AREA

Author:	OFT Masterplan Team
Title:	Rehabilitation of the Hecketts South Area
Date:	2000/2001
Reference area:	SM01
Status:	Incomplete Report

Notes:

- Six test holes were profiled.
- Water qualities corresponding to the test holes were analysed.
- No soil classification, vegetative or agricultural potential described.

2. BORROW AREAS FOR CAPPING MATERIALS FOR EXISTING RESIDUE DEPOSIT

Author:	Knight Piésold Consulting Engineers
Title:	Rehabilitation and Repair of Existing Waste Disposal Site: Potential Borrow Areas for Capping Materials
Date:	November 1998
Reference area:	CS12; CS14 & CS18; External Zone IV
Status:	Report

Notes:

- Geology of Vanderbijlpark area: Pretoria Group of Transvaal Supergroup.
- 48 test pits are described (W = 16; N = 18; P = 12).
- Discussion of sources in terms of suitability for borrow material.
- No soil classification, vegetative or agricultural potential described.

3. MATERIAL PERMEABILITY AT KIEWET SITE

Author:	Geotechnical Services (Iscor Mining Consulting Services)
Title:	Permeability Invesigation of Materials from Kiewet Disposal Landfill
Date:	March 1999
Reference area:	CS14
Status:	Report

Notes:

- 9 permeability tests were performed at the Kiewet site.
- 4 possible materials for capping: Andesite, Shale, Quartzite, Quaternary gravel. Andesite is the most suitable material for capping.
- No soil classification, vegetative or agricultural potential described.

4. REHABILITATION OF EXISTING RESIDUE DEPOSIT

Author:	Presentation by Gert Visser to DWAF
Title:	Rehabilitation Plan: Landfill Site: Iscor Vanderbijlpark
Date:	16 September 1997
Reference area:	CS07
Status:	Report on Presentation to DWAF

Notes:

- Progress feedback and projected project strategy.
- No specific soil information.
- No soil classification, vegetative or agricultural potential described.

5. ASSESSMENT OF THE DRAINAGE CONDITIONS BELOW THE COAL STOCKYARD

Author:	Jones & Wagner Consulting Engineers
Title:	Assessment of drainage conditions below Coal Stockyard
Date:	6 September 2000
Reference area:	IM04
Status:	Letter to Group Five Civils

Notes:

- A series of test holes (8), double ring infiltrometer, cone penetration and spoon penetration tests were performed.
- Recommendations were made regarding the drainage system under the coal stacking area.
- No soil classification, vegetative or agricultural potential described.

6. REHABILITATION AND REPAIR OF THE EXISTING RESIDUE DEPOSIT

Author:	Knight Piesold Consulting Engineers / Digby Wells & Associates
Title:	Rehabilitation and Repair of the Existing Waste Disposal Site – Operation Manual
Date:	October 1999
Reference area:	CS07
Status:	Report

Notes:

- Reference to the update of record (3) of this database for the source of materials.
- Very good section on soil amelioration, vegetating, and maintenance.
- No soil classification, vegetative or agricultural potential described.

7. GEOTECHNICAL INVESTIGATION FOR KIEWET SITE

Author:	Jarrod Ball & Associates
Title:	Report on the Geological Investigation for the Proposed Kiewet Disposal Landfill
Date:	August 1998
Reference area:	CS14
Status:	Report to Lekoa Vaal Metropolitan Council

Notes:

- Description of transported and residual soils.
- Description of excavatibility and permeability of material.
- No soil classification, vegetative or agricultural potential described.

8. GEOHYDROLOGICAL AND GEOTECHNICAL INVESTIGATIONS INTO KIEWET SITE

Author:	Jarrod Ball & Associates
Title:	Geohydrological and Geotechnical Investigations into the Proposed Kiewet Site Candidate Landfill Site
Date:	February 1998
Reference area:	CS14
Status:	Report

Notes:

- Description of transported and residual soils.
- No soil classification, vegetative or agricultural potential described.

9. GEOTECHNICAL INVESTIGATION OF SLAG DUMPS

Author:	Geotechnical Serivices
Title:	Geotechnical Investigation: Vanderbijlpark Works – Slag Dumps (*CIV 37*)
Date:	13 November 1992
Reference area:	CS07
Status:	Report

Notes:

- Investigation into slope stability of the existing residue deposit, and the possible maximum height of the dump.
- No soil classification, vegetative or agricultural potential described.

10. GEOTECHNICAL INVESTIGATION – SLAG DUMPS

Author:	Geotechnical Services
Title:	Geotechnical Investigation: Vanderbijlpark Works – Slag Dumps (*CIV37/1*)
Date:	20 January 1993
Reference area:	CS07
Status:	Report

Notes:

- Update of Previous Report (Record 10).
- No soil classification, vegetative or agricultural potential described.

11. A HYDROCARBON POLLUTION SOIL ASSESSMENT AT COKE OVENS AND SUPRACHEM

Author: Geo-Hydro Technologies Consulting Scientists

Title: A Hydrocarbon Pollution Soil Assessment at Iscor Vanderbijlpark Coke Ovens & Suprachem (*VDB/97/047*)

Date: June 1997

Reference area: IM02; IC01

Status: Report

Notes:

- Horizontal extent of plume has been established – not vertical.
- Hydrocarbons are present in the soil and in the vapour phase
- Various chemical analyses of soils.
- No soil classification, vegetative or agricultural potential described.

12. HYDROCARBON POLLUTION SOIL ASSESSMENT AT COKE OVENS, SUPRACHEM AND BLAST FURNACES

Author: Geo-Hydro Technologies Consulting Scientists

Title: A Hydrocarbon Pollution Soil Assessment at Iscor Vanderbijlpark Coke Ovens, Suprachem & Blast Furnaces

Date:

Reference area: IM02; IC01; IM03; IM01

Status: Report

Notes:

- Horizontal extent of plume has been established – not vertical.
- Hydrocarbons are present in the soil and in the vapour phase
- Various chemical analyses of soils.
- No soil classification, vegetative or agricultural potential described.

13. INVESTIGATION TO DETERMINE THE POTENTIAL INORGANIC SOIL POLLUTION: HECKETT PLANT 80 AND HECKETT PLANT 85

Author:	Stef van der Zee (student from Netherlands – Hogeschool IJselland)
Title:	Investigation to determine the potential inorganic soil pollution: Heckett plant 80 and Heckett plant 85: Iscor Vanderbijlpark works
Date:	February 1998
Reference area:	SM01
Status:	Report

Notes:

- Pollution potential of Heckett South Area.
- SAR was determined, and several other chemical parameters were evaluated.
- No soil classification, vegetative or agricultural potential described.

14. SOIL VAPOUR SURVEY OF HOTMILL SOUTH

Author:	Geo-Hydro Technologies Consulting Scientists
Title:	Ecoprobe 4 Soil Vapour Survey Hotmill South, Iscor Works, Vanderbijlpark (*MILL/99/138*)
Date:	January 1999
Reference area:	CP01
Status:	Report

Notes:

- The hotmill south area is polluted with hydrocarbons in the vapour phase.
- No soil classification, vegetative or agricultural potential described.

15. CREDENTIALS OF LABORATORY ANALYTICAL REFERENCES AND CONSOLIDATED MAPPING OF INORGANIC POLLUTION

Author:	Envirogreen
Title:	Credentials of Laboratory Analytical References and Consolidated Mapping of Inorganic Pollution at Iscor Vanderbijlpark
Date:	May 1999
Reference area:	CS11; CS22; CS12; CS14;
Status:	

Notes:

- Maps of all polluted areas in the northern areas of the site.
- Handbook of Standard Soil Testing Methods for Advisory Purposes.
- Letter of reference for analytical procedures.
- NB. Figure 1: Soil classification within the areas west of Iscor.

16. EVALUATION OF THE REPORT: 1996 PEDO-GEOCHEMICAL ASSESSMENT OF VELD AREA AND S-WORKS INDUSTRIAL AREA

Author:	Envirogreen
Title:	Evaluation of the Report: 1996 Pedo-Geochemical Assessment of Veld Area and S-Works Industrial Area at Iscor Vanderbijlpark
Date:	June 1996
Reference area:	S-Works & Veld Area
Status:	

Notes:

- 1996 pedo-geochemical assessment should not be taken as a quantification of the inorganic pollution potential of the soils to the surrounding water systems, since all parameters contributing to the migration of pollutants from the polluted soils have not been evaluated.
- No soil classification, vegetative or agricultural potential described.

17. LEACHATE MANAGEMENT INFRASTRUCTURE PHASE IV: INORGANIC SOIL QUALITY INVESTIGATION

Author:	Envirogreen
Title:	Leachate Management Infrastructure Phase IV: Inorganic Soil Quality Investigation
Date:	April 1999
Reference area:	Burnes catchment area
Status:	Report

Notes:

- Figure 2 / Table 2 shows dominant soil forms of the Burnes catchment area.
- Figure 4 shows the areas where Na, NO_3, SO_4, Cl and F pollution exists.
- See Executive Summary – the soils do not have any irrigation potential.
- Soil remediation is reviewed in Executive Summary.

- SAR has been calculated (page 21) – all samples are acceptable.

18. SCOPE AND IMPACT OF POTENTIAL INORGANIC SOIL POLLUTION: RIETKUIL 554

Author: Envirogreen
Title: Scope and Impact of Potential Inorganic Soil Pollution: Rietkuil 554
Date: July 1998
Reference area: Rietkuil 554
Status: Report

Notes:

- Low to medium agricultural potential (see Executive Summary).
- No evidence of inorganic pollution.
- Figure 2 / Table 2 shows dominant soil forms of Rietkuil 554.

19. LOUISRUS NORTH PEDO-CHEMICAL ASSESSMENT

Author: Envirogreen
Title: Loiusrus North Pedo-Chemical Assessment
Date: June 1999
Reference area: Louisrus North
Status: Report

Notes:

- Figure 2 / Table 2 shows dominant soil forms of Louisrus North (high clay content and shallow effective depth.
- No evidence of inorganic pollution.
- Low agricultural potential (dry land or irrigation).

20. PEDO-GEOCHEMICAL ASSESSMENT RIETKUIL 554 AND 583

Author: Envirogreen
Title: Pedo-Geochemical Assessment Rietkuil 554 and 583
Date: April 1999
Reference area: Rietkuil 554 and 583
Status: Report

Notes:

- Figure 2 / Table 1 shows dominant soil forms of Rietkuil 554 and 583.
- Inorganic pollution is present – unfavourable EC conditions.
- Soils have no irrigation potential.
- Remediation measures are reviewed in the document.

21. RESIDENTIAL SUITABILITY STUDY

Author:	EVN / Mark Wood Consultants
Title:	A Residential Suitability Study for the areas of Linkholm, Drakeville, Steelvalley and a portion of Louisrus Smallholdings.
Date:	November 1997
Reference area:	Linkholm, Drakeville, Steelvalley and Louisrus
Status:	Report

Notes:

- Soils are described in Section 4.2 (page 40) – classification, chemistry, capability, suitability.
- Four main groups of soils include vertic, duplex, plinthic and shallow rocky soils – generally very poor soils for agriculture and construction.
- Saline (sodic) conditions occur in these areas.

22. AGRICULTURAL POTENTIAL AND LAND VALUES

Author:	Johan Badenhorst Consulting Engineers (Envirogreen)
Title:	Interim Report – Agricultural Potential and Land Values
Date:	May 1999
Reference area:	552 IQ & 551 IQ
Status:	Report

Notes:

- No irrigation potential in area due to shallow soils, impermeable plintic and high clay content vertic layers.
- See Appendix A (Envirogreen) and Appendix B (UP – Dept of Plant Production and Soil Science).
- Soil classification (Figure 1) and position of agricultural potential (Figure 3).
- Market values of farms.

23. SCOPE AND IMPACT OF POTENTIAL INORGANIC SOIL POLLUTION: LOUISRUS

Author:	Envirogreen
Title:	Scope and Impact of Potential Inorganic Soil Pollution: Louisrus
Date:	September 1997
Reference area:	Louisrus
Status:	Report

Notes:

- Figure 2 / Table 3 shows dominant soil forms of Rietkuil 554 and 583.
- Inorganic pollution is present over the entire area.
- Soils have low to high irrigation potential.
- SAR values have been determined.

24. COST BENEFIT ANALYSIS – SPECIALIST REPORT – ECOLOGICAL OVERVIEW

Author:	L&W Environmental (Loxton, Venn & Ass. / Wates, Meiring & Barnard)
Title:	Cost Benefit Analysis – Specialist Report – Ecological Overview
Date:	November 1998
Reference area:	Linkholm, SteelValley, Drakeville, Louisrus and Rietkuil
Status:	Report

Notes:

- Focus of this study is on vegetation and fauna.
- No soil classification, vegetative or agricultural potential described.

25. COST BENEFIT ANALYSIS – SPECIALIST REPORT – VETERINARY OVERVIEW

Author:	L&W Environmental (Loxton, Venn & Ass. / Wates, Meiring & Barnard)
Title:	Cost Benefit Analysis – Specialist Report – Veterinary Overview
Date:	November 1998
Reference area:	Linkholm, SteelValley, Drakeville, Louisrus and Rietkuil
Status:	Report

Notes:

- Potential risk of animals to polluted water - minimal.

- No soil classification, vegetative or agricultural potential described.

26. COST BENEFIT ANALYSIS – SPECIALIST REPORT – AGRICULTURAL IMPLICATIONS

Author:	L&W Environmental (Loxton, Venn & Ass. / Wates, Meiring & Barnard)
Title:	Cost Benefit Analysis – Specialist Report – Agricultural Implications
Date:	November 1998
Reference area:	Linkholm, SteelValley, Drakeville, Louisrus and Rietkuil
Status:	Final Report

Notes:

- Soils are reviewed in Section 1.3.
- Map 3 provides the soil and land capability at reconnaissance level.
- Description of soil classification and agricultural potential on page 4.
- High salt concentrations below Louisrus canal.
- Semi-volatile organic materials have been identified in isolated boreholes.

27. SCOPE AND IMPACT OF POTENTIAL INORGANIC SOIL POLLUTION: CYFERPAN AND RIETKUIL AREAS

Author:	Envirogreen
Title:	Scope and Impact of Potential Inorganic Soil Pollution: Cyferpan and Rietkuil Areas, Adjacent to Iscor Vanderbijlpark
Date:	August 1997
Reference area:	Cyferpan and part of Rietkuil overlapping with Report 23.
Status:	Final Report

Notes:

- Figure 2 / Appendix A shows dominant soil forms of Cyferpan area.
- Figure 5 / Appendix A shows dominant soil forms of part of the area included in Report 23 (Figure 1).
- Soils have predominantly high agricultural potential.
- SAR values have been determined.

28. SCOPE AND IMPACT OF POTENTIAL INORGANIC SOIL POLLUTION: CYFERPAN 104

Author:	Envirogreen
Title:	Scope and Impact of Potential Inorganic Soil Pollution: Cyferpan 104
Date:	March 1998
Reference area:	Cyferpan
Status:	Final Report

Notes:

- Figure 2 / Appendix A showing dominant soil forms of Cyferpan area is missing.
- Soils have high agricultural potential (bottom pg. 4).
- SAR values have been determined.

29. SCOPE AND IMPACT OF POTENTIAL INORGANIC SOIL POLLUTION: RIETKUIL 551 & 552

Author:	Envirogreen
Title:	Scope and Impact of Potential Inorganic Soil Pollution: Rietkuil 551 & 552
Date:	January 1998
Reference area:	Rietkuil 551 & 552 – same as for Report 23.
Status:	Final Report

Notes:

- The coverage of this area is the same as for Report 23.
- Figure 2 / Appendix A showing dominant soil forms of Rietkuil 551 & 552 area is missing.
- Soils have high agricultural potential (middle pg. 7).
- SAR values have been determined.

30. SCOPE AND IMPACT OF POTENTIAL INORGANIC SOIL POLLUTION: LINKHOLM AND STEEL VALLEY AREAS

Author:	Envirogreen
Title:	Scope and Impact of Potential Inorganic Soil Pollution: Linkholm and Steel Valley Areas, adjacent to Iscor Vanderbijlpark.
Date:	June 1997
Reference area:	Linkholm and Steel Valley Areas
Status:	Final Report

Notes:

- Figure 2 / Appendix A showing dominant soil forms of Linkholm and Steel Valley
- Soils have low to medium agricultural potential.
- SAR values have been determined.

APPENDIX 2: FERROLAND GAME MANAGEMENT PLAN

Ferroland

Motivering vir die vestiging van wild vir die bestuur van weidings te Vanderbijlpark.

Opgestel deur:

Deon Kruger.
Plaasbestuurder Vanderbijlpark.

Inhoud.

1.Doelwitte.

Die volgende doelwitte word nagestreef:

1. Die bewaring van die totale ekosisteem deur die benutting van die ekosisteem vir ontspanning, opvoeding en navorsing.

2. Bewaring vir die produksie van benutbare produkte nl. wildsvleis, trofeë en lewendige wild.

3. Minimum versteuring van die habitat gekoppel aan minimale bestuur om die ingryping van die mens se invloed op die habitat te beperk.

4. Optimale bodembenutting.

2.Ligging en Oppervlakte.

Die plaas is geleë in die suidelike hoëveldstreek van Gauteng, ongeveer 10 kilometer van die stadskern van Vanderbijlpark en 60 kilometer suid van Johannesburg.

Die plaas word omgrens met die N1 suid in die weste, die R553 in die ooste, die R54 in die noorde en die R57 in die suide.

Die kampe geidentifiseer vir die vestiging van wild word aangedui in die meegaande kaart nl. Zone 1 en 4 (Rietkuil 511 IQ), Zones 5 (Cyferpan 549 IQ) en Zone 6 Houtkop bekend as die Kiewietkamp. (Zones 1 en 4 asook Zones 5 en 6 word binnekort gekonsolideer). **Sien Aanhangsel A.**

Oppervlaktes:

Zone 1 en 4: 950 hektaar.
Zone 5 en 6: 780 hektaar.

TOTAAL: 1730 hektaar.

3.Habitatontleding.

Landvorm(landskaptipe).

Beide bogenoemde kampe word terreinmorfologies as vlakteveld gekarteer.

Die kampe is geleë op die sekondêre waterskeiding tussen die Vaalrivier en Rietspruit.

Die helling is plat en geen erosie word waargeneem nie.

Geologie en grond.

Die grond bestaan uit Sedimentêre gesteentes soos sandsteen, kwartsiete en konglomerate met 'n relatiewe lae pH.

Die grondtipes in die verskillende kampe is as volg.

Zone 1 en 4:	Hutton, Avalon, Westleigh, Rensburg, Arcadia en Wasbank tipes.
Zone 5:	Rensburg en Arcadia tipes.
Zone 6:	Hutton, Avalon en Bainsvlei tipes.

Dreinering.

Die dreinering is as volg:

Zone 1:	'n Enkele vlei en Iscor se kanaal dreineer in 'n westelike rigting na die Rietspruit.
Zone 4:	Plat oppervlakte wat hoofsaaklik geabsorbeer word.
Zone 5:	Plat oppervlakte wat hoofsaaklik geabsorbeer word.
Zone 6:	Plat oppervlakte wat in die oostekant na die Leeuwpan en Vaalrivier dreineer.

Klimaat.

Die klimaat is gematig met 'n somer reënval gemiddeld van 649 millimeter per jaar. **Sien Aanhangsel B.** Die winters is koud met 'n gemiddelde rypdatum van 15 Mei.

Die heersende windrigtings is hoofsaaklik noordoos en suidwes.

Plantegroei.

Die verskillende kampe het voorheen hoofsaaklik uit lande bestaan waarop kontantgewasse verbou is. Die habitat kan hoofsaaklik verdeel word as volg.

1.	Natuurlike veld.	Zone 1 en 4:	240 hektaar.
		Zone 5 en 6:	400 hektaar.
2.	Aangeplante weidings.	Zone 1 en 4:	710 hektaar.
		Zone 5 en 6:	380 hektaar.

1. Natuurlike veld.

Die veldtipes wat in die natuurlike grasveld voorkom staan bekend as kort en gemengde grasveld. Die belangrikste grassoorte wat voorkom is Themeda triandra (rooigras), Heteropogon contortus (pylgras), Cymbopogon plurinodus (terpentyngras), Elionurus muticus (koperdraad) , Eragrostis chloromelas (krulblaar) en Cynodon dactylon (kweek).

Rooigras

Gemengde grasveld

Die meeste grasse is meerjarig maar a.g.v. oorbeweiding deur voormalige grondeienaars kom eenjarige grasse soos Tragus berteronianus (klitsgras), Aristida congesta (steekgras) en Chloris virgata (witpluim chloris) voor. Indringerplante soos Stoebe vulgaris (bankrotbos) en paraffienbos is ook tekens van oorbeweiding en kom op klein areas voor.

Bankrotbos

Paraffienbos

Die meeste van die meerjarige grasse is smaaklik in die somer en word geredelik deur wild gevreet.

Bome wat hoofsaaklik deur vorige bewoners aangeplante is sluit in Bloekom, Populier, Soetdoring, Heuningpeul, Sering, Seder, Denne en verskeie ornamentele struike.

Heuningpeul en Bloekombome en Katbos

Soetdoringbome en Rooigras

Giftige plante soos Selonsroos, Litjieskaktus, Kannas en Lantana kom voor op die plotte maar is in die proses om uitgeroei te word.

2. Aangeplante weidings.

Die lande wat omgeskakel is na aangeplante weidings bestaan hoofsaaklik uit die volgende grasspesies: Meerjarige grasse soos Digitaria eriantra (Smutsvinger), Panicum maximum (Witbuffels), Chloris gayana (Rhodes), Antephora pubescens (Borseltjie), Eragrostis curvula (oulands) en Cynodon dactylon (kweek). Eenjarige grasse soos Eragrostis teff (tef), Eleusine indica (jongosgras), en Urochloa panicoides (Tuinbeesgras) kom ook voor.

Smutsvingergras

'n Volledige grasopname en spesies samestelling is gedurende Februarie 2001 deur 'n student gedoen . Die data is verwerk en sal jaarliks opgedateer word. Statistiek oor die data sal slegs sinvol geanaliseer kan word na meer as een jaar se opname.

Fenologie.

Fenologie is die verskillende groeifases in die lewensiklus van plante in reaksie op die klimaatsritme van die omgewing. Fenofases soos die blaar-, blom, en vrugfase kom meestal net in spesifieke tye van die jaar hoofsaaklik in die somer voor.

Dit is veral veranderinge in die beskikbaarheid, groeistadium en smaaklikheid van die gras na gelang van die seisoene, tesame met die beskikbaarheid van oppervlakwater wat 'n rol speel met die bewegingspatrone van diere.

In die winter is die gras dormant en minder smaaklik en moet dit in aanmerking geneem word in die drakrag om wildsgetalle te bepaal.

4.Drakrag.

Die drakrag en weidingskapasiteit van die gebied word nie sommer uit die lug gegryp nie. Verskeie faktore soos territorialiteit, skuiling, klimaat, roofdiere, vreetgewoontes, waterbeskikbaarheid, omheining, tropsamestelling en tropversteuring beinvloed die normale voeding en teling van wild.

'n Kombinasie van die volgende erkende metodes is gebruik vir die drakragbepaling.

1.Skattingsmetode.

2.Energiemetode.

3.Grootvee-eenheidmetode.

Laasgenoemde metode word meestal gebruik en is wetenskaplik deur die Departement van Landbou in Irene ontwikkel.

Die inligting ingesamel deur die student en die praktiese ervaring en kennis van die gebied het die moontlik gemaak om die drakrag so akkuraat as moontlik te bepaal.

Die voorkoms van grasspesies in terme van Toenemers en Afnemers word ook in berekening gebring om die wildgetalle te bepaal.

'n Stelsel van aanhoudende beweiding sal gebruik word. 'n Verskeidenheid van herbivore sal gebruik word om die volle spektrum van plantegroei te benut.

Die drakrag op Vanderbijlpark word as volg vasgepen;

Natuurlike veld:	6 hektaar per Grootvee-eenheid.
Aangeplante weidings:	3 hektaar per Grootvee-eenheid.

5.Water voorsiening.

Waterontledings van al die moonlike bronne is gedoen en voldoen aan die standaard vir wild en veesuipings.

Watervoorsiening in die kampe is as volg: (Sien Aanhangsel C).

Zones 1 en 4: Kanaalwater, damme en windpompe.

Zones 5 en 6: Damme en windpompe.

Kanaal water

6.Omheining.

Die onderskeie kampe is omhein met 'n elektriese draad van 20 drade, twee meter hoog.

Die draad is geskik vir die volgende wildspesies.

1.Swartwildebeeste.

2.Springbokke.

3.Blesbokke.

4.Rooihartebeeste.

5.Zebras.

6.Volstruise.

Elektriese bekragtiger

Elektriese omheining

7.Siektebeheerstreke.

Die Natuurbewarings owerhede is gesetel te Heidelberg en Memel.

Die gebied val buite die verklaarde Siektebeheerstreke wat ingestel is om bek en klouseer en miltsiekte beheer.

'n Permit om Swartwildebeeste aan te hou moet deur Natuurbewaring uitgereik word om die voorkoms van snotsiekte te beheer. Verskeie wildplase in die omgewing hou Swartwildebeeste aan en probleme om permitte te bekom word nie voorsien nie.

Die gebied val buite die Hartwater besmettings gebied.

8.Tipes wild.

As al bogenoemde faktore ontleed word kan die volgende wildtipes suksesvol gevestig word.

1.Swartwildebeeste.

2.Springbokke.

3.Blesbokke.

4.Rooihartebeeste.

5.Zebras.

6.Volstruise.

Blesbokke

Kapitaal. (Rand)

	Jaar 1	Jaar 2	Jaar 3	Totaal
Swartwildebeeste.	416 000-00	416 000-00	416 000-00	1 248 000-00
Springbokke.	67 500-00	67 500-00	67 500-00	202 500-00
Blesbokke.	97 500-00	97 500-00	97 500-00	292 500-00
Rooihartebeeste.	70 000-00	70 000-00	70 000-00	210 000-00
Zebras.	80 000-00	80 000-00	80 000-00	240 000-00
Volstruise.	68 000-00	68 000-00	68 000-00	204 000-00
TOTAAL:	**799 000-00**	**799 000-00**	**799 000-00**	**2 397 000-00**

2. Normale uitgawes.

Die volgende werkskostes word voorsien:

a. Vervoer van aangekoopte wild.

b. Lekblokke.

c. Draad hestelwerk.

d. Vangkostes.

3. Bemarking van wild.

Weens die ligging en aard van terrein kan normale jag nie plaasvind nie.

Die volgende praktyke sal toegepas word.

1.Boogjag.

2.Vang van wild.

Daar is twee plaashuise beskikbaar vir akkomodasie en moet in aanmerking geneem word.

Die bemarking van wild sal eers in jaar 3 in aanvang neem.

Die verkoopprys sal markverwant wees en onderhewig wees aan die drakrag van die veld vir die betrokke seisoen.

Die jag van voëls soos fisante en tarentale in die winter sal ook 'n addisionele inkomste lewer.

Tarentale

12.Opsomming.

Die gebruik van wild om die weidings optimaal te benut kan beslis met sukses toegepas word.

'n Teeltrop van 300 Bonsmaras sal op die res van die plaas in Zones 2, 3 en 7 gevestig word.

'n Kombinasie van wild en beeste in Vanderbijlpark sal nie net 'n lewensvatbare boerdery vestig nie maar is ook in lyn met Iscor se Omgewings Strategie.