HYDRO-PEDOLOGICAL ASSESSMENT

Strubensvalley Ext 24

Proponent:
RENICO
Project Reference:
22040 – Strubensvalley Ext 24
Report Date:
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Applicant Name	**Renico Construction (Pty) Ltd.**

	Name	Signature	Date
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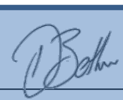
Amendments on Document

Date	Report Reference Number		Description of Amendment
2021/11/29	22040_HPedo_0	22040_HPedo_1	Finalise report – Final layout updates

DECLARATION OF INDEPENDENCE

Specialist Name	Mr. D. Botha
Declaration of Independence	I declare, as a specialist appointed in terms of the National Environmental Management Act (Act No 108 of 1998) and the associated 2014 Environmental Impact Assessment (EIA) Regulations, that: • I act as the independent specialist in this application; • I will 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; • I declare that there are no circumstances that may compromise my objectivity in performing such work; • I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity; • I will comply with the Act, Regulations and all other applicable legislation; • I have no, and will not engage in, conflicting interests in the undertaking of the activity; • I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority; • All the particulars furnished by me in this form are true and correct; and • I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.
Signature	
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1 INTRODUCTION

Prism Environmental Management Services was requested by **RENICO** to undertake a Hydropedology Assessment for the proposed development **Strubensvalley Ext. 24.** This, specifically to inform the Environmental Impact Assessment (EIA) and Water Use License Application (WULA) for the said development.

1.1 Project Description

RENICO intends to develop a residential township on Erf 1327 and 1328, to be known as **Strubensvalley Ext. 24**. The development will be zoned for residential use. The site extends from North to South along Christiaan de Wet road and falls under the jurisdiction of the City of Johannesburg Metropolitan Municipality (CoJ).

The proposed development includes the development of several "Residential 3" units on approximately 1,97 hectares (Erf 1327). In addition, the proposed development also includes the provision of all necessary services to the residential development, including water, sanitation, stormwater and internal roads.

The site is also affected by the proposed development of the intersection with Christiaan de Wet Road and the Metro Boulevard. Same does not form part of this application, but must be kept in mind as part of the development layout and aspects to be assessed.

1.1.1 Study Site Location

The proposed development is located on **Erf 1327**, **Strubensvalley Ext 24**, City of Johannesburg (CoJ), Gauteng Province (*hereafter referred to as the study site/s*) (Figure 1-2) (Figure 1-3). The study site measures approximately 1,97 ha. The study site is located in quaternary catchment A21E in the Limpopo Water Management Area (WMA 1). The study area falls within the Grassland Biome (Biome 06), the Highveld Level-1 Ecoregion (Ecoregion 11) (Kleynhans *et al.*, 2005).

1.2 Scope and Purpose

The aim of this study was to undertake a Hydropedology Assessment for the proposed development by performing a soil survey and classifying soil by use of soil morphology (Soil Classification Working Group, 2018). Soil morphology was converted to hydrological response units as per Van Tol & Le Roux. (2019). This, specifically to inform the Environmental Impact Assessment (EIA) and Water Use License Application (WULA) for the said development.

1.3 Overview of Specialist

Prism EMS conducted the required specialist hydropedology assessment of the site to inform the Environmental Impact Assessment (EIA) and Water Use License Application (WULA). The team under lead of Mr. D. Botha conducted the assessment. The details of the team are tabularised in Table 1-1.

Table 1-1: Details of Specialist

Specialist	Mr. D. Botha – Wetland Specialist | Geomorphologist
Company:	Prism EMS
Qualifications:	M.A. Environmental Management B.A. Hons. Geography & Environmental Management (Geomorphology) B.A. Humanities Post Higher Education Diploma Wetland and Wetland Delineation *(DWAF Accredited Short Course)* Soil Classification and Wetland Delineation – Short Course – *Terrasoil Science* Tools for Wetland Assessment – *Rhodes University* SASS5 Aquatic Biomonitoring Training – *Department of Water Affairs, Ground Truth* Wetland Plant Taxonomy – *Water Research Commission* Hydropedology and Wetland Functioning – *Water Business Academy / Terra Soil Science* Wetland Legislation | Law application in wetland management – *WetRest Centre for Wetland Research and Training* Hydropedology and Wetlands Course – *WetRest Centre for Wetland Research and Training | Digital Soils Africa (DSA)*
Experience:	18⁺ Years
Affiliation/ Registration	South African Council for Natural Scientific Professions (SACNASP) registered Scientist | Pr.Sci.Nat. (119979) Registered Member of Environmental Assessment Practitioners Association of South Africa (EAPASA)(2019/1209) Member of the International Association for Impact Assessors (IAIAsa) (1653) Member of the Gauteng Wetland Forum Member of the South African Wetland Society (461716)
Address:	12A Beacon Road, Poortview, Johannesburg
Tel:	087 985 0951
Fax:	086 601 4800
Email:	dewet@prismems.co.za

Designation	**Name**	**Qualification**	**Professional Registration**	**Role**
Specialist Team				
Hydropedologist	M Tinnefeld	M.Sc. Soil Science B.Sc. Hons. Soil Science B.Sc. Soil & Grassland Science 10 Years' Experience	**Pr. Sci. Nat. (114087)** SASSO (851) WSSA (PVXVTM4L) GSSA EGU (388469)	Specialist Hydropedologist

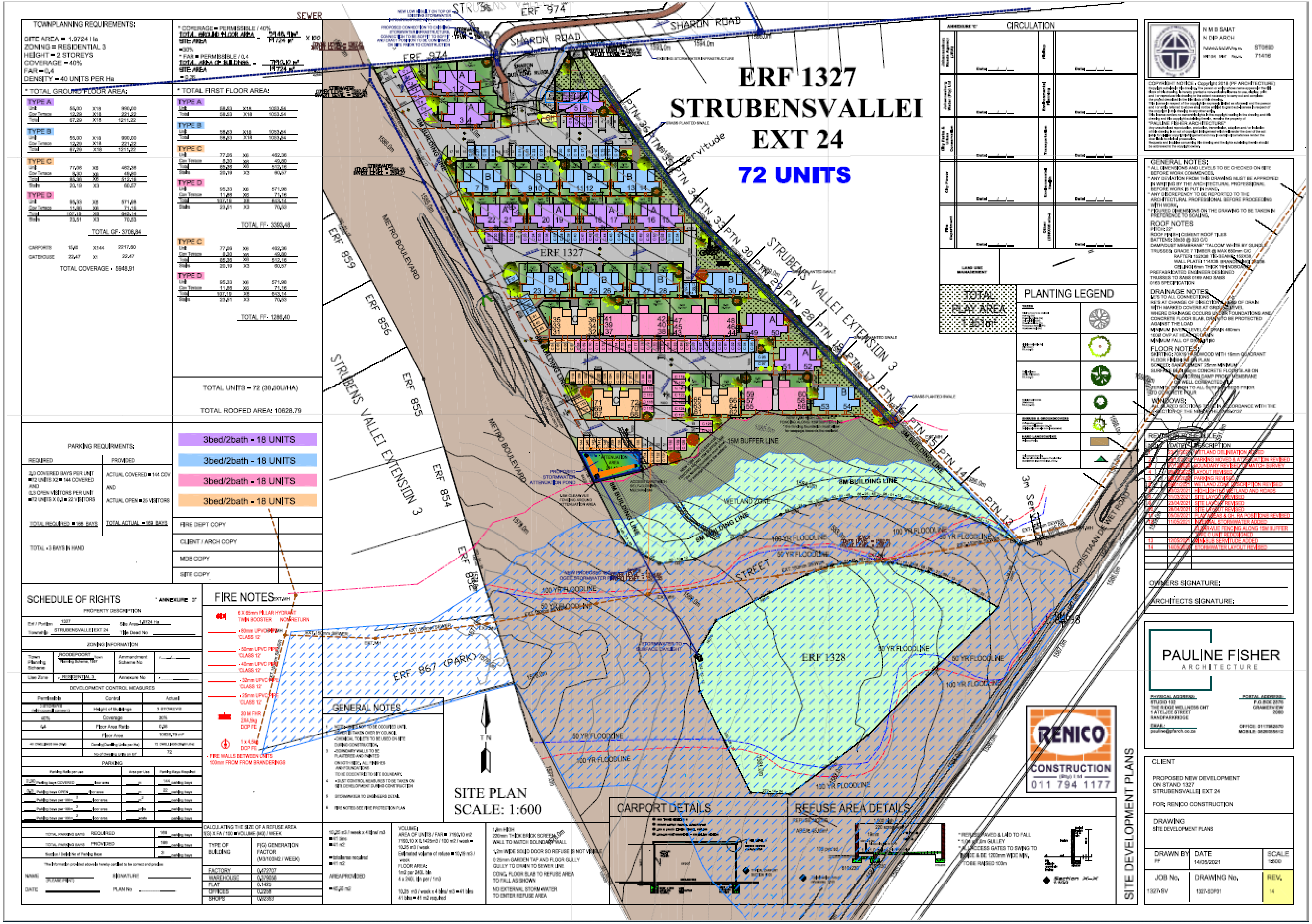

Figure 1-1: Proposed Layout.

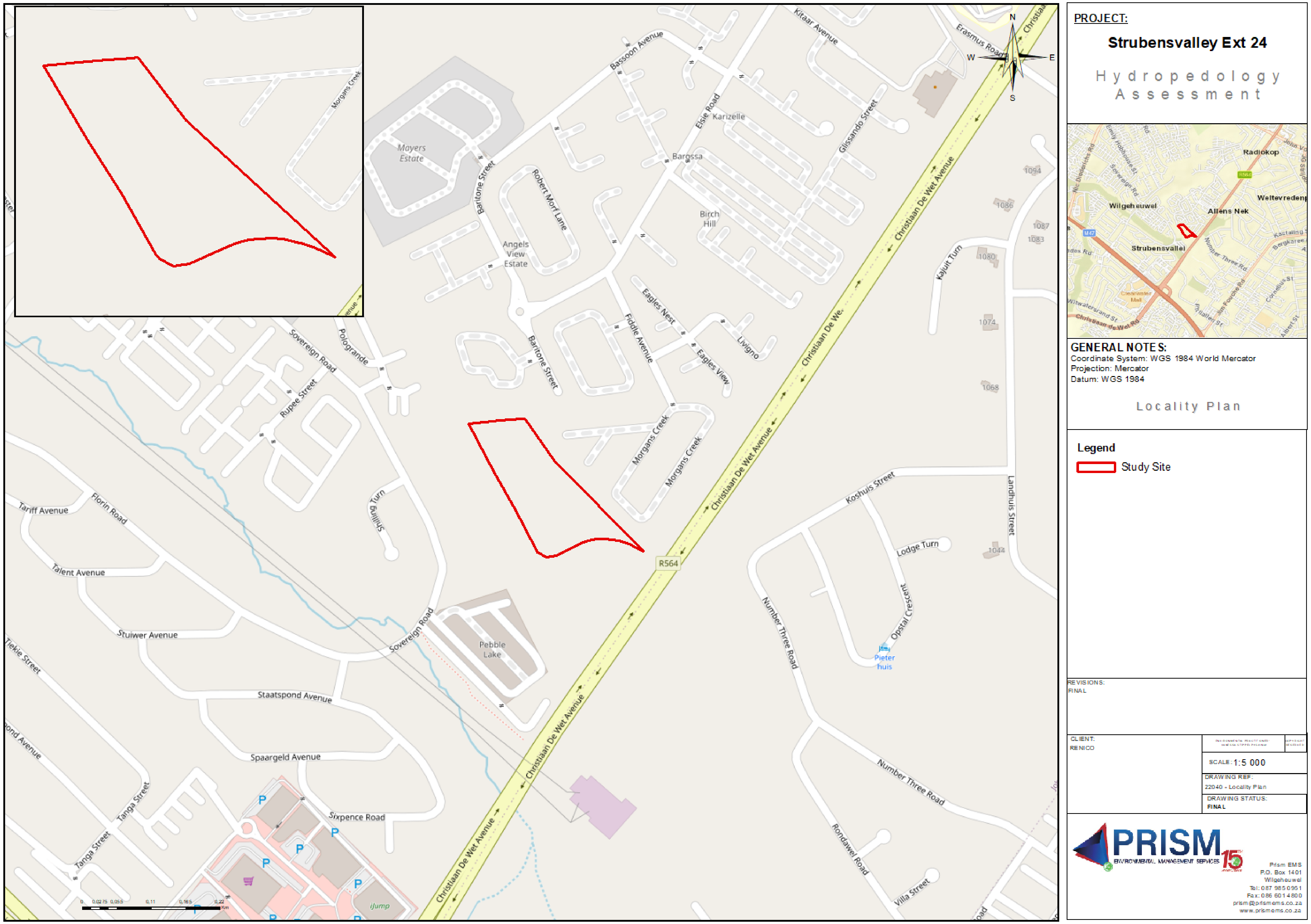

Figure 1-2: Locality Plan.

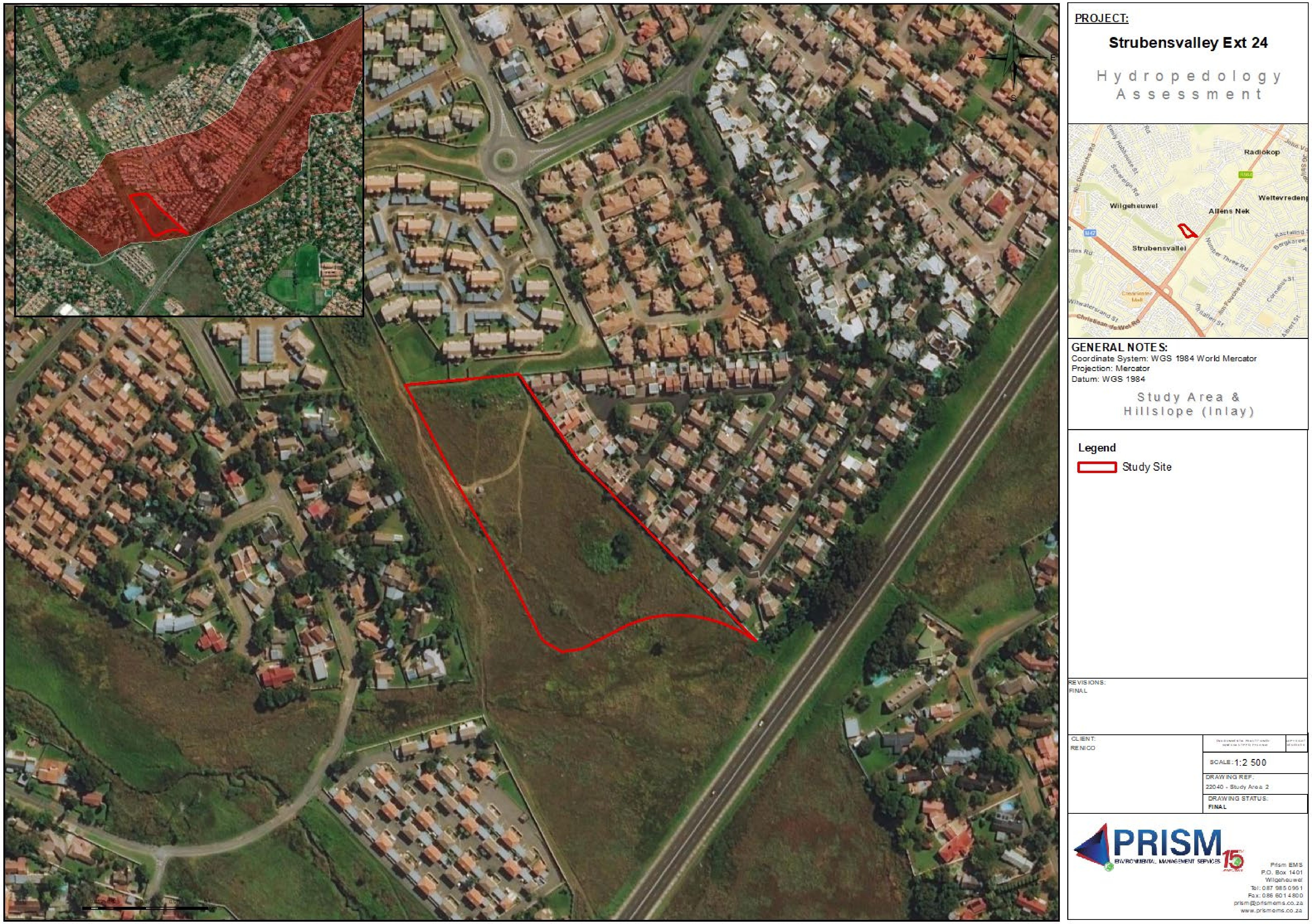

Figure 1-3: Map of the survey area with hillslope insert (top left corner).

2 REPORT OUTLINE

Appendix 6 of GN 982 of 4 December 2014 was amended by introducing the new minimum requirements for specialist protocols of GN 320 of 20 March 2020. In particular, the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity is applicable. In line with this, Table 2-1 provides an overview of the new specialist protocols together with information on how these requirements have been met.

Table 2-1. Specialist Report Requirements.

Requirement from Section 2.7 of Protocol for the Specialist Assessment and Minimum Report Content Requirements for Assessments with no specific prescribed protocols (GN 320 of 20 March 2020)	Chapter
(2.7.1. Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae	Chapter 1.3
2.7.2. A signed statement of independence by the specialist	*Declaration of Independence*
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;	Chapter 4.1
2.7.4. The methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant	Chapter 4.
2.7.6. The location of areas not suitable for development, which are to be avoided during construction and operation, where relevant	Chapter 6
2.7.5. A description of the assumptions made, any uncertainties or gaps in knowledge or data	Chapter 5
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" sensitivity and that were not considered appropriate (Note: Section 2.4. says: "*The assessment must identify alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification and which were not considered appropriate*"	Chapter 6
2.7.7. Additional environmental impacts expected from the proposed development	Chapter 6 Chapter 7
2.7.8. Any direct, indirect and cumulative impacts of the proposed development on site	Chapter 6 Chapter 7
2.7.9. The degree to which impacts and risks can be mitigated	Chapter 6 Chapter 7.1
2.7.10. The degree to which the impacts and risks can be reversed	Chapter 6

Requirement from Section 2.7 of Protocol for the Specialist Assessment and Minimum Report Content Requirements for Assessments with no specific prescribed protocols (GN 320 of 20 March 2020)	Chapter
2.7.11. The degree to which the impacts and risks can cause loss of irreplaceable resources	Chapter 6
2.7.12. A suitable construction and operational buffer using the accepted methodologies	Chapter 4 Chapter 6
2.7.13. Proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr);	Chapter 6 Chapter 7
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” sensitivity and that were not considered appropriate	Chapter 6 Chapter 7
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	Chapter 7 Chapter 7
2.7.16. Any conditions to which this statement is subjected.	Chapter 7 Chapter 7

3 LEGISLATION AND GUIDELINES

3.1 Guideline for Hydropedological Assessments and Minimum Requirements

This guideline was developed by Prof Johan van Tol and colleagues, all scientists in the field of hydropedological sciences. It culminated after various WRC and other research projects, where DWS were involved at different levels. The authors of this document; Van Tol, J.J., Bouwer, D. & Le Roux, P.A.L., 2021 are at the cutting edge of the developments in the field of Hydropedology, all of them either from the University of the Free State (UFS) or previously from UFS. DWS had various interactions with the research team, even people not mentioned, and this eventually culminated in this approach where DWS as regulator can now adopt these methods of assessing the relevant aspects of hillslope hydrology that can influence decision making positively in a consistent and standardised method.

Hydropedological surveys aim to characterise dominant surface and sub-surface flowpaths of water through the landscape to wetlands and streams, or groundwater. The objective of these guidelines is to standardise hydropedological survey methodology to identify dominant hydrological drivers and responses of landscapes in order to quantify the impact of new development on water resources. This will assist decision makers to understand the hydrological system and thereby make sensible decisions with regard to sustainable water management.

These guidelines were developed from numerous scientific and consultancy projects (van Tol, 2020) and are divided into four steps:

1) Identification of dominant hillslopes.
2) Conceptualising hillslope hydropedological responses.
3) Quantification of hydraulic properties and flowrates.
4) Quantification of hydropedological fluxes.

The first two steps should be conducted for any impact assessment requiring a hydropedological survey. Step 3 and 4 will typically be required where drastic land-use change or planned e.g., open-pit mining, large developments which will obstruct lateral flowpaths. Wetland vegetation is adapted to shallow water table conditions. Due to water availability and rich alluvial soils, wetland areas are usually very productive. Tree growth rate is high and the vegetation under the trees is usually lush and includes a wide variety of shrubs, grasses and wildflowers (van Tol *et al*; 2021).

3.2 Protocol for the Specialist Assessment

Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Section 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998 when applying for Environmental Authorisation including the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impact on Aquatic Biodiversity (GN 320 of 20 March 2020).

The Department of Forestry and Fisheries and the Environment (DFFE) has published a number of protocols for the specialist assessment and minimum report requirements for a number of specific aspects including:

- Agriculture;
- Avifauna (in relation to solar and wind energy generation);
- Noise;
- Defence;
- Civil Aviation;
- Terrestrial Plant Species;
- Terrestrial Animal Species;
- Terrestrial Biodiversity; and
- Aquatic Biodiversity.

No Specific Assessment Protocols have been prescribed for Hydropedological Assessments in terms of the Protocol for the Specialist Assessment and Minimum Report Content Requirements. Site sensitivity verification will comply with Appendix 6 of the EIA Regulations and Department of Water and Sanitation (DWS) guidelines for Hydropedological Assessments.

3.3 EIA Applicable Legislation

3.3.1 National Environmental Management Act (Act No. 107 of 1998) (NEMA)

The proposed development triggers a number of activities in terms of NEMA. These are listed in Table 3-1.

Table 3-1: Listed Activities in terms of NEMA

Competent Authority	GN	Activity Number	Type of Environmental Assessment	Authority Reference number
Gauteng Department of Agriculture and Rural Development (GDARD)	R 983 of 4 December 2014 (as amended):	12, 19, 27	Basic Assessment Process	GAUT 002/21-22/E2896
	R. 985 of 4 December 2014 (as amended)	4 12 and 14		

3.4 WULA Applicable Legislation

3.4.1 National Water Act (Act No 36 of 1998) (NWA)

The NWA is the primary regulatory legislation; controlling and managing the use of water resources as well as the pollution thereof and is implemented and enforced by the Department of Human Settlements, Water and Sanitation (DHSWS[1]). Section 21 of the NWA lists water uses that must be licensed unless it is listed in the schedule (existing lawful use) and/or is permissible under a general authorisation, or if a responsible authority waives the need for a Water Use Licence.

The following listed water uses, that require a Water Use License according to Section 21 of the NWA, are triggered for the proposed project:

- 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.

A Water Use Licence Application (WULA) will be undertaken.

[1] Previously referred to as the Department of Water and Sanitation

4 METHODOLOGY

4.1 Hydropedological Assessment

4.1.1 Desktop Assessment

A preliminary desktop assessment was undertaken using aerial photographic interpretation and Geographic Information Systems (GIS) analysis of the study site. Historical records and reports were consulted. The Department of Water and Sanitation (DWS) database was also consulted to obtain historical data for the study area. Historical data and official approvals were also consulted during the assessment.

4.1.2 Field Investigation

The field investigation was undertaken **19 November 2021** to assess and corroborate the pedogenetic evolution driven by hillslope hydrological input and controls as presented on the survey area.

The field procedure for the hydropedological assessment was conducted according to the Guidelines for Hydropedological Assessments and Minimum Requirements as set out by the Department of Water Affairs and Forestry (DWS 2021).

The guidelines for Hydropedological assessments:

- **Step 1: Identification of the representative hillslope/s**
  - Identify land types (Land Type Survey Staff, 1972 – 2006) within the study area.
  - Identify dominant hillslopes (from crest to stream) of the study area using terrain analysis.
    - There should be at least one hillslope in each land type of the study area.
  - Hillslopes should be representative of the topography (e.g. slope, aspect and curvature) and land types.
    - For example, where the site is divided by a stream, a representative hillslope should be identified on both sides of the stream.
- **Step 2: Conceptualise hillslope hydropedological responses**
  - Transect survey
    - Transect soil survey should be conducted on each of the identified hillslope (Le Roux et al., 2011).
    - Soil observations should be made at regular intervals, not exceeding 100 m, on the transect.
    - Profile pits of representative soil forms should be opened to proper description, photographs and collection of undisturbed samples.
    - Observation depth should be until refusal. Where the soil depth exceeds 2m, auger observations must be made in the bottom of the pit in order to describe soil/saprolite/bedrock transition.
  - Soil description and classification
    - Soils should be described and classified in accordance with the South African Soil Classification system up to family level (Soil Classification Working Group, 2018).

  - The following morphological properties should be described:
    - Thickness of horizons
    - Structure (size, grade, type)
    - Estimated texture
    - Matrix Munsel colour (moist and dry)
    - Mottles (colour, size, frequency, prominence and type)
    - Concretions (colour, size, frequency, prominence and type)
    - Precipitation of carbonates, gypsum or salts
    - Roots (abundance)
    - Macropores (frequency and size)
    - Nature of transition between horizons/bedrock/saprolite
  - Profile should then be regrouped into one of the seven hydropedological groups (van Tol & Le Roux, 2019).
- Conceptual hillslope hydropedological response
  - The occurrence, sequence and coverage of the different hydropedological groups on a transect must then be used to describe the hydrological behaviour of the hillslope (van Tol et al., 2013).
  - This will include a graphical representation of the dominant and sub-dominant flowpaths at hillslope scale prior to development. This will include:
    - Overland flow
    - Subsurface lateral flow
    - Bedrock flow and
    - Return flow
    - Storage mechanisms
  - The impact of the proposed development on the hydropedological behaviour should also be graphically presented. This should typically include the location of the development on the hillslope and the anticipated impact of the development on water flows.

4.1.3 Mapping

Mapping was done by computerised processing from in-field gathered data utilising GPS tools, mobile applications and GIS modelling.

5 ASSUMPTIONS, GAPS AND LIMITATIONS

The study was limited to a snapshot view during a few site visits. The field investigations were undertaken on **19 November 2021** to assess and confirm the hydropedology of the survey area. Weather conditions during the survey were favourable for recordings. The location recordings were recorded by handheld GPS.

It must be noted that, during the process of converting spatial data into final output drawings, several steps are followed that may affect the accuracy of areas presented. Due care was taken to preserve accuracy. Printing or other forms of reproduction may also distort the scale indicated in maps. It is therefore suggested that the key areas identified in this report be pegged in the field in collaboration with the surveyor for precise boundaries.

It is unlikely that more surveys would alter the outcome of this study radically.

6 RESULTS AND FINDINGS

6.1 Hydropedological Assessment

Prism EMS attended to the Hydropedological assessment of the study area, both desktop and infield assessments were conducted. The conceptual hydrological response is adjusted to afford specialist tacit knowledge in so far as the colluvium has independent expressions and controls as first order hydrological controller.

The site expresses the pedogenetic evolution driven by hillslope hydrological input and controls. The hydropedology is expressed as vertically heterogeneous pedogenetic strata of independent genetic hydromorphic expressions, as well as the integration thereof as phenetic hydromorphic expressions.

The site forms the transition of various sub catchments and surface sealed/altered springs upslope, drained by valley bottom confluences with elevation in the hillslope, however manipulated through the colluvial strata forming the parent material and leading to the deflection through strata specific genetic and phenetic hydropedological reaction.

The spatial distribution of lateral colluvial strata is thus expressed as benched seep wetlands respectively within the confluence forming the tributary of the Wilgespruit. The various separate colluvial strata however are subject to the hillslope crest recharge, to midslope interflow of shallow and deep duplicate expression, and responsive in the wetland.

The hydrograph thus will have a longer/larger baseflow contribution from crest driven recharge to deep interflow down the midslope to respond within the wetland. The hydrograph will on the increase and decrease in slope over time, thus be subject to the various spatio-temporal disturbances within the overlying colluvial layers of various origin and thus different biogeochemical reaction in the wetland.

The intensity of iron and the expression in elevation of manganese above stream channel where relatively high in the profile, relative to the expression of the Albic horizon in the vertical extent of the profile, forms the upper tip of the wetland. This is the wetland that extends vertically up the hillslope, where within the lower topographically set wetland, this minute expression becomes the gleic and gley hydromorphological character of the soils within the entire vertical extent of the profile, referred in text as the biological separation zone. The wetland thus forms where the lateral force is drawn down by the porous connectivity of the soil and the surface and soil fauna & flora afford the rapid redox process via its hydrological response. The shallow hydrological biological response thus functions as the product best suited to mitigate the vertical force of water, down the hillslope.

The site is hydropedologically complex, yet once the extent and location of various processes and expressions (flowpaths and storage mechanisms express, naturally) is understood, appropriate mitigative actions can be taken to divert the functionality to be in functionality with the imposed arbitrary development.

A geohydrological investigation is necessary to afford confidence to risk relative to the bedrock conditions. A (the) geophysical assessment of the hydropedological, geohydrological, and geophysical data, once available, must be conducted.

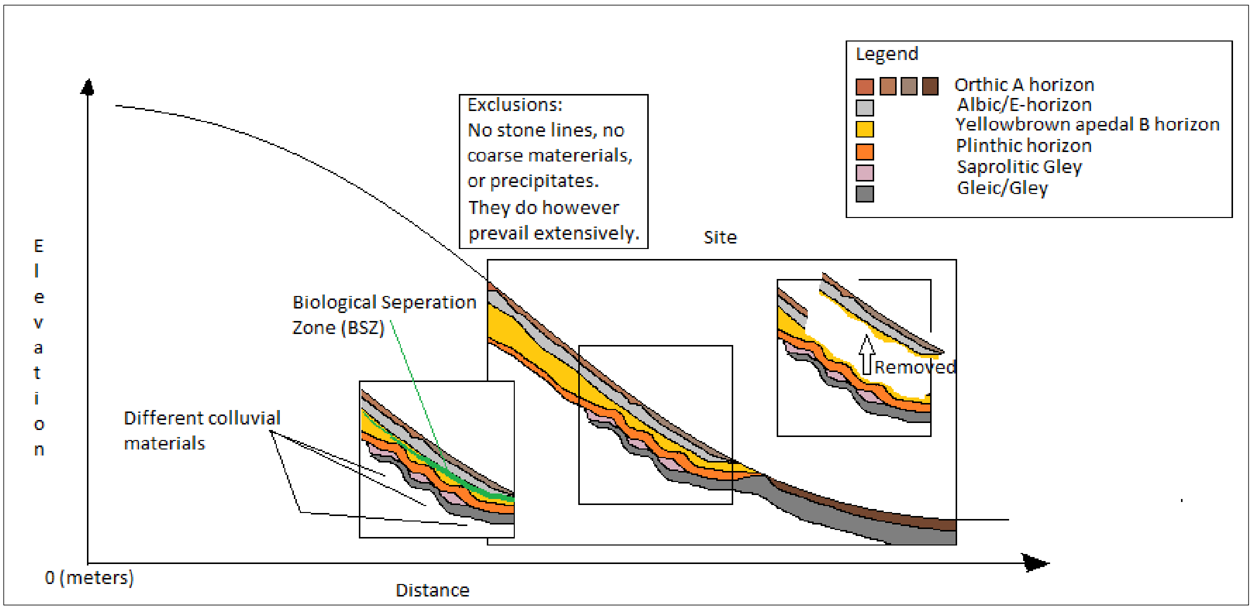

Figure 6-1: Conceptual depiction of the changes to the natural condition.

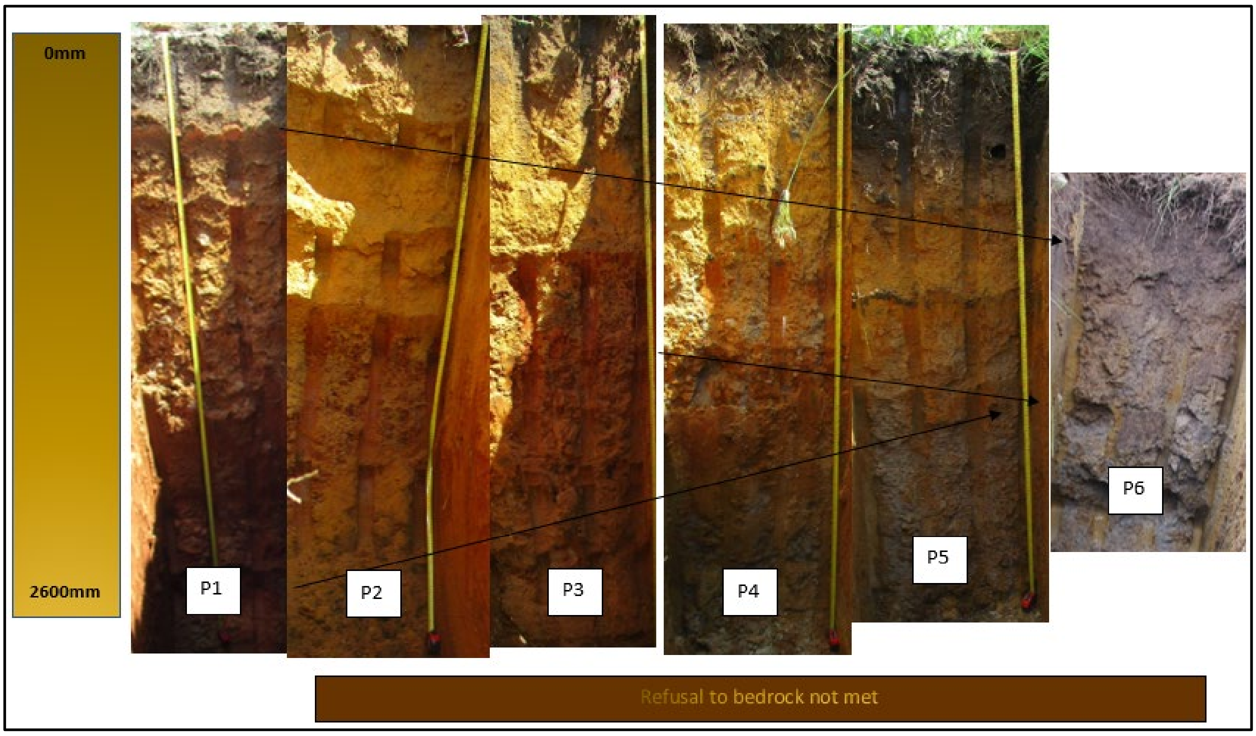

Figure 6-2 Catena of the site, with reduction of soil depth with decrease in topography (from left to right)

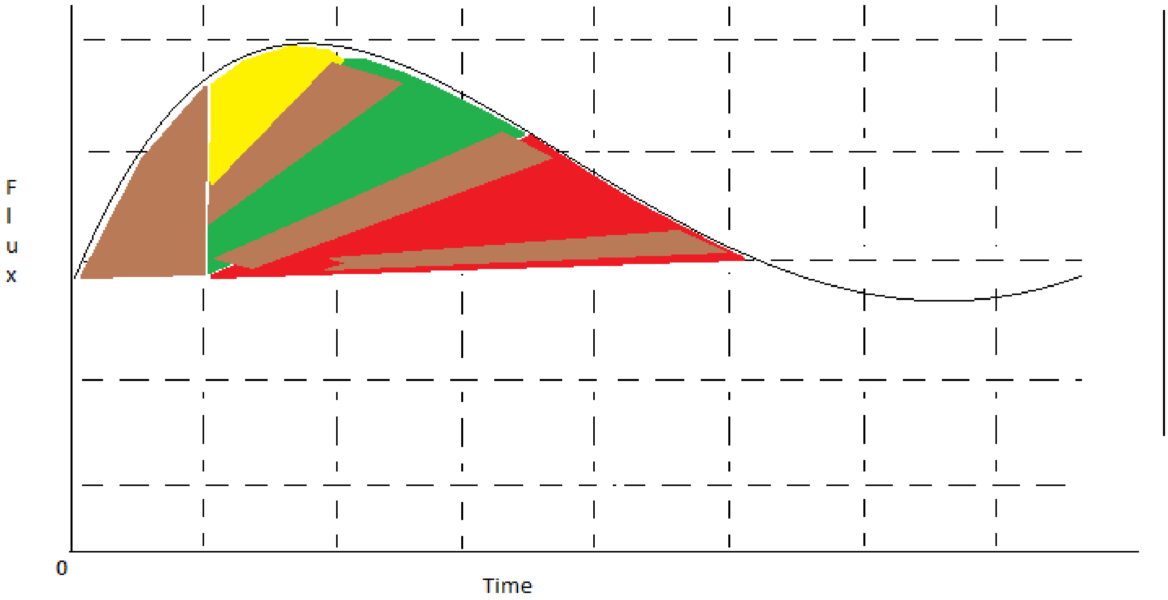

Figure 6-3: Conceptual soils response hydrograph.

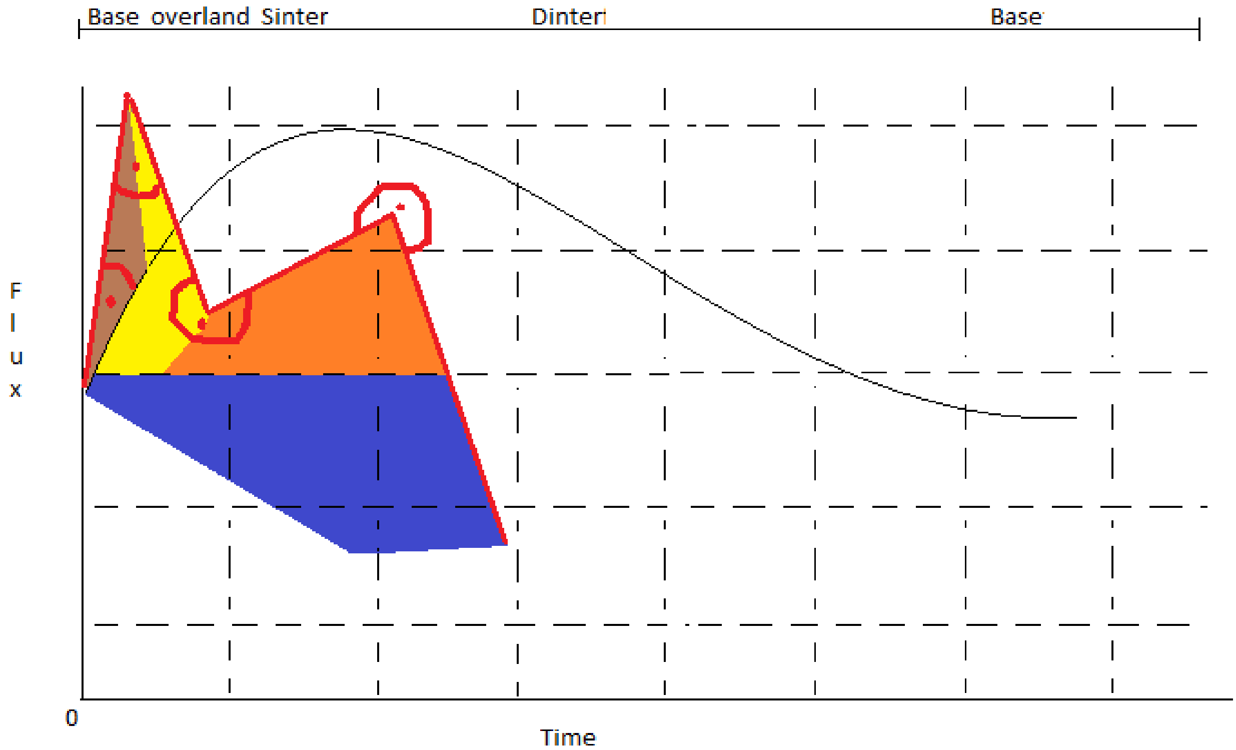

Figure 6-4: Hydrograph based on conventional development protocols without mitigation

The hydrograph in current 'undisturbed' state releases water flux through the hillslope into the wetland in sequence of hydropedological response units sequentially overlying the hillslope. By removing the Biological Separation Zone (BSZ) (green)(Figure 6-1 and Figure 6-3), shallow waters contribute to wetland as result of the hydrological connectivity within the landscape, no longer function but are points of inflection/vertices, indicating points of concern for development and the environment, respectively.

A rise in the topology reduces the soil volume and forces the iron to manifest as a darker red (matrix mottling) within the lower profile, as well reaching higher into the profile, where extreme interflow flux results in yellowing overlain by extensive albic expression.

Figure 6-5: Soils observations in unit 4 (Figure 6-9)

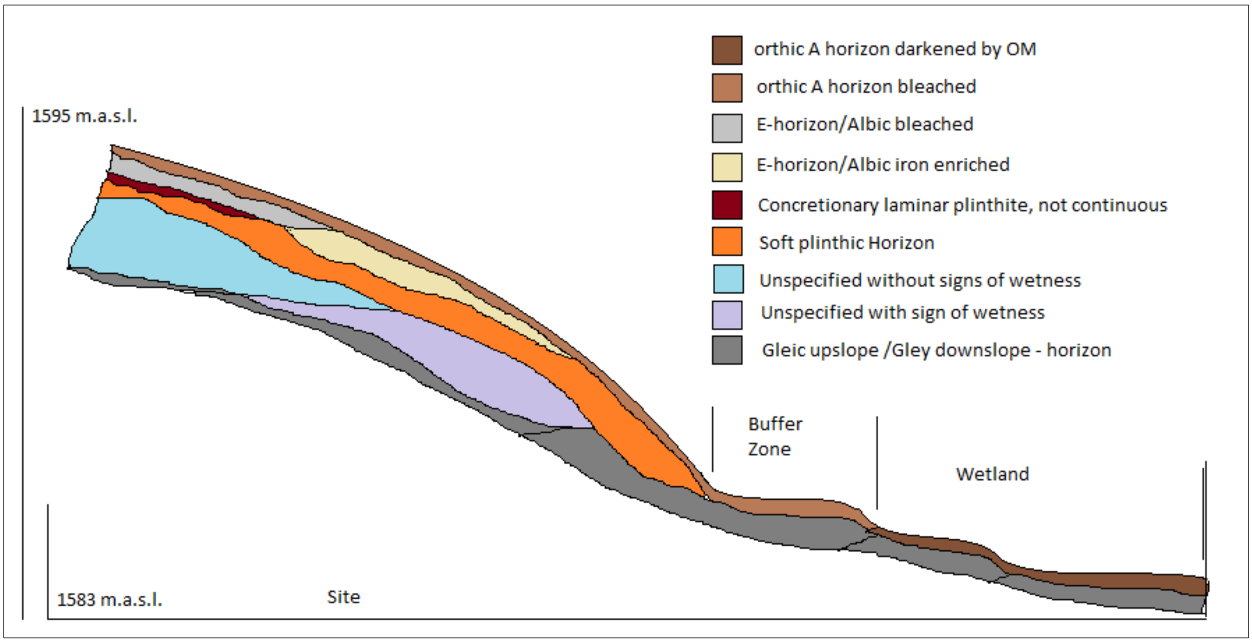

Figure 6-6: Soil distribution of the sites' catena

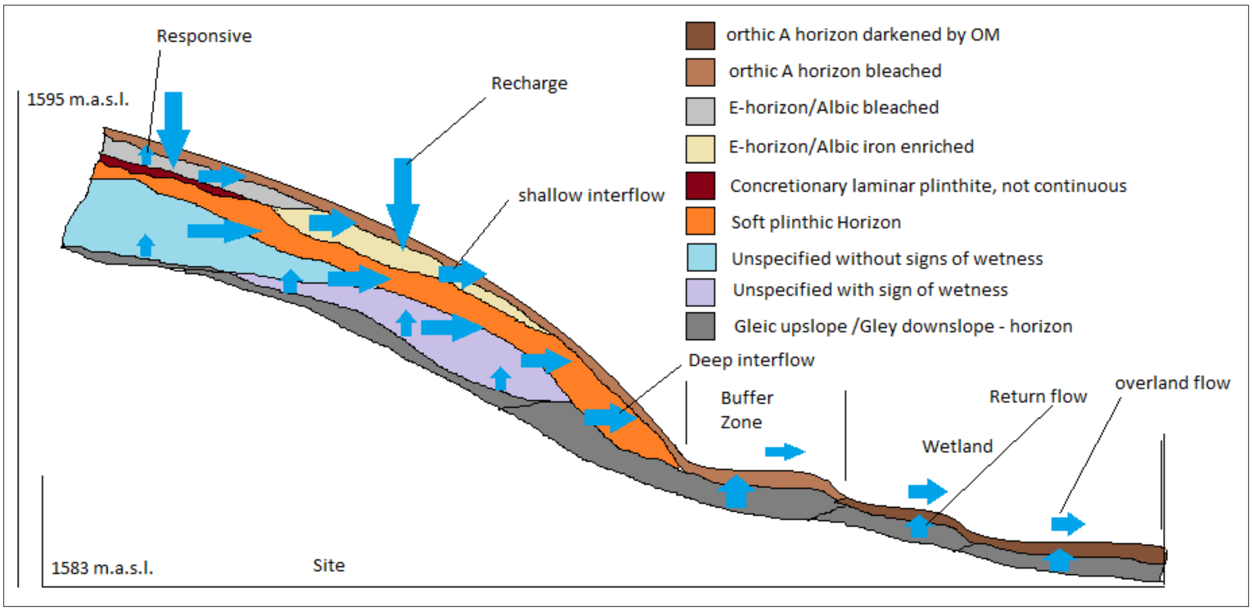

Figure 6-7: Conceptual hydrological response model

6.2 Mapping

Figure 6-8 indicates the Conceptual Hydrological Response Map of the study site.

Figure 6-9 illustrates the Soil Form Distribution of the study site.

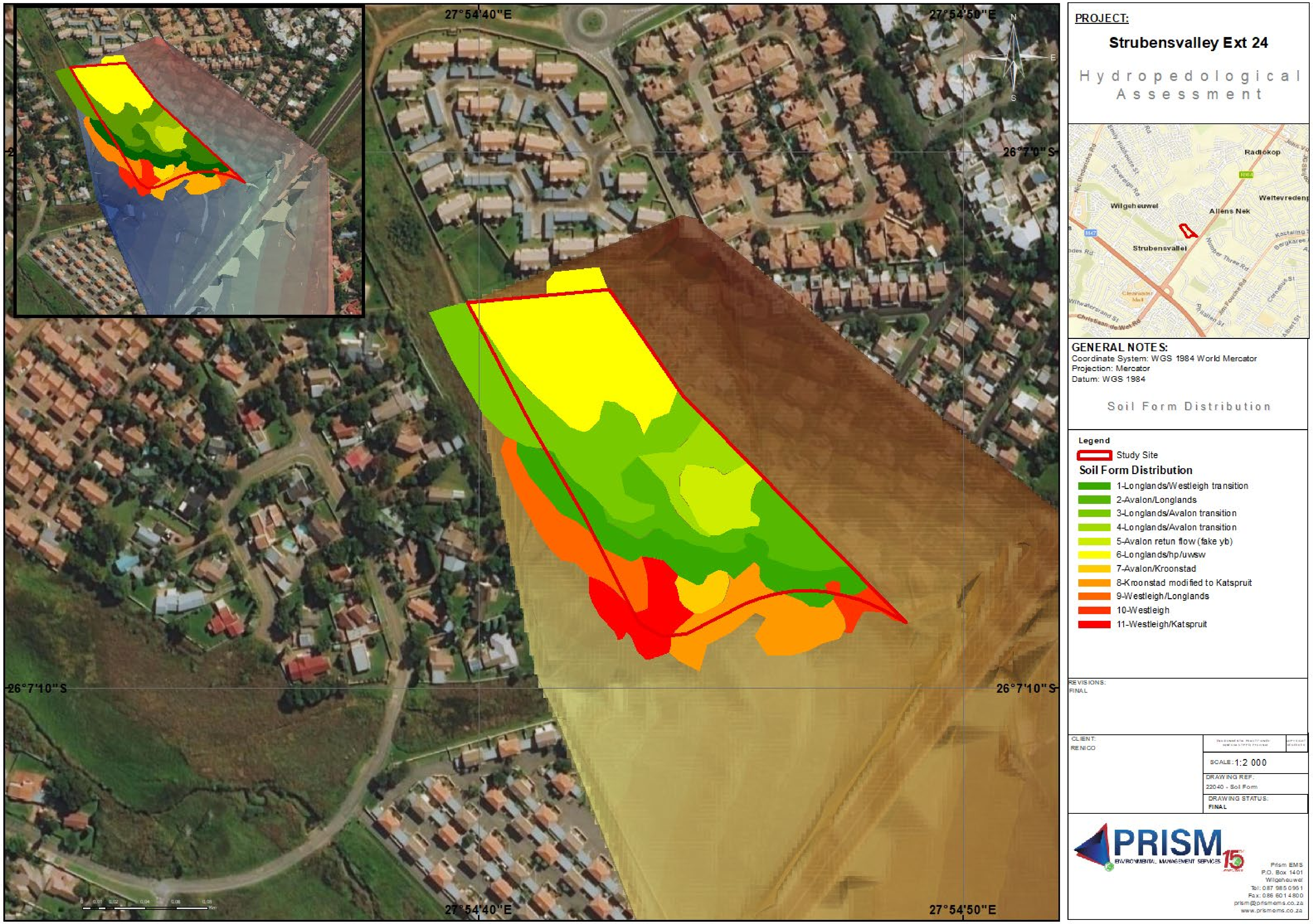

Figure 6-8: Soil Form Distribution with insert of conceptual hydrological response (top left).

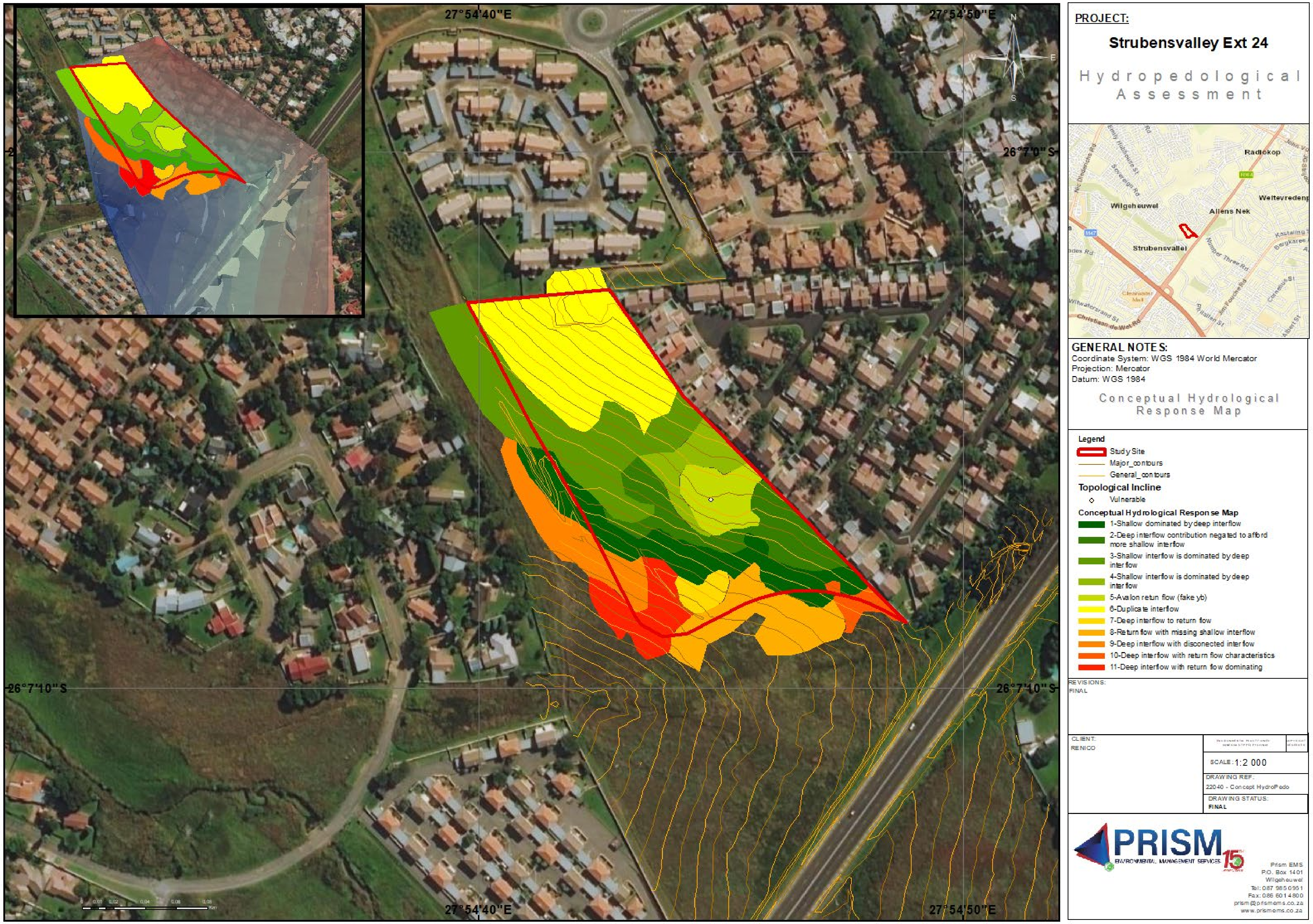

Figure 6-9: Conceptual Hydrological Response Map with insert of soil distribution map (top left).

7 REASONED OPINION AND RECOMMENDATIONS

Translation of morphology observed into soil water interactions and risk/mitigation as to the invasion within the sphere by conventional construction protocol.
[linking soil form distribution map (Figure 6-8) to conceptual hydrological response map (Figure 6-9)].

Table 7-1: Hydropedological interpretation

Soil morphological interpretation (classification)	Hydropedological interpretation (response of interaction between water and soil)	Mitigation/risk analysis
Shallow interflow dominated by deep interflow	Reduced buffer of iron at surface	If the shallow interflow is removed, the iron will spill (and water with it), where the iron will precipitate at the surface and induce disconnection between atmosphere and soil (loss of on-site infiltration, poor faunal and floral environment).
Deep interflow contribution negated to afford shallower interflow expression	Increase buffer of iron at surface	Due to faster rates/flux capacity (or deeper profile), the expulsion of iron into the biological zone is lower.
Deep interflow to return flow favoring shallow interflow expression	Reduced soil volume with more functionality of buffer within g-horizon	The increased period of saturation lower in the profile expresses as G versus red/iron unspecified with signs of wetness, however afford more flux as return flow with iron reduction increasing in the G.
Return flow with missing shallow interflow	Loss of iron buffer to surface	The lacking shallow interflow to afford rooting and biological water for dilution purposes.
Avalon return flow (fake yellow-brown color) due to leveling of underlying topology	Reduced soil volume	The reduction of vertical soil volume, as well as the inflow from the hillslope, afford a redder profile however with period of saturation (over the annum) not sufficient for reduction – hence (Unit 4, Figure 6-9) is the functional nexus of flux aversion from hillslope input
Deep interflow with disconnected shallow interflow	Shallow disconnected (manages overland flow)	The shallow interflow a receiver of overland flow, with little to insignificant contribution of the responsive deep interflow
Deep interflow with return flow characteristics	Sensitive – functions as the plug of the hillslope	The duration of saturation, as well as hillslope and site-specific interflow contributions to the location, affords maturation of the iron to gley and thus reduction of flux capacity.

The project can be supported, should all the mitigation measures be implemented and monitored against, to ensure compliance.

7.1 Mitigation and Monitoring Requirements

The site affords "X" amount of water storage and flux capacity. Both factors are of a high value, where conventional cut and fill will have to be cognisant of risk by fracturing or impeding the biological separation zone. The displacement of soil porous media, as well the introduction of impervious vertical concrete/masonry walls, will promote flux and duration of flux to move between the units envisaged to be developed as per standard protocol. Indications by the geotechnical report confirm storage and flux.

It is suggested that suitable infill for benching be afforded, primarily as the site holds the entire hillslope (via the plug) in balance. The invasion of the existing soil substrate will require high level hydropedological analysis (level 3&4 according to the Department of Water and Sanitation (DWS) Guidelines for Hydropedological Assessments), whereas the infilling of suitable materials will provide for the increased capacity of the site to mitigate future envisaged developments along the bottom of the site (i.e. the construction of the Metro Boulevard and intersection with Christiaan de Wet Road), simultaneously allowing for minimal destruction of the existing hillslope 'plug'.

Where shallow interflow is dominated by deep interflow (Unit 4, Figure 6-9), a separate/unique mitigation must be afforded. The implicit flowpath is of high flux and reduction value, relative to the surrounding soils (Unit 4, Figure 6-9).

The following are recommended:

- Onsite consultation with hydropedologist prior and during services installation
- Onsite consultation with hydropedologist prior and during cut and fill design (levels to be determined)
- Bedrock was not encountered during the survey. (Geo-tech report also corroborates same). Soil rock interface was not encountered due to limitation of the use of TLB machinery. Hand auguring was not permissible due to the hardness of the material. It is thus recommended that a mechanical (drill type) investigation be conducted to confirm bedrock conditions.
- The topological backslope area (Unit 4, Figure 6-9) should be further investigated in terms of the annual duration of saturation as factor for the reduction i.e. maturation of the soil (gleying).
- It should be attempted to enhance the current wetland function.
    - Wetland drivers should be maintained as far as possible.
    - Water quality preservation is key.

8 CONCLUSION

The baseline investigation concluded that the site is complex from a hydropedological point of view. More certainty is required in terms of the driver for hydropedology. The development of the site can thus be supported with specific investigation of the soil water interactions.

The project can be supported, should all the mitigation measures be implemented and monitored against to ensure compliance and protection of the natural resources.

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APPENDIX A


STRUBENS VALLEY EXT. 24
STRUBENS VALLEY EXT. 25
STRUBENS VALLEY EXT. 18
PROPOSED METRO BOULEVARD
ACCESS POINT
HUNTER THERON INC.
TOWN PLANNERS
STRUBENSVALLEI
EXTENSIONS 24 AND 25
PROPOSED ACCESS SPACING
ALONG
METRO BOULEVARD
LdT
FMG
GMH
SHEET 1 OF 1
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