WETLAND STUDY:

PROPOSED DEVELOPMENT OF LANSERIA ERF 157 GAUTENG PROVENCE

Ver 1

November 2024 (REV 1)

PREPARED BY: Dr Andries Gouws, Prof Lesley Brown

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DECLARATION

The observations, conclusions and recommendations made in this report are based on the best available data and on best scientific and professional knowledge. Survey points are normally accurate to within 3-8 metres; which must be considered in the use of the information.

The directors of INDEX (Pty) Ltd exercises due care and diligence in rendering services and preparing documents. However, the company accepts no liability, and the client, by receiving this document, indemnifies INDEX (Pty) Ltd and its directors and employees, by the use of the information contained in this document, against any action, claim, demand, loss, liability, cost, damage and expense arising from or in connection with services rendered.

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Dr Andries Gouws of INDEX (Pty) LTD conducted the survey. He is a registered member of SACNASP (Registration Number 400140/06) and is a registered member of the South African Soil Science Society.

Prof Leslie Brown assisted with the fieldwork and reviewed the report. He is registered as a Professional Natural Scientist (Registration Number 400075/98) and has the following qualifications:

- PhD Terrestrial plant ecology
- MSc. Water ecology
- BSc Hons (Botany)
- BSc (Ed) (Botany, Zoology, Education)
- Wetland and Riparian Delineation *(DWAF Accredited Course)*
- Soil Classification and Wetland Delineation Short Course – TERRASOIL Science
- Wetland Legislation Course - Wetrest

General declaration:

- INDEX acted as the independent specialist in this application;
- Perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- There were no circumstances that may compromise INDEX's objectivity in performing such work;
- INDEX have expertise in conducting the specialist report relevant to this application, including knowledge of NEMA and its regulations and any guidelines that have relevance to the proposed activity;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity.

Signature of specialist for INDEX

November 2024.

CONTENTS OF THE SPECIALIST REPORT

The contents of this specialist report comply with the legislated requirements as described in the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity (GN R. 320 of 2020).

The findings of the specialist assessment must be written up in an Aquatic Biodiversity Specialist Assessment Report that contains, as a minimum, the following information:

2.7.1	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Refer to DECLARATION
2.7.2	A signed statement of independence by the specialist;	Refer to DECLARATION
2.7.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	The survey took place in October 2024
2.7.4	The methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant;	Section 4.1
2.7.5	A description of the assumptions made, any uncertainties or gaps in knowledge or data;	There are no uncertainties
2.7.6	The location of areas not suitable for development, which are to be avoided during construction and operation, where relevant;	None was identified
2.7.7	Additional environmental impacts expected from the proposed development;	None was identified
2.7.8	Any direct, indirect and cumulative impacts of the proposed development on site;	None was identified
2.7.9	The degree to which impacts and risks can be mitigated;	Section 12
2.7.10	The degree to which the impacts and risks can be reversed;	No impacts are expected
2.7.11	The degree to which the impacts and risks can cause loss of irreplaceable resources;	No impacts are expected
2.7.12	A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies;	No buffer is recommended
2.7.13	Proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr);	Section 13
2.7.14	A motivation must be provided if there were development footprints identified as per paragraph 2.4 above that were identified as having a “low” aquatic biodiversity sensitivity and that were not considered appropriate;	The wetland is not sensitive
2.7.15	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not; and	Section 13
2.7.16	Any conditions to which this statement is subjected.	Section 13

2.8	The findings of the Aquatic Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report including the mitigation and monitoring measures as identified, that are to be included in the EMPr.	✓
2.9	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report	

1 BACKGROUND

Index was requested to undertake a wetland assessment for a proposed township establishment.

The property is located in the Lanseria Airport precinct. The site is approximately 25ha. Approximate centre coordinates are -107 163, -2 871 400 (System WS29).

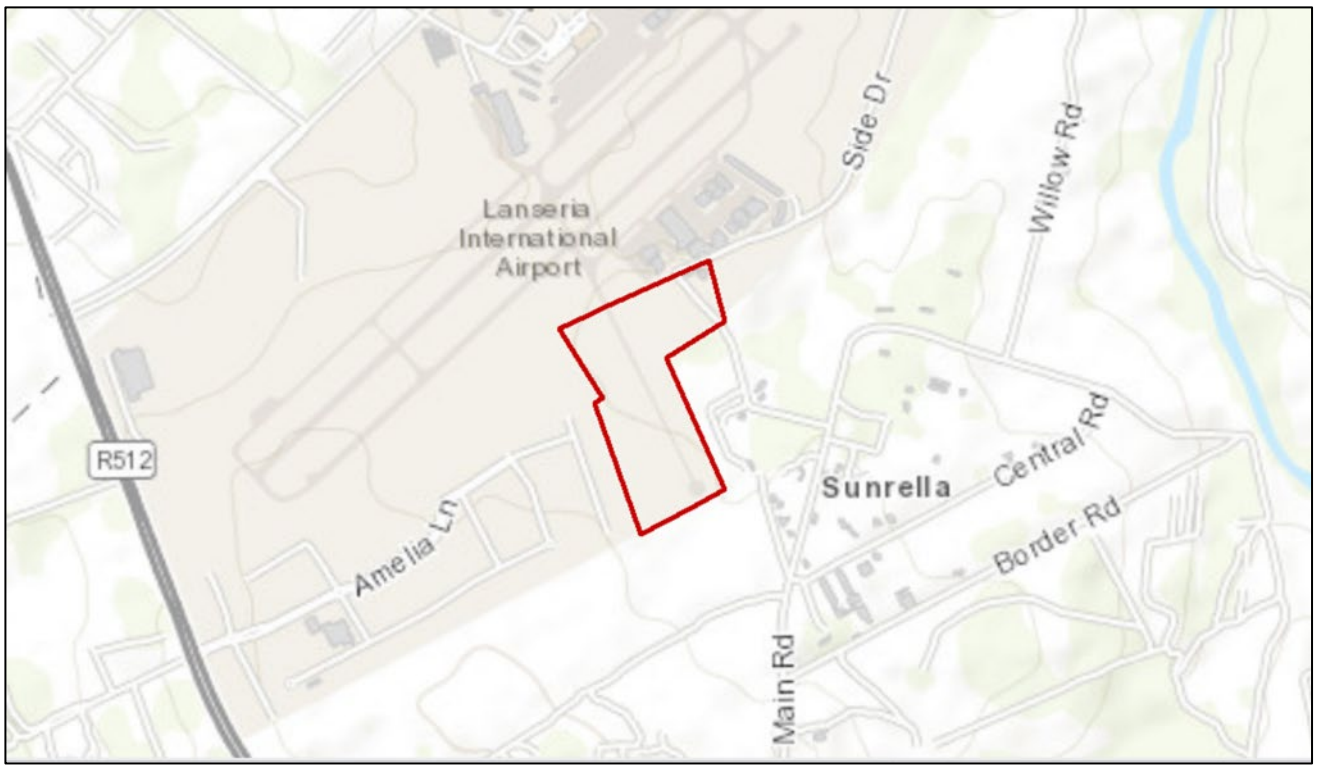


Figure 1. Locality of the site

Attribute	
Location	Erven 159-164 lia x 1), lia apron (erf 157&158 lia x 1)
City/town	Johannesburg METRO
Property size (affected property)	24,9ha
Artificial wetland size	1,23
Length of watercourse	None

The process followed for the riparian / wetland delineation and assessment is according to the methodology as contained in the Department of Water Affairs and Forestry, 2005 publication: A Practical Field Procedure for Delineation of Wetlands and Riparian Areas

The report conforms to the requirements of the Department of Water and Sanitation, and includes the following:

- Brief description of the natural environment that has an impact on wetland formation;
- Discussion of aspects determining wetland formation;
- Wetland delineation;

- Present ecological status of the wetland;
- Impact assessment;
- Conclusions and findings.

For the description of the environment, the findings and recommendations were taken from of *'TERRESTRIAL BIODIVERSITY (FLORA & FAUNA) ASSESSMENT FOR: Portion 32 of the Farm Botesdal 529JQ and Portions of Erf 183 Lanseria Airport Extension 1, Lanseria, Gauteng*' ; compiled by Prof Lesly Brown of Enviroguard Ecological Services cc.

2 LEGISLATION

National Water Act, 1998

In the National Water Act, a wetland is described as 'land which is transitional between terrestrial and aquatic systems where the water table is at, or near the surface; or the land that is periodically covered with shallow water, and which in normal circumstances supports, or would support vegetation typically adapted to life in saturated soil.'

Riparian zones are described as '*the physical structure and associated vegetation of the areas associated with a watercourse which is commonly characterised by alluvial soils, and which is inundated or flooded with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent areas*.'

The following is quoted from the Department of Water Affairs: Wetland delineation guidelines (2005), and is a description of hydromorphic soils:

'*A hydromorphic soil displays unique characteristics resulting from its prolonged and repeated saturation. A fluctuating water table, common in wetlands that are seasonally or temporarily saturated, results in alternation between aerobic and anaerobic conditions in the soil. Lowering of the water table results in a switch from anaerobic to aerobic soil conditions, causing dissolved iron to return to an insoluble state and be deposited in the form of patches or mottles in the soil. Recurrence of this cycle of wetting and drying over many decades concentrates these bright, insoluble iron compounds*.'

The National Water Act (Act) (Act 36 of 1998) recognises that the entire ecosystem and not just the water itself. The water resource and surrounding areas must be considered and constitutes the resource. No activity may therefore take place within a freshwater resource unless it is authorised by the Department of Water and Sanitation (DWS). Any area within a wetland or riparian zone is excluded from development unless authorisation is obtained from the DWS in terms of Sections 21 of the Act.

General Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the NWA (Act 36 of 1998)

In accordance with GN 509 of 2016, a regulated area of a watercourse for Section 21(c) and 21(i) of the NWA, 1998 is defined as:

- the outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;
- in the absence of a determined 1 in 100-year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or
- a 500 m buffer from the delineated boundary (extent) of any wetland or pan (regulated area).

This notice should be read together with the Risk Assessment provisions in the General Authorisation Notice in Relation to Section 21. The provisions of Section 21 that apply are:

- Section 21(c): Impeding or diverting the flow of water in a watercourse
- Section 21(i): Altering the bed, banks, course or characteristics of a watercourse.

Buffers

- Buffer recommendation of DWS

  In terms of legislation, wetlands and riparian zones are defined in the Water Act as a water resource and any activities that are contemplated that could affect the wetlands requires authorisation (Section 21 of the National Water Act of 1998).

  Although a distance of the buffer is not fixed in legislation, the distance of at least 32 metres is recommended. DWA developed a tool to calculate the buffer, it should be determined by the Buffer tool[1].

- Buffers as per GDARD guidelines

  The Minimum Requirements for Biodiversity Assessments, 2014 of the Gauteng Department of Agriculture and Rural Development (GDARD, 2014) state that different buffers must be applied to sites inside and outside the urban edge (Table 1).

Table 1. Buffer requirements as per GDARD, 2014

	Wetlands	Riparian areas
Inside urban edge	30 meters	32 meters
Outside urban edge	50 meters	100 meters

3 SITE SENSITIVITY VERIFICATION AND MINIMUM REPORT CONTENT REQUIREMENTS

Prior to commencing with a specialist assessment, the current use of the land and the environmental sensitivity of the site under consideration identified by the screening tool[2] must be confirmed by undertaking a **site sensitivity verification.**

- The site sensitivity verification must be undertaken by an environmental assessment practitioner or a specialist.
- The site sensitivity verification must be undertaken through the use of:

[1] Buffer zone guidelines for wetlands, rivers and Estuaries. 2017. WRC Report TT715-1-17.

[2] Procedures for the assessment and minimum criteria for reporting of identified environmental themes in terms of Section 24(5)a and (h) and 33 of the NEMA, 1994

- a desk top analysis, using satellite imagery;
- a preliminary on-site inspection; and
- any other available and relevant information.

- The outcome of the site sensitivity verification must be recorded in the form of a report that:
  - confirms or disputes the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.;
  - contains a motivation and evidence (e.g., photographs) of either the verified or different use of the land and environmental sensitivity; and
  - is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

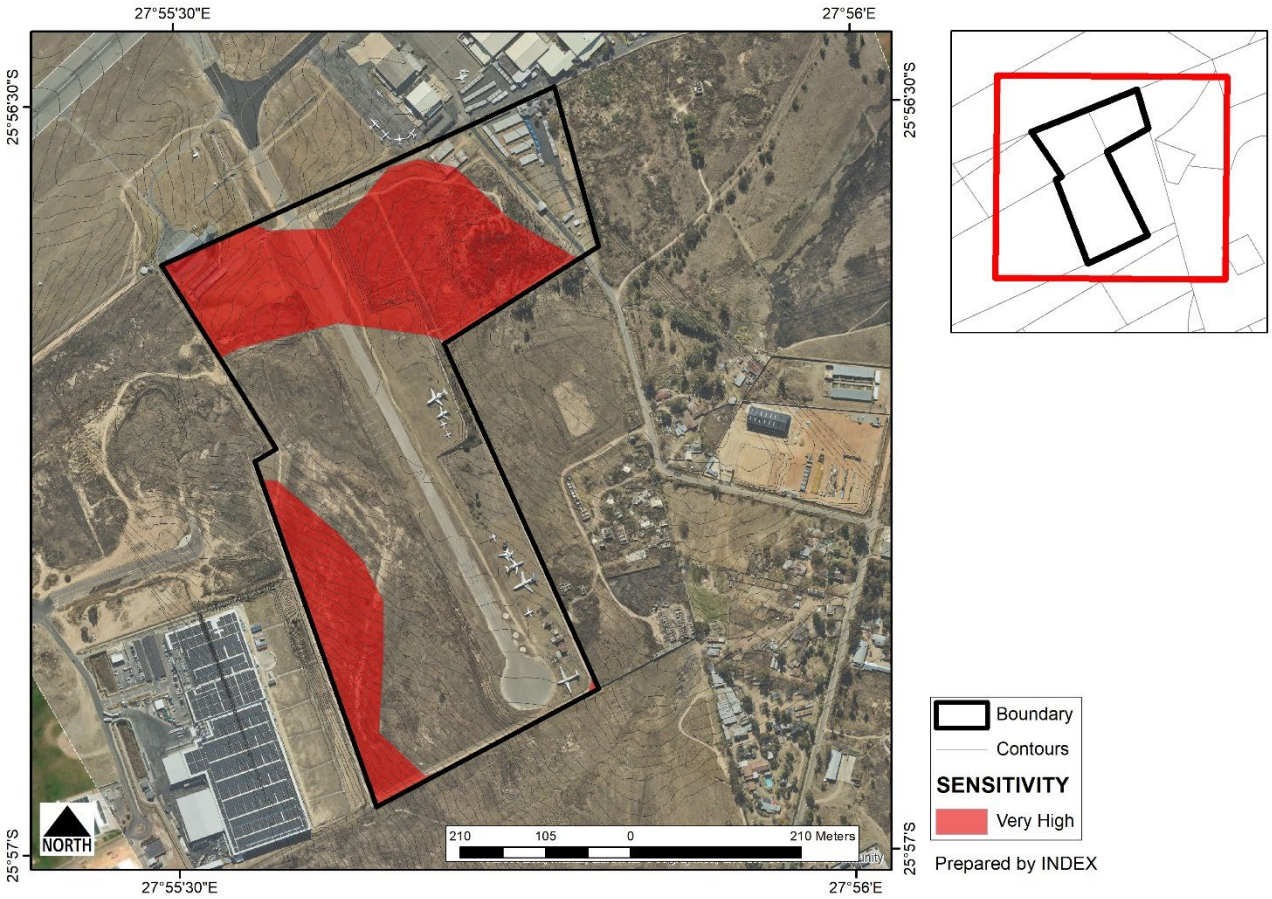


Figure 2. Tool sensitivity

Verification

The site sensitivity verification study found that the sensitivity tool on aquatic biodiversity is incorrect.

- Most of the site was transformed when the topsoil was removed in 2014. Artificial drainage channels were created to concentrate and divert stormwater to ultimately be released into a wetland 300m east of the site (refer to Section 4.3 and 4.4.2).

- A stormwater attenuation pond was constructed west of the site to control the stormwater from the main runway and runoff from ALPLA Lanseria - Packaging company's warehouse (refer to Figure 7).
- The land in the north-eastern corner was used to stockpile soil; it is uneven derelict land that is encroached by *Eucalyptus*. The Tool indicates it as highly sensitive. However, it is not a wetland but because it is so uneven, depressions encourage common wetland plants to establish.

The wetlands reflected in Figure 3 have been artificially created, but because it now performs basic wetland services such as water attenuation and silt capturing, it was assigned a sensitivity of *medium*.

Photo 1. Dry Glenrosa soil indicated as high sensitivity

Photo 2. Dry rocky soil indicated as high sensitivity

Photo 3. Stockpiled soil indicated as high sensitivity

Photo 4. Constructed stormwater drain

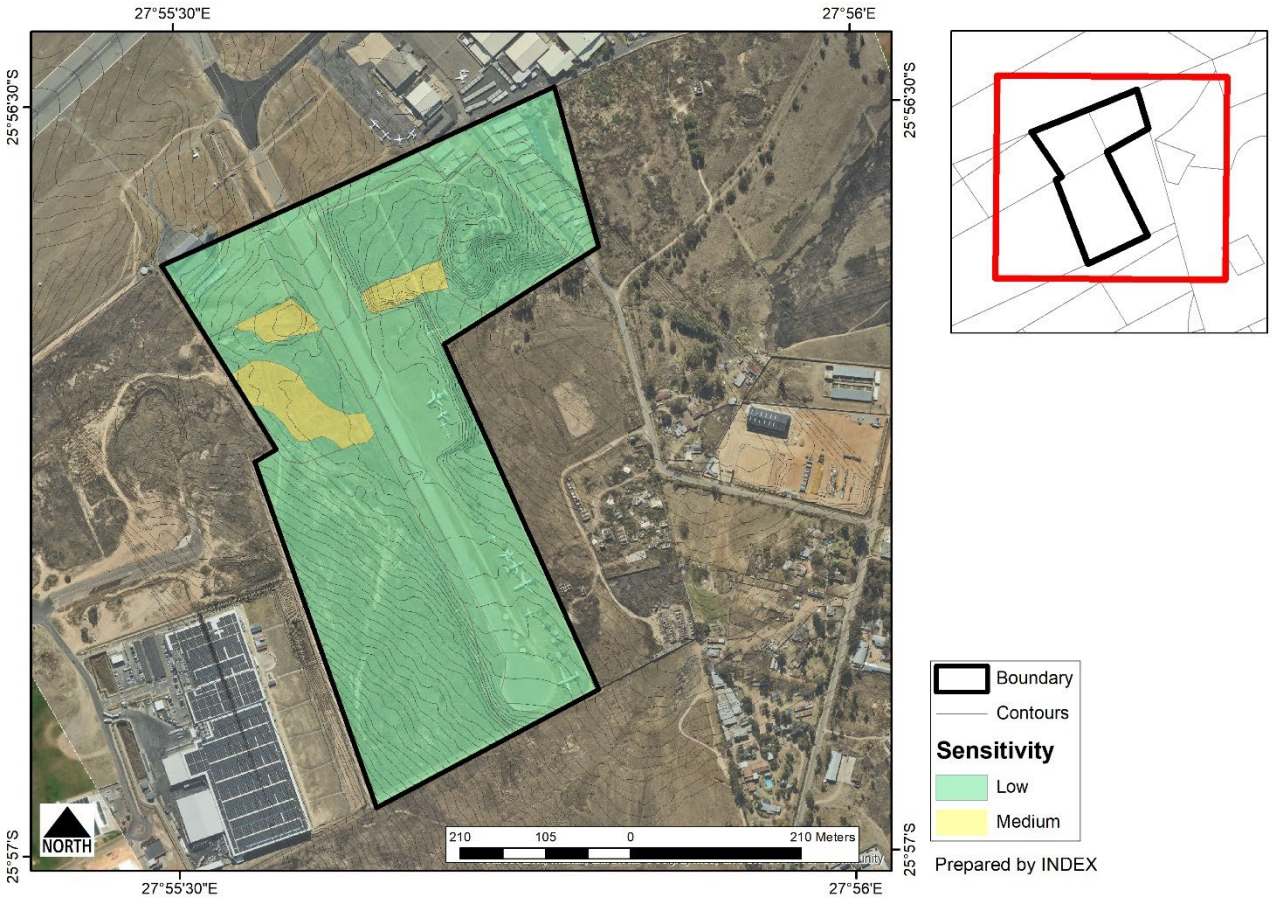


Figure 3. Actual site sensitivity

4 DESCRIPTION OF THE ENVIRONMENT

4.1 METHOD FOLLOWED FOR INVESTIGATION OF WETLAND

The procedure followed was as follows:

- Satellite images were used as backdrop for digitizing features;
- LIDAR data was used to develop a DTM and water flow paths, as well as for the generation of contours;
- A soil survey was done in accordance with the Binomial Classification System for Southern Africa (Soil Classification Working Group, 1991, revised 2016). Initial delineation of the soil forms took into account the following: vegetation type, terrain form, colour and texture of the soil. The boundaries are then refined through soil auger and or soil probe;
- Because of the topography, soil form had clear and distinct boundaries. These boundaries were delineated from earlier satellite images. Soil forms were then investigated in more detail. Vegetation composition was used as an indicator where wetland soils were likely to occur;
- Using the above information, the final boundary of the artificial wetland was delineated.
- Observations points are indicated in Figure 3 and photos provided as an addendum.

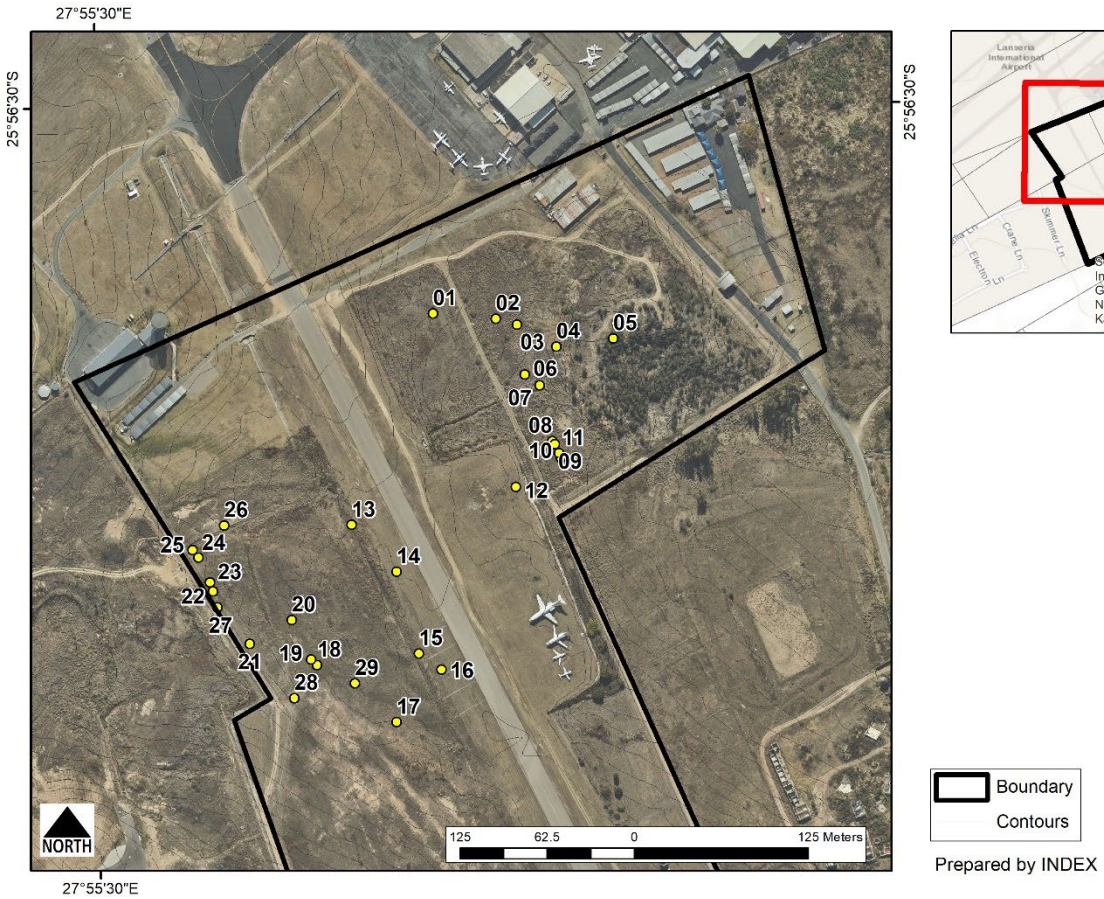


Figure 4. Position of observations made on site

The survey took place on 16 October 2024. This is in spring, at the start of the growing season. The evening of 15 October saw a rainstorm that overtopped the berms on the southern boundary of the site and led to surface flow and damming against the runway. The water also blocked the stormwater drains.

4.2 PRESENT LAND USE

The site is located within the Lanseria airport security area, alongside an east/west runway. Land uses are as follows:

1) Airport runway: this is a portion of land that was levelled and which is now used to store obsolete aircraft.
2) West of the runway is vacant land from which soil was removed in order to level the runway. Bare granite rock occurs on large sections of this land.
3) The central northern part of the site is vacant land.
4) Derelict land occurs just south of the commercial land. This is soil stockpiled some time ago and because it is so uneven, created ideal conditions for *Eucalyptus* trees and some hydrophytic plants to flourish.
5) The north eastern corner is indicated as commercial. This is the entrance to the site and the Lanseria International Airport Training Academy.

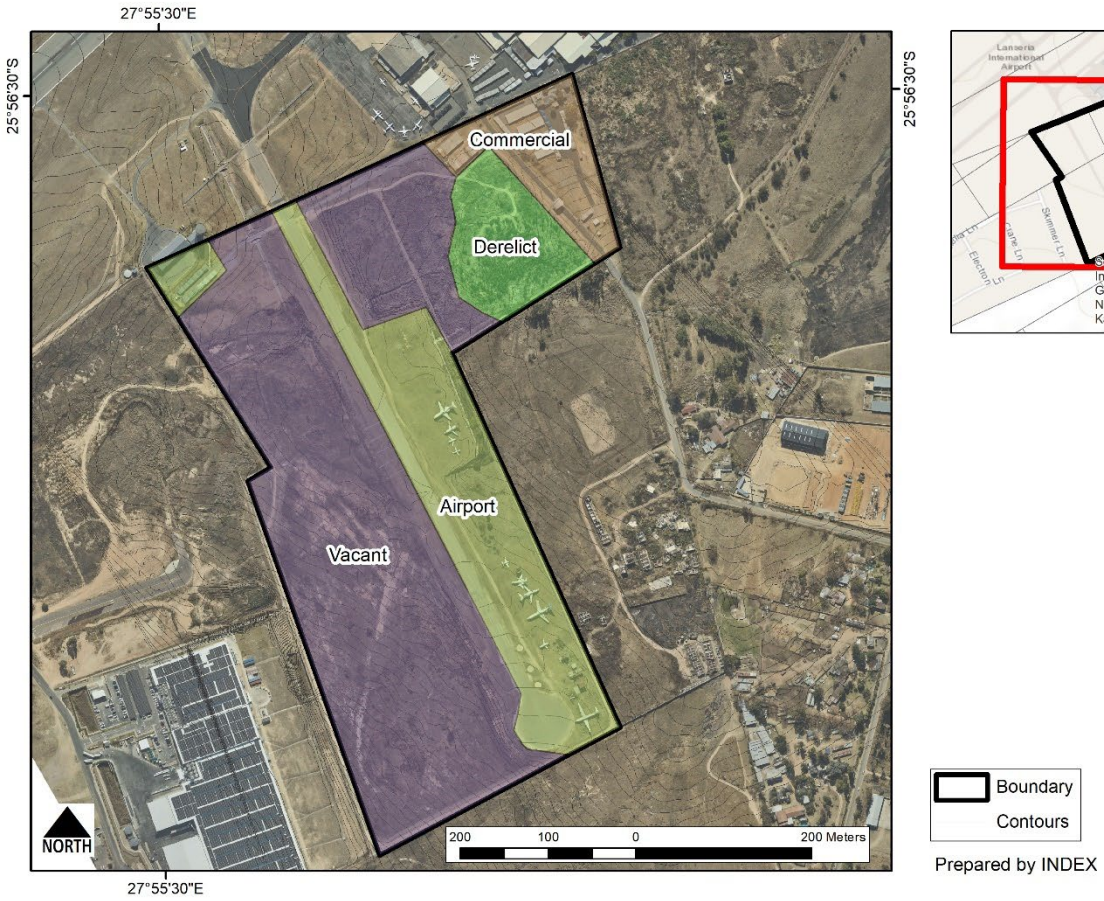


Figure 5. Present land uses of the property

4.3 HISTORIC SITUATION

- The site was developed as an airport in 1972 and opened in 1974. Two runways were constructed, 45 degrees, and later, one at 70 degrees. The latter one is where the development site is located. It is referred to as Runway 3.
- In 2011, soil was dumped in the northeastern section of the present development site. It was later encroached by *Eucalyptus.* Topographic maps of 2004 indicates that this area is located in a concave slope that allowed for surface flow of water emerging from the runway and vacant land west of the site. (refer to Figure 5).
- In 2014, the entire portion of land west of Runway 3 was stripped and the material used for construction purposes. Figures 6 & 7 clearly indicates the extent of the excavations. The entire drainage concave valley floor was transformed at that time and the functioning of the runoff system compromised.
- Land preparation for the construction of the ALPLA Lanseria - Packaging company to the west of the development boundary commenced in 2020/21 (see Figure 8). A platform of about 7m high was created on which the buildings were placed. A Stormwater attenuation pond was constructed north of the platform. A berm was constructed along the north western boundary of the development site, with drainage pipes that released stormwater directly onto the land west of Runway 3.
- Overtopping of the berm following rainstorms leads to saturated soils, and notwithstanding the shallow soils, wetland plants have started to flourish. This however is not a natural situation and when the

stormwater system is upgraded, the soil will dry out and the wetland plants will die off and change to terrestrial plants.

Figure 6. Google image 2011. Soil was dumped in the northeastern section of the development site

Figure 7. Google image 2014. The portion of land west of Runway 3 was stripped and the material used for construction purposes.

Figure 8. Google image 2021. Land preparation and construction of the ALPLA Lanseria - Packaging facility.

4.4 NATURAL RESOURCES

4.4.1 CLIMATE

Rainfall

- The rainfall is typical of the Highveld's summer rainfall pattern, where more than 80% falls from October through to April. An average of 715 mm rain is expected per year in the area, of which 585 mm is estimated as being available for vegetation growth.

Temperature

- Average temp
  - The monthly maximum temperature reaches a peak of 26,2^{0}C in January and then steadily falls to 16,3^{0}C in July.
  - The summers are mild and maximum temperatures above 32^{0}C are not common.
- Minimum temperature
  - The average monthly minimum temperature is 4,0^{0}C in June and July, while the absolute minimum can reach -4^{0}C.
  - The area experiences severe frost, which occurs frequently from mid-April to as late as September.
  - Occurrence of frost has to be considered in plant selection.
- The summers are mild where temperatures above 30^{0}C are seldom reached.

Wind

- Wind with moderately high speeds occurs from late winter to early summer.
- Wind damage to trees is not expected.

4.4.2 TERRAIN MORPHOLOGY AND HYDROLOGY

The entire development site is highly modified; ground was removed to construct the runways; the control tower and the stormwater drains when the warehouse of the ALPLA Lanseria - Packaging company was constructed.

Historical orthophotos obtained for the archives of the Surveyor General indicate that there were two main channels that drained the southern portion of Lanseria Airport (see Figure 6). One of these drained the subject site. These same photos showed an unchannelled flow pattern, which was likely surface flow. This same pattern was identified in a recent hydropedology survey on a land directly west of the site.

Figure 9 indicates a west to east section of the site. It clearly shows the raised runway and the uneven derelict land on the eastern boundary.

Figure 9, Morphology of the site

The general slope is less than 2% towards the east. The section through the site clearly shows that the construction of the runway concentrated and diverted the water through a drain underneath the runway.

ALPLA Lanseria - Packaging company's stormwater is channelled north towards a storm water attenuation pond from where it is gradually released through a constructed berm by regular placement of 100mm to 300mm drainage pipes.

Photo 5. Storm water drains along the southern boundary

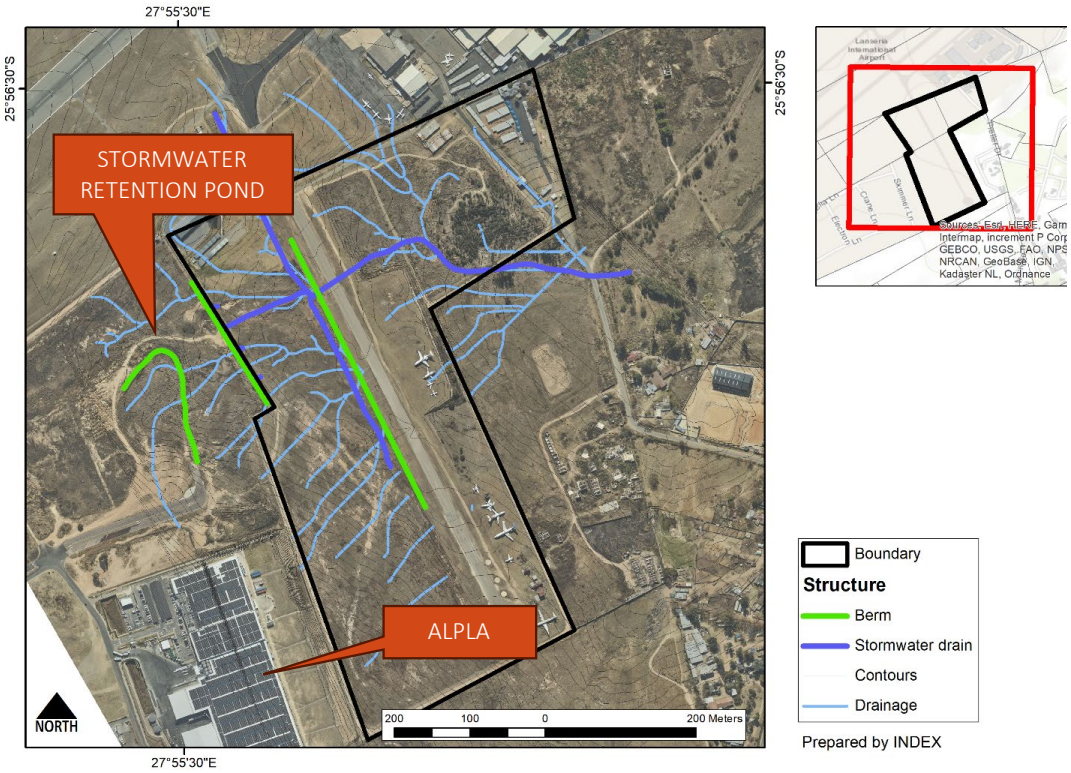


Figure 10. Surface hydrology

4.4.3 SOIL

A soil survey was one by Index as part of the agricultural specialist report and found the following:

Unit	Wetland soil	Area (ha)	Description	
Exc	No	1.91	Excavations / derelict land covered with mainly *Eucalyptus* trees. Due to the uneven topography, some areas gave rise to saturated soil conditions which allowed wetlands plants to develop. This, however, is not a wetland.	
Gs250	No	0.29	Shallow greyish topsoil that overlies partially weathered granite. Most of the topsoil was stripped in 2014. The topsoil's water holding capacity breached and the profile saturated. Once water no longer infiltrates, surface saturated flow in the layer above the granite or surface flow takes place. The soil shows signs of sheet and gully erosion.	
Gs300	No	8.2	Similar to Gs250, the soil was stripped of soil for construction purposes. However, this soil unit has a dry subsoil with only terrestrial vegetation.	

Gs400	No	1.87	This unit occurs in the northern part od the site, next to the runway. It consists of shallow yellowish-brown topsoil on partially weathered granite. The soil is 400 to 500 mm deep.	
INF	No	9.02	This unit consists of deturbed soil that is under building infrastructure. The ground is compacted with all rainfall water that drains via stormwater drains to lower lying areas.	
Lo/Wc	Yes	1.51	Profile development has taken place since 2014 and has caused mottling. However, because the soil is shallow and the water holding capacity is low, it rapidly dries out with the result that only facultative wetland species thrive.	
Wb	No	2.1	The runway effectively acts as a cutoff structure. All the water from surface flow to the north of west of the runway is channeled and released through a drain to the part north east of the runway. The channel was full of water during the time of the survey.	
Grand Total		**24.9**		

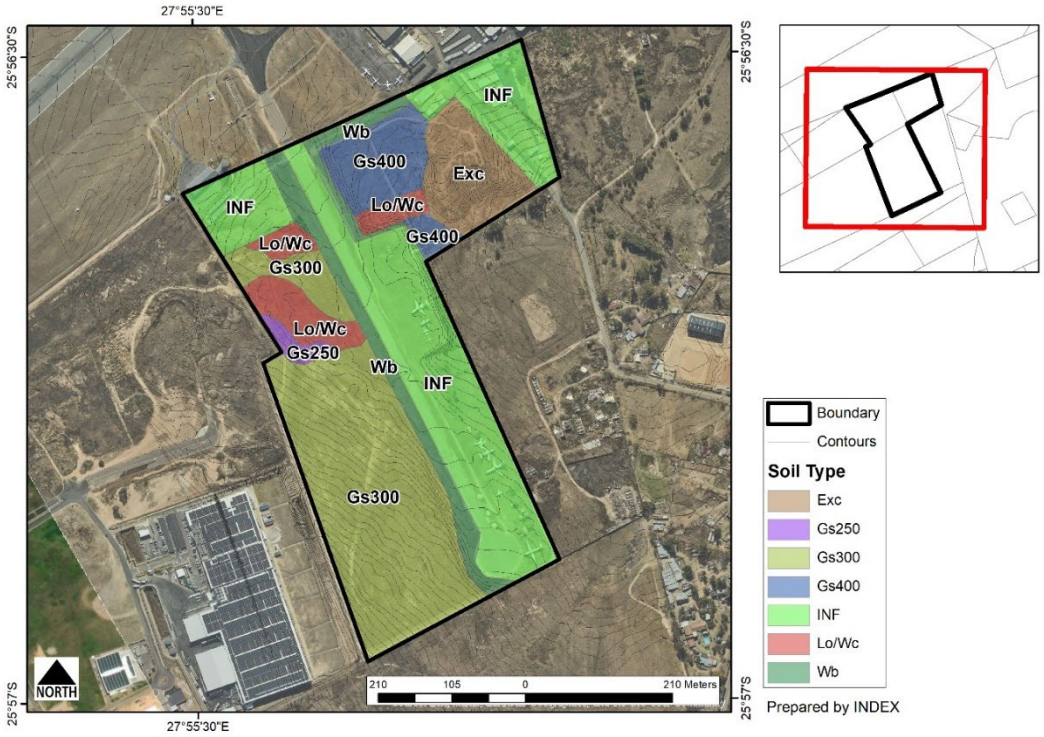


Figure 11. Soil map

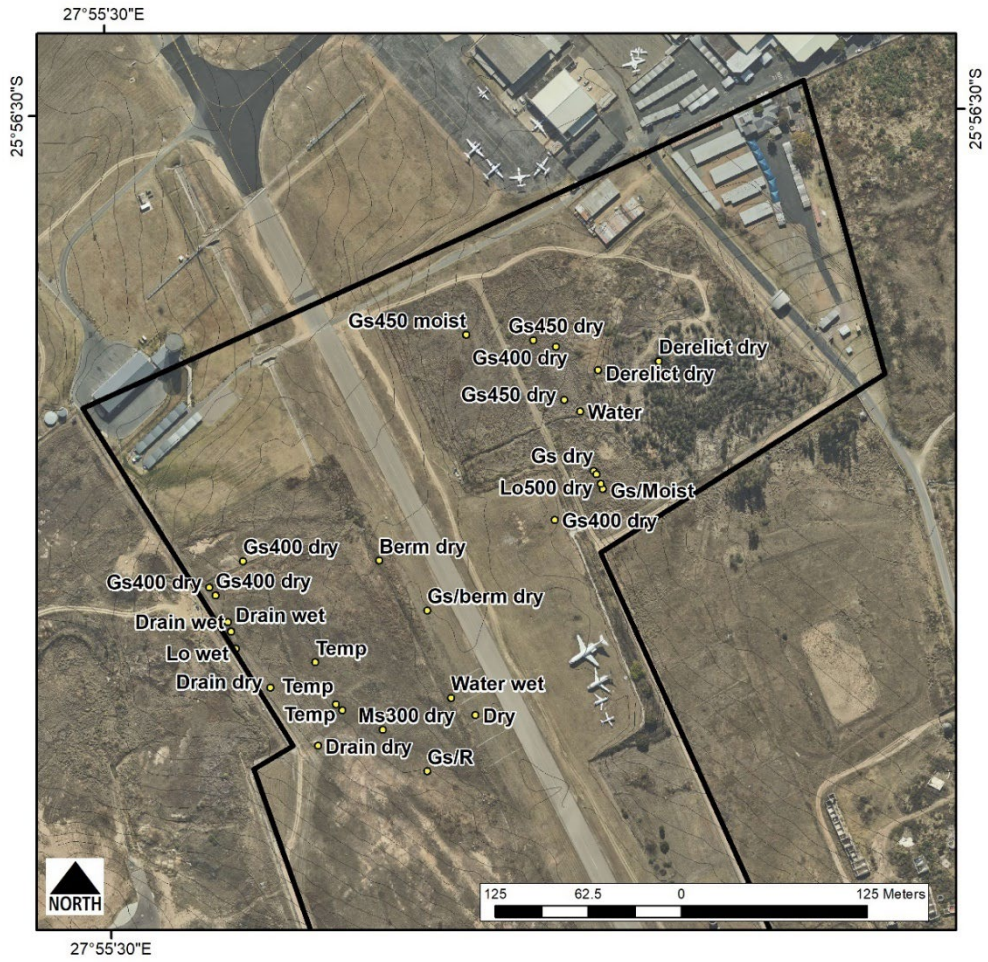


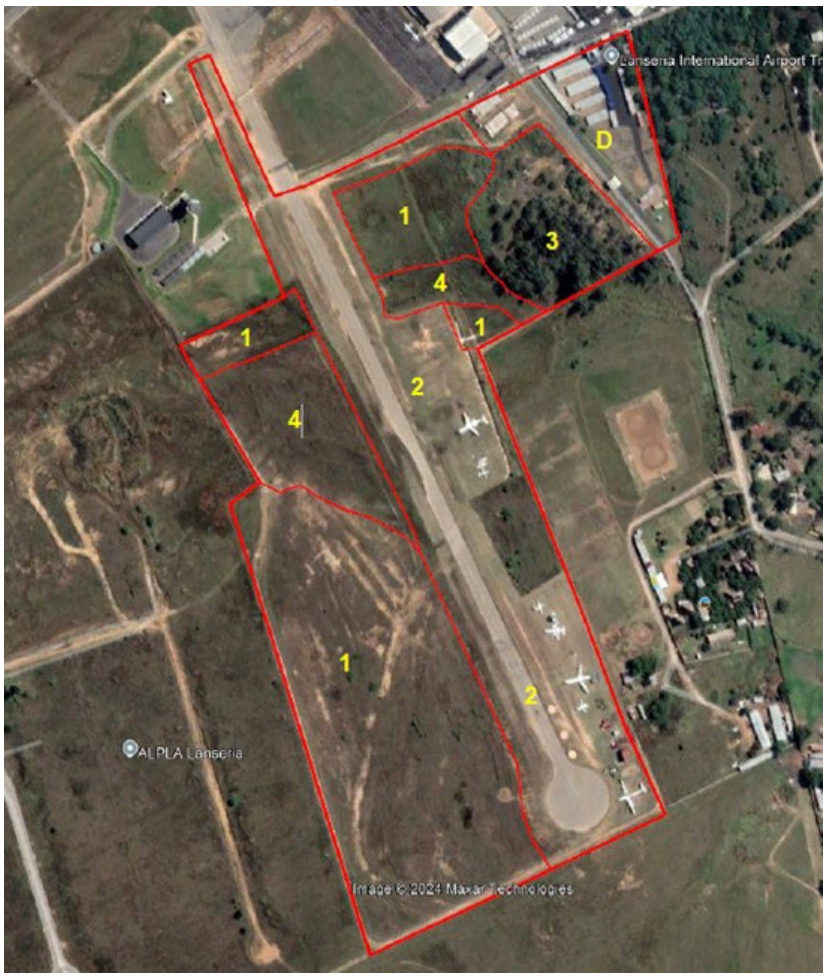
Figure 12. Soil observations

4.4.4 VEGETATION

Most of the site was recently burned due to veld fires. This had the advantage that the soil conditions could easily be investigated. The plant species were identified during two visits; the first on 16 October 2024, the second on 13 November 2024.

The platform and land adjacent to the runway consists of *Cynodon dactylon*. The vegetation is dominated by *Hyparrhenia hirta* and *Heteropogon contortus* grasslands, *Eucalyptus* woodland as well as lower-lying artificially created drainage lines and secondary seasonal wetlands.

The vegetation units as identified by the terrestrial survey conducted by Enviroguard Ecological Services cc, are summarised below:



Vegetation unit 1: Degraded grassland that comprises the largest part of the study area. In 2014 the area was cleared for construction purposes. This has resulted in pioneer and secondary successional species establishing together with alien invasive trees. The prominence of the grasses *Eragrostis rigidior, Hyparrhenia hirta* and *Heteropogon contortus* together with various pioneer grasses and forbs are indicative of the previous degradation.

Vegetation unit 2: The Runway grass area includes a runway and where decommissioned airplanes are parked. The area is mowed on a weekly basis and maintained as a lawn to prevent birds from roosting.

Vegetation unit 3: This is an Artificial wetland area and is located in the western and eastern sections of the study area. The vegetation includes a mixture of terrestrial and moisture-loving plants. These areas were originally terrestrial land but was modified during the construction of the secondary runway. Stormwater from

the main runway as well as the surrounding areas were diverted towards this section. Furthermore, the area is artificially fed with water from attenuation ponds further west from outside the study area.

Based on the general topography of this area, under pre-development conditions, surface water dispersion would have spread over the entire study site and not just this section.

With the various developments along the periphery of the study area as well as the construction of the runway, all stormwater was directed towards the study area via several stormwater pipes and artificially excavated canals along the western section of the study site. To prevent this water from flowing onto the runway an artificial berm was created along the western boundary of the runway. Surface water from the areas outside the study area is then channeled towards the berm from where it flows onto the larger section west of the secondary runway. The runway and a large berm across the width of the runway dams the water which then flows into an artificially dug channel that directs the water underneath the runway through stormwater pipes towards the eastern section of the runway, where it is discharged into the landscape.

The constant release of water onto the landscape east of the runway has created a narrow channel, and ponding of the water, where artificial wetland conditions have developed. The erstwhile terrestrial land that was excavated is now degraded because of the various construction activities on and around the site.

Vegetation unit 4: *Eucalyptus* woodland occurs in the eastern section of the study area. This area has been affected by land infill, dumping of rubble and litter; and alien plant invasion. The area has been transformed with no natural vegetation remaining.

5 NFEPA WETLANDS

National Freshwater Ecosystem Priority Areas for South Africa (or the 'NFEPA project') is a tool developed in 2011 and is now under the administration of Working for Water of DWS to indicate "*wetland ecosystem types and wetland condition on a national scale. The delineations were based largely on remotely-sensed imagery and therefore did not include historic wetlands lost through drainage, ploughing and concreting*." (Extracted from SANBI GIS metadata.) There are no NFEPA wetland recognised in proximity of the site.

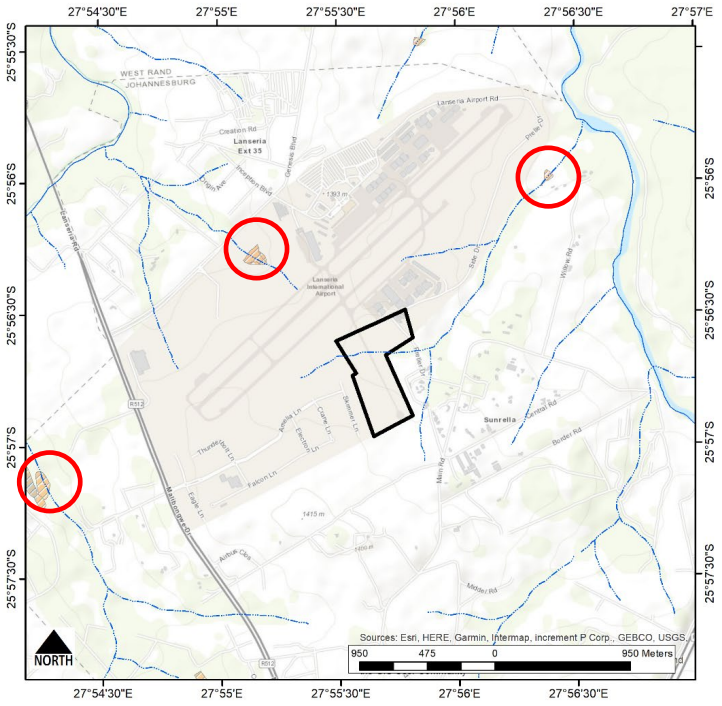


Figure 13. NFEPA wetlands in the area

6 WETLAND DELINEATION

The (hydro-geomorphology) HGM classification of DWS was followed; this classification system is based on the position of a wetland in the landscape (geomorphic setting), dominant sources of water, and the flow and fluctuation of water once in the wetland. Units are indicated in the addenda.

Wetlands are defined by the National Water Act as '*land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.*' Accordingly, a wetland must have one or more of the following attributes:

- Wetland (hydromorphic) soils that display properties resulting from prolonged saturation;
- The presence, at least occasionally, of water-loving plants (hydrophytes);
- A perched water table that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil.

The objective of the delineation procedure is to identify the outer edge of the temporary zone. This outer edge marks the boundary between the wetland and adjacent terrestrial areas. Occurrence of standing water and hydrophilic plants and finally, soil conditions were used as the determinant for this assessment. In more detail, the following:

6.1 CRITERIA

Soil condition is the primary criterion that signifies waterlogged conditions. These conditions manifest itself through plant communities that can tolerate hydromorphic soils. These plants are hydrophytes that are adapted to stresses imposed on plants through temporary or permanent waterlogged conditions. Because of the disturbed nature and history of the site, credence was placed on the plant composition as boundary of the saturated zones.

The importance of retaining and maintaining functional wetlands are well established - the process of establishing the boundaries less so. The following criteria discussed in *A Practical Field Guide for the Identification and Delineation of Wetlands and Riparian Areas*, published by DWS are used as baseline information. Guidelines for the main indicators are the following:

Terrain morphology

Wetlands predominantly occur on valley bottoms and on seeps in other terrain forms. Refer to Section 4.3.2.

Vegetation

Vegetation on site was used as a reflection of the soil conditions, but only used as a visual method of finding areas where wetlands may occur.

- Large proportion of hydrophytes; emergent plants: reeds, sedges, and floating or submerged aquatic plants indicate permanently saturated wetlands;
- Hydrophilic sedges and a variety of grass and hydrophilic woody plants are dominant on seasonally waterlogged soils;
- A variety of water tolerant grasses and woody species that may also occur on non-wetland areas can be indicative of temporarily waterlogged conditions.

Soils

Soils are the main determinant of wetland conditions. Redoximorphic features must be present within the upper 500 mm of the soil profile for an area to be considered a wetland. Redoximorphic features typically occur in three types:

- Matrix colour: *in situ* low chromas resulting from the absence of Fe^{3+} ions which are characterised by "grey" colours of the soil matrix.
- Depletion of Fe-Mn oxides or where both Fe-Mn oxides and clay have been stripped.
- Accumulation of iron and manganese oxides (also called mottles).

Qualifying colours, according to the Munsell colour chart are indicated in the annexures.

6.2 WETLAND BOUNDARIES

Water saturated portions could clearly be identified during the site visit. Seasonally saturated soils were classified as temporary and artificial wetlands. The saturated land on the western portion is largely fed from the stormwater drain that enters the site.

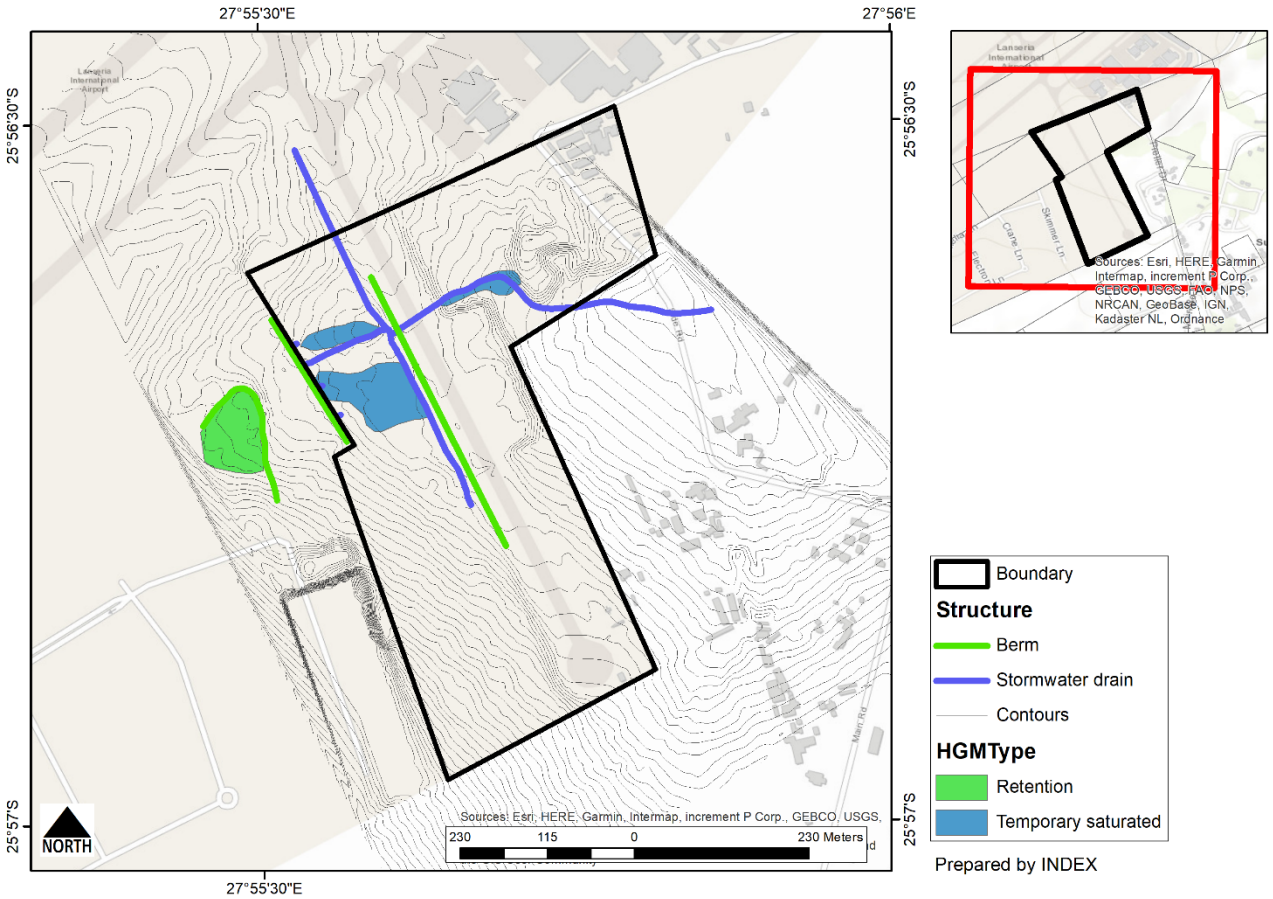


Figure 14. Wetlands on the development site

7 THE PRESENT ECOLOGICAL STATE (PES)

The wetland is isolated with no natural connectivity to any river or stream. It developed because of anthropogenic activities: stormwater retention pond outside and south of the development site, drainage from the runway, artificially dug channels etc. This is creating adverse ecological problems for the whole northwestern portion of the project area.

An artificial wetland has formed as a result of construction of the stormwater retention actions and the berm along the western boundary of the development site. This introduced stormwater and created artificial conditions that caused the wetland. A new stormwater system is proposed that will effectively cut off the source of water and will likely lead to the wetland plants to disappear and the area becoming dominated by terrestrial vegetation again.

Prior to these disturbances, the stormwater release was in the form of laminar surface flow, with few or no facultative wetland plants.

The description of classes and score of the state of the wetland are as follows:

Table 2. Impact scores and Present Ecological State categories used by WET-Health for describing the integrity of wetlands

Description	Combined impact score	PES Category
Unmodified, natural.	0 – 0,9	A
Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1 – 1,9	B
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact	2 – 3,9	C
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4 - 5,9	D
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6 - 7,9	E
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8 - 10	F

The PES category is classed as critically modified (class F). This is the result of the activities of surrounding commercial and urban development.

Table 3. Summary of the Present Ecological State associated with the project area Present Ecological State

Variable	Status
Modifications to Instream Habitat Continuity	Low
Modifications to Riparian/ Wetland Zone Continuity	Serious
Potential Instream Habitat Modifications	Serious
Modifications to Riparian/ Wetland Zones	Low
Potential Flow Modifications	Critical
Potential Physical-Chemical Modifications	Serious

8 THE ECOLOGICAL IMPORTANCE AND SENSITIVITY

The artificial wetland areas are located in the northern portions of the site west and east of the runway respectively. There is a mixture of terrestrial and moisture-loving plants. These areas were originally terrestrial land, but water was diverted towards this section by the construction activities west of the site.

This area used to be terrestrial land; but due to the constant water release during the rainfall season especially and the damming of the water, artificial wetland conditions have developed. Because it is an artificial wetland with a low plant species richness, this area has a Low aquatic sensitivity and importance.

Table 4. Ecological Importance and Sensitivity classes. (DWA 2013)

Ecological Importance and Sensitivity Categories	Range of EIS Score	EIS Class
Very high: Wetlands that are considered ecologically important and sensitive on a national or international level. The biodiversity of these systems is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water.	4	A
High: Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these systems may be sensitive to flow and habitat modifications. They play a role in moderating the quality and quantity of water in major rivers.	3-4	B
Moderate: Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these systems is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major river.	2-3	C
Low/Marginal: Wetlands that is not ecologically important and sensitive at any scale. The biodiversity of these systems is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	1-2	D
None: Wetlands that is rarely sensitive to changes in water quality/hydrological regime.	0	E

Ecological importance is an expression of a wetland's importance to the maintenance of ecological diversity and functioning on local and wider spatial scales. Ecological sensitivity refers to the system's ability to tolerate disturbance and its capacity to recover from disturbance once it has occurred (DWAF, 1999). This classification of water resources allows for an appropriate management class to be allocated to the water resource and includes the following:

- Ecological Importance in terms of ecosystems and biodiversity;
- Ecological functions; and
- Basic human needs.

Table 4 indicates the EIS scores obtained for the section of the watercourse discussed in the current study. Table 5 provides an overview of the rating scale used with an explanation of the relative status of units in each category. Although the wetland is deemed not sensitive according to this methodology it remains a component of a non-renewable resource and as such is protected by various pieces of legislation and local policies, and should therefore in this context be seen as sensitive.

Table 5. EIS scores obtained for the wetland (DWAF, 1999)

WETLAND IMPORTANCE AND SENSITIVITY	Importance	Confidence
Ecological importance & sensitivity	0	***4.2***
Hydro-functional importance	1.0	***4.0***
Direct human benefits	0	***4.0***
Overall score	**1.0**	

9 CONNECTIVITY

The site is surrounded by activities of the Lanseria International Airport and its infrastructure. The area directly south of the study site is open land which has been affected by various anthropogenic activities. Towards the east, outside the study area, there is a stream/wetland system.

These is no connectivity with the wetland downstream. The flow at present is via stormwater drains.

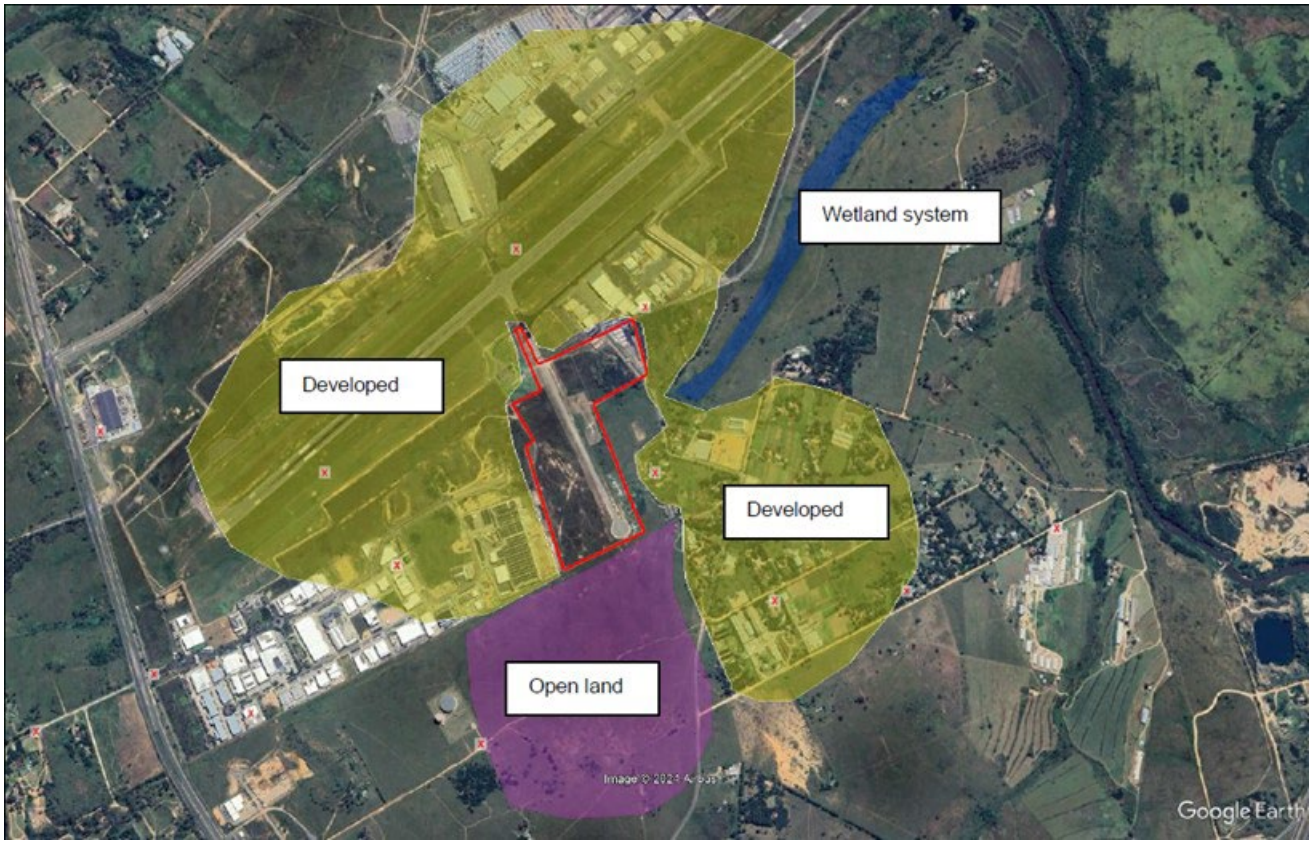


Figure 15. Connectivity of wetlands (source: Terrestrial study)

10 BUFFER ZONE

The prescribed buffers are as follows:

- The Water Act: The Buffer Tool calculated the buffer as a minimum of 15 metres.
- In terms of NEMA's EIA Regulations any development within the 1:50 year floodline and 32 metres from the stream margin will trigger environmental authorisation in terms of the NEMA
- Provincial: GDARD: The site falls within the development boundary (urban edge) of the Johannesburg Metro - a buffer of 30 metres is recommended.

Buffer determination

The artificial wetland on the site has no connectivity downstream, and as such has no ecological function apart for stormwater attenuation. However, the proposed development will implement a stormwater system that will control the stormwater through an attenuation structure. Because no functional wetlands were identified, no buffer is applicable.

11 PROPOSED DEVELOPMENT

The proposed development is indicated in Figure 17.

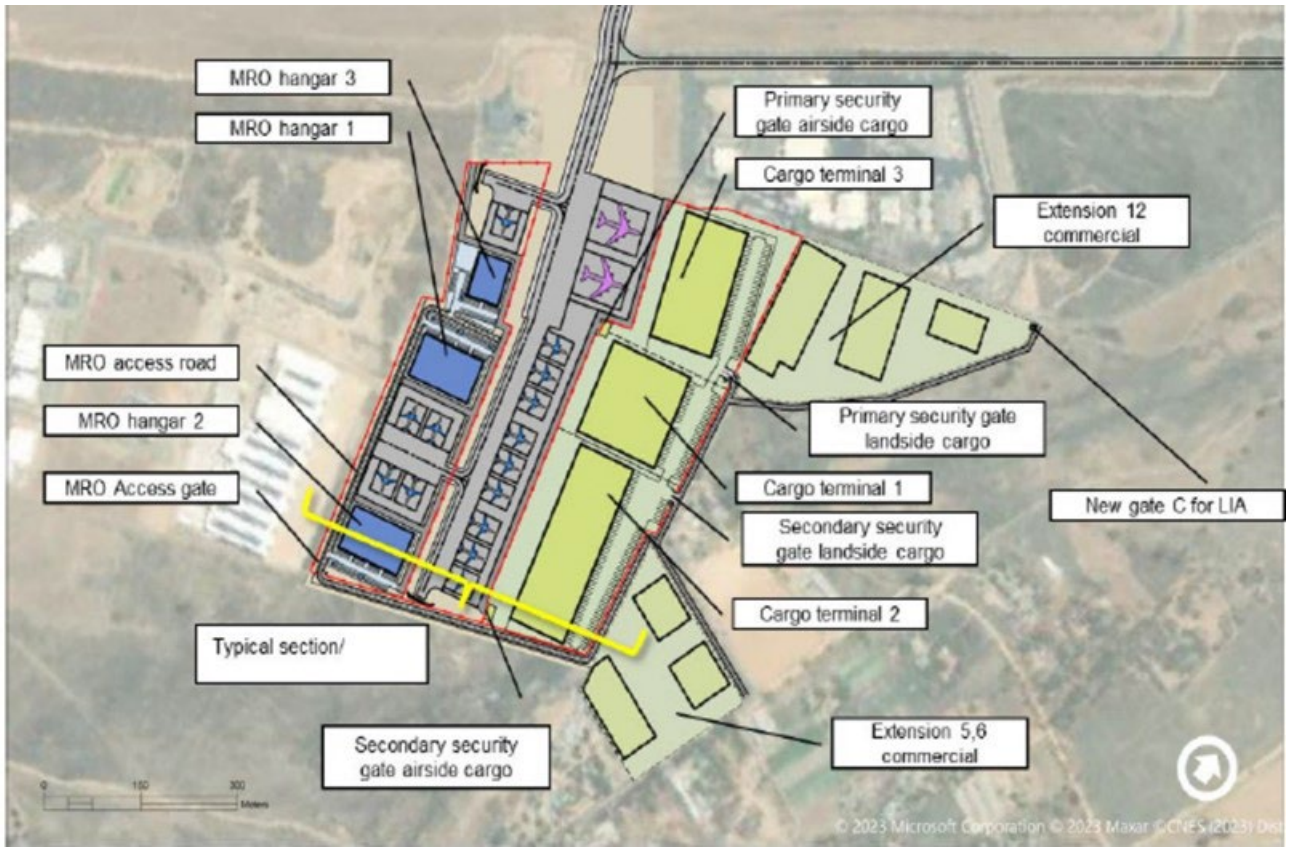


Figure 16. Development footprint and proposed services

12 IMPACT STATEMENT

The wetland is regarded as an artificial system that developed as a result of human activities, i.e., channelling of surface and storm water onto the area from outside of the site and the attenuation dams from the adjacent developments. The berm along the western boundary as well as that next to Runway 3, dams water which is discharged via an artificial drain and stormwater pipe below the runway, and then towards a canal that ultimately flows into the wetland east of the site.

Because of the higher-than-normal flow volumes being experienced as a result of the release of storm and surface water onto the area, wetland conditions have developed. Once the proposed stormwater management system has been installed, the area would become dry again.

No birds are allowed in the artificial wetland because of the potential danger they pose to air traffic. This implies that it is not possible to have a true wetland on the development site because it would automatically attract birds.

Based on these results and the low functioning of the wetlands, the development will have a **low ecological sensitivity.**

13 CONCLUSION & RECOMMENDATIONS

- In 2011, soil was dumped in the northeastern section of the present development site. It has since encroached by *Eucalyptus.*
- In 2014, the entire portion of land west of Runway 3 was stripped of topsoil and used for construction. The entire concave valley floor was transformed at that time and the functioning of the runoff system compromised.
- Land preparation for the construction of the ALPLA Lanseria - Packaging facility commenced in 2020/21. A platform of about 7m high was created on which the buildings were placed. A Stormwater attenuation pond was constructed north of the platform. A berm was constructed along the north western boundary of the development site, with drainage pipes that released stormwater directly onto the land west of Runway 3.
- Overtopping of the berm following rainstorms leads to saturated soils, and notwithstanding the shallow soils, wetland plants have started to flourish. When the stormwater system is upgraded, the soil will dry out and the wetland plants will gradually change to terrestrial plants.

Wetland boundaries

Water saturated portions could clearly be identified during the site visit. Seasonally saturated soils were classified as temporary and artificial wetlands. The saturated land on the western portion is largely fed from the stormwater drain that enters the site.

The wetland is isolated with no natural connectivity to any river or stream. Anthropogenic activities created adverse ecological problems for the whole northwestern portion of the project area.

An artificial wetland was formed with the construction of the stormwater retention facility and the berm constructed along the western boundary of the development site. The new stormwater system that is proposed will effectively cut off the source of water and will likely lead to the wetland plants to disappear.

Prior to these disturbances, the stormwater release was in the form of surface flow this few or no facultative wetland plants.

Because it is an artificial wetland with a low plant species richness, this area has a Low aquatic sensitivity and importance.

CONNECTIVITY

The site is surrounded by activities of the Lanseria International Airport and its infrastructure. The area directly south of the study site is open land which has been affected by various anthropogenic activities. There is no connectivity with the wetland downstream. The flow at present is via stormwater drains.

Buffer determination

There is only an artificial wetland on the site that has no connectivity downstream, and which has no ecological function apart for stormwater attenuation. Because no functional wetlands were identified, no buffer is applicable.

Recommendations

1) Birds are chased away or eradicated for safety reasons. This means that stormwater attenuation takes place by means of constructed features that releases water into the wetland system north-east of the site;
2) The stormwater attenuation structure that was proposed for the ALPLA Packaging Facility must be implemented. This will effectively dry out the artificial wetlands;
3) The existing stormwater attenuation system should be incorporated into the plan for the proposed development;
4) Because there is no reason why land just west of Runway 3 should be protected, that it be used to do infill for the proposed platform in the northeastern portion of the site.

It is recommended that the project be approved.

14 REFERENCES

Assessment Index in River Eco Classification: Manual for Eco Status Determination (version 2). Joint Water Research Commission and Department of Water Affairs and Forestry report. WRC Report No., DWAF, Pretoria, South Africa.

Buffer Zone Guidelines for Rivers, Wetlands and Estuaries Part 1: Technical Manual. 2017. Douglas Macfarlane, Ian Bredin. Report to the Water Research Commission. WRC Report No. TT 715-1-17.

Department of Water Affairs and Forestry, 2005. A practical field procedure for identification and delineation of wetland and riparian areas. DWS, Pretoria.

Land Type Survey Staff. 1972-2006. *Land Types of South Africa: Digital map (1:250 000 scale) and soil inventory databases*. ARC-Institute for Soil, Climate and Water, Pretoria.

Marnewecke, G. & Kotze, D., 1999. Appendix W6: Guidelines for delineating the boundaries of a wetland and the zones within a wetland in terms of the South African Water Act. Version 1.0. Department of Water Affairs and Forestry, Pretoria, South Africa.

McVicar *et al*. 1977. Soil Classification: A Binomial System for South Africa. Department of Agriculture.

Mucina, L. & Rutherford, M. C. (Eds) 2006. The vegetation of South Africa, Lesotho and Swaziland.

National Water Act, Act 36 of 1998.

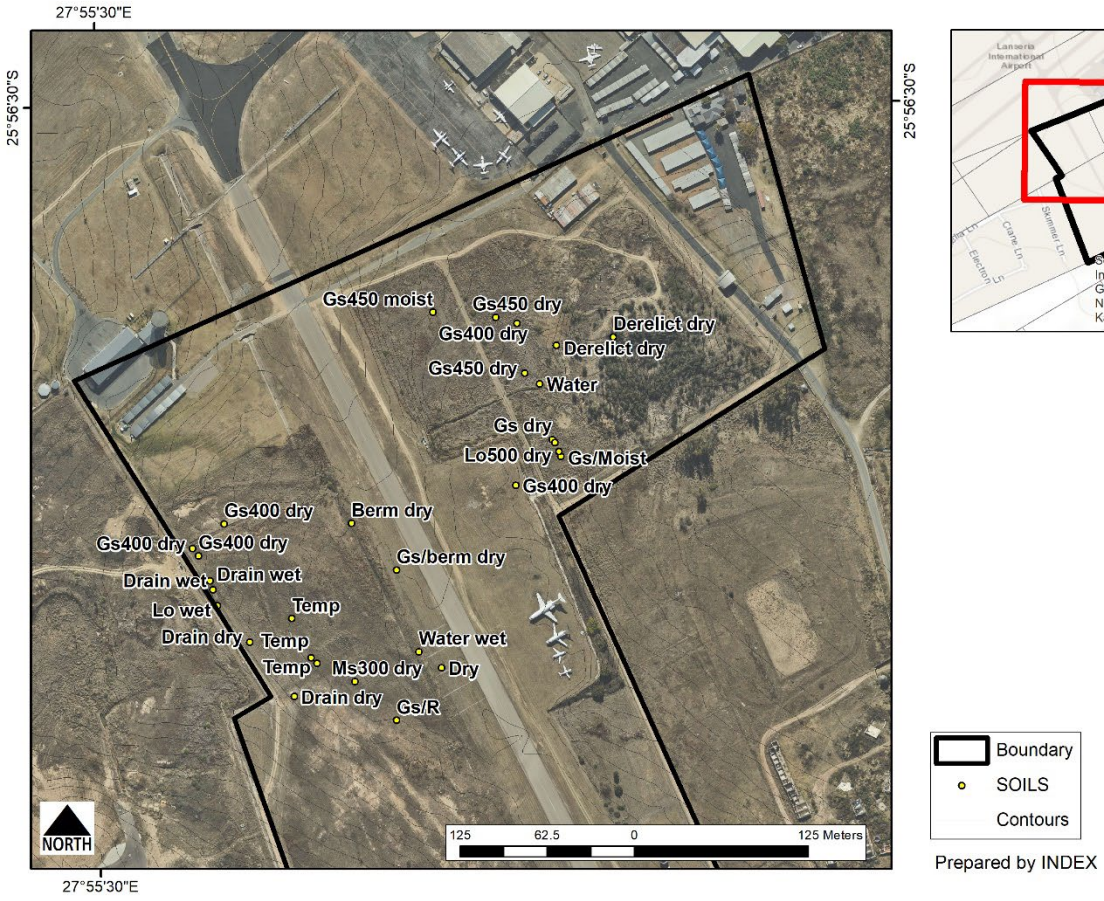
Ollis D, Snaddon K, Job N, Mbona N. Classification System for Wetlands and other Aquatic Ecosystems in South Africa. SANBI Biodiversity Series 22.

Pressy, R.L. 1997. Protected areas: Where should they be and why should they be there? (In Spellerberg, I.F., ed. Conservation Biology, England, Longman Publishers. p. 171-185)

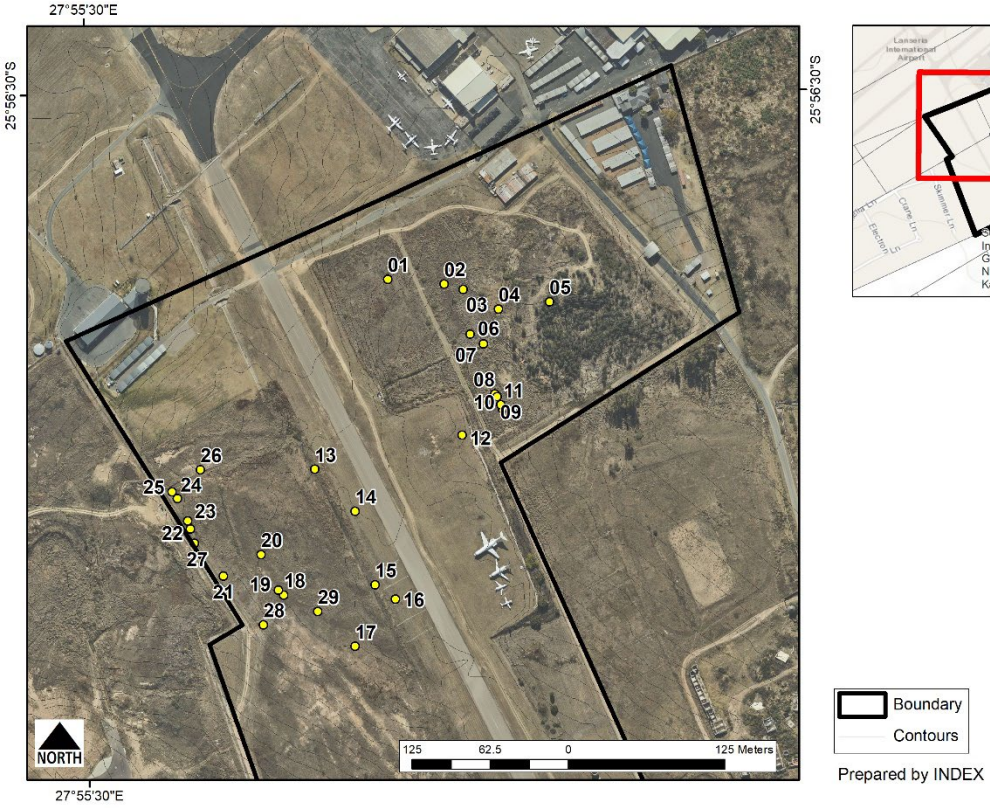
Strelitzia 19. South African National Biodiversity Institute, Pretoria.

15 ANNEXURES

15.1 SOIL OBSERVATIONS



15.2 PHOTOS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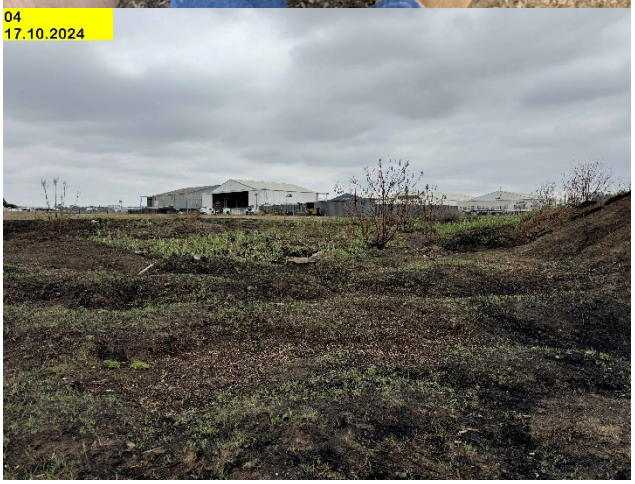
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15.3 DESCRIBING AND CLASSIFYING COMMON TYPES OF WETLANDS

The wetland typing system proposed above (Table 1) identifies seven basic wetland types across South Africa, with true rivers being a separate (eighth) category characteristic of confined valley floors. Thus, in valley bottom positions of the landscape we could expect to find:

- Rivers;
- Lakes;
- Unchannelled Valley Bottoms;
- Channelled Valley Bottoms; and
- Meandering Floodplain systems

Seepage wetlands could be expected to be found in slope positions of the landscape, and depressional pans (sometimes surrounded by seepage wetlands) might be found in crest positions of the landscape. The characteristics of the seven basic wetland types (and contrasted to rivers) are described below.

Rivers

Linear fluvial, eroded landforms which carry channelized flow on a permanent, seasonal or ephemeral/episodic basis. The river channel flows within a confined valley (gorge) or within an incised macro-channel. The "river" includes both the active channel (the portion which carries the water) as well as the riparian zone.

Meandering Floodplains

Linear fluvial, net depositional valley bottom surfaces which have a meandering channel which develop upstream of a local (e.g. resistant dyke) base level, or close to the mouth of the river (upstream of the ultimate base level, the sea). The meandering channel flows within an unconfined depositional valley, and ox-bows or cut-off meanders - evidence of meandering – are usually visible at the 1:10 000 scale (i.e. observable from 1:10 000 orthomaps).

The floodplain surface usually slopes away from the channel margins due to preferential sediment deposition along the channel edges and areas closest to the channel. This can result in the formation of backwater swamps at the edges of the floodplain margins.

Channelled Valley Bottoms

Linear fluvial, net depositional valley bottom surfaces which have a straight channel with flow on a permanent or seasonal basis. Episodic flow is thought to be unlikely in this wetland setting. The straight channel tends to flow parallel with the direction of the valley (i.e. there is no meandering), and no ox-bows or cut-off meanders are present in these wetland systems. The valley floor is, however, a depositional environment such that the channel flows through deposited sediment. These systems tend to be found in the upper catchment areas.

UNCHANNELED Valley Bottoms

Linear fluvial, net depositional valley bottom surfaces which do not have a channel. The valley floor is a depositional environment composed of fluvial or colluvial deposited sediment. These systems tend to be found in the upper catchment areas, or at tributary junctions where the sediment from the tributary smothers the main drainage line.

Lakes

These are depressions in the valley bottoms which may be temporarily, seasonally or permanently inundated. Unlike pans, they are not deflationary erosional features, but instead they have, or would have had, an outlet at the downstream end of the valley (a low point); which has been variously blocked or otherwise restricted by dune deposits; terminal moraines (e.g. Lake District; U.K.), landslides or other depositional features across the valley bottom. Their shape is therefore determined by the surrounding slopes/higher ground (in contrast to the deflation processes creating the typical circular or oval depressional pan shapes).

Seepage wetlands

Seepage wetlands are the most common type of wetland (in number), but probably also the most overlooked. These wetlands can be located on the mid- and footslopes of hillsides; either as isolated systems or connected to downslope valley bottom wetlands. They may also occur fringing depressional pans. Seepages occur where springs are decanting into the soil profile near the surface, causing hydric conditions to develop; or where throughflow in the soil profile is forced close to the surface due to impervious layers (such as plinthite layers; or where large outcrops of impervious rock force subsurface water to the surface).

Depressional Pans

Small (deflationary) depressions which are circular or oval in shape; usually found on the crest positions in the landscape. The topographic catchment area can usually be well- defined (i.e. a small catchment area following the surrounding watershed). Although often apparently endorheic (inward draining), many pans are “leaky” in the sense that they are hydrologically connected to adjacent valley bottoms through subsurface diffuse flow paths.

Flats

In areas with weakly developed drainage patterns and flat topography, rainfall may not drain off the landscape very quickly, if at all, due to the low relief. In such areas (commonly characterized by aeolian deposits or recent sea floor exposures) the wet season water table may rise close to, or above, the soil surface, creating extensive areas of shallow inundation or saturated soils. In these circumstances the seasonal or permanently high groundwater table creates the conditions for wetland formation.

15.4 CRITERIA FOR THE IDENTIFICATION OF WETLANDS (DWAF)

The main indicators are:

1) Terrain – Valley bottom and seep on slopes
2) Soil form indicator –
3) Soil wetness indicator
    a. Hue 2.5YR
        i. >5 value and <2 chroma, or
        ii. >6 value and <4 chroma
    b. Hue 10YR
        i. 4 value and <2 chroma, or
        ii. 5 value and <3 chroma, or
        iii. 6 value and <4 chroma
    c. Hue 7.5YR
        i. 5 value and <2 chroma, or
        ii. >6 value and <4 chroma
    d. Hue 5YR
        i. 5 value and <2 chroma, or

ii. >6 value and <4 chroma

e. Hue 5Y

i. >5 value and <2 chroma, or

4) Vegetation indicator – Will contain hydrophyte plants

There are three wetland vegetation indicators, each associated with specific soil properties.

Permanently waterlogged conditions are grey coloured or organic soils.

- Valley bottom terrain morphology;
- Champagne, Katspruit, Willowbrook and Rensburg soil form – all forms have gleyed subsoil;
- Wetness - prominent grey matrix, few to no high chromas within 500 mm.
- Vegetation
  - Large proportion of hydrophytes
  - Emergent plans: reeds, sedges, etc.;
  - Floating or submerged aquatic plants.

Seasonally waterlogged soils have a grey matrix with many mottles.

They usually occur just outside the area of normal base flow and are saturated for a significant portion of the rainy season.

- Valley bottom terrain morphology;
- Kroonstad, Longlands, Wasbank, Lamotte, Escourt, Klapmuts, Vilafontes, Kinkelbos, Cartref, Fernwood, Westleigh, Dresden, Avalon, Glencoe, Pinedene, Bainsvlei, Bloemdal, Witfontein, Sepane, Tukulu, Montagu.
- Wetness
  - Grey matrix (>10%)
  - Many high chroma mottles
- Vegetation
  - Hydrophilic sedges that are restricted to wetland areas

Temporary waterlogged soils are normally grey-brown on colour with few mottles.

- Valley bottom terrain morphology;
- Inhoek, Tstitsikamma, Houwhoek, Molopo, Kimberley, Jonkersberg, Groenkop, Etosha, Addo, Brandvlei, Glenrosa or Dundee.
- Wetness
  - Minimal grey matrix (>10%)
  - Few high chroma mottles
- Vegetation
  - Predominantly grasses which occur on non-wetland areas and hydrotropic species.
  - Predominantly woody species which occur on non-wetland areas and hydrotropic species.

Outside this zone is the adjacent terrestrial area that is not classified as wetlands.

15.5 INDICATOR PLANTS WHERE WETLANDS MAY OCCUR

Gramineae (Grasses)

1) *Imperata cylindrical* Temporary wetness
2) *Setaria sphacelata* Temporary and seasonal
3) *Pennisetum thunbergii* Temporary and seasonal
4) *Hemarthria altissima* Temporary and seasonal
5) Paspalum urvillei Temporary
6) Paspalum dilatatum Temporary
7) *Paspalum distichum* Seasonal and permanent
8) *Andropogon appendicularis* Temporary and seasonal
9) *Ischaemum fasciculatum* Seasonal and permanent
10) *Arundinella nepalensis* Temporary and seasonal
11) *Andorpogon eucomis* Temporary and seasonal
12) *Festuca caprina* Temporary and seasonal
13) *Aristida junciformis* Temporary and seasonal
14) *Eragrostis plana* Temporary

15) *Eragrostis planiculmis* Temporary and seasonal

16) *Phragmites australis* Permanent

17) *Leersia hexandra* Temporary and seasonal

18) *Miscanthus capensis* Temporary and seasonal

19) *Miscanthus junceus* Temporary and seasonal

Cyperaceae (Sedges)

1) *Cyperus sexangularis* Temporary and seasonal
2) *Cyperus latifolius* Seasonal and permanent
3) *Cyperus fastigiatus*
4) *Cyperus marginatus*
5) *Fuirena pubescence*
6) *Kyllinga erecta*
7) *Scleria welwitschii*
8) *Eleocharis dregeana*
9) *Eleocharis limosa*
10) *Schoenoplectus brachycerus*
11) *Schoenoplectus corymbosus*

Juncaceae (Rushes)

1) *Typhaceae* (Bullrushes) Permanent
2) *Typha capensis*

Potamogetonaceae (Pondweeds)

1) *Potamogeton thunbergii* Permanent

Asphodelaceae (Red-hot pokers)

1) *Kniphofia* species
2) *Kniphofia linearfolia*

Amaryllidaceae (Vlei lilies) Wetland and non-wetland

1) *Crinum* species
2) *Crinum macowanii*

Polygonaceae (Knotweeds) Permanent and or seasonal

1) *Persicaria attenuata*

Additional species form other families

1) Xyris capensis
2) *Satyrium hallackii*
3) *Ranunculus multifidus*
4) *Sium repandum*
5) *Gunnera repandum*
6) *Mentha aquatica*