11th February 2021

Attention**: Vicki King**

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PROPOSED HOUSING DEVELOPMENT ON ERVEN 2954, 2955 & 2956 KINGSBURGH EXTENSION 9, ETHEKWINI MUNICIPALITY (KZN)

Preliminary Forest 'Buffer Zone' Recommendations

Dear Vicki

In my capacity as the independent ecologist appointed by the Applicant 'Dan's Spares', and as briefed by yourself as their appointed independent Environmental Assessment Practitioner (EAP), I respond to the letter received from the eThekwini Municipality Development Planning, Environment & Management Unit: Environmental Planning & Climate Protection Department (EPCPD) dated 20th October 2020 (reference: DPM/EIA 818A), and specifically the comments received from the EPCPD around the need for 'forest buffer zones' to inform development layout planning and long-term forest management.

I trust that the response will prove useful in addressing the need for appropriate forest buffers at the site of the planned residential development and that the EPCPD may find the recommendations to their satisfaction and in line with their mandate and objectives towards natural areas management and conservation in the eThekwini Municipal Area.

I also welcome any comments the Applicant/Developer, the EPCPD and any other relevant environmental authorities may have.

Should you have any queries, comments or require further clarity on any aspect of this document, please contact me directly.

Yours faithfully

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1 Introduction & Background

The planned development of a residential (housing) project on Erven 2954, 2955 & 2956 Kingsburgh Extension 9 (eThekwini Municipality, KZN) is situated within a steep valley comprising mixed woodland, thicket, grassland and young forest vegetation communities that are likely to be impacted to varying degrees. According to the specialist Vegetation Assessment Report for the project (Styles, 2018), consultations and negotiations with the EPCPD (Environmental Planning &, Climate Protection Department) unit of the eThekwini Municipality[1] resulted in a provisional agreement supporting potential development on areas of the site where there will be the "*least impact on better quality vegetation at the site*". This includes areas of young, seral forest vegetation focused away from the primary instances on the property.

In response to the DBAR (Draft Basic Assessment Report) compiled in terms of the National Environmental Management Act: EIA Regulations (2017, as amended) and submitted by Metamorphosis Environmental Consultants on behalf of the developer and applicant to the eThekwini Municipality for comment, the EPCPD (Environmental Planning &, Climate Protection Department) unit of eThekwini provided a formal written response containing comments, as per the letter dated 20th October 2020 (reference: DPM/EIA 818A). On page 2 of said letter, the EPCPD commented that:

> *"…none of the development sites have included forest buffers[2] as part of the development layouts. Buffering of forest habitat is essential to reduce and mitigate the impacts of development on sensitive ecological functioning of these wooded areas. Buffers to the forest must be incorporated into the layouts".*

Furthermore, the EPCP has recommended provisional buffer widths as follows:

> *"Buffer widths must be 40m, with the outer 20m closest to the forest being considered a no-go area, the 20m portion of the buffer closest to the development may be used for recreational aspects, such as walking paths and leisure areas."*

Following a virtual meeting between the EPCPD (represented by Michelle Lotz and Greg Mullins), Metamorphosis Environmental Consultants (represented by the Environmental Assessment Practitioner or EAP, Vicki King) and Eco-Pulse Consulting (represented by Adam Teixeira-Leite, as Principal Scientist and Ecologist) held on the 16th November 2020, it was agreed that Eco-Pulse would investigate suitable forest buffer widths and recommendations based on the following main discussion points:

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[1] Whilst it is acknowledged that this process of engagement began with the local municipal authority, this was critical to proceeding with any viable environmental authorization process, even if the Provincial KZN EDTEA (Department of Economic Development, Tourism & Environmental Affairs) is the competent authority ultimately responsible for reviewing the Environmental Assessment Report (DBAR) and confirming environmental authorization for the development. Furthermore, the need for consultation with the Provincial Conservation Authority (Ezemvelo KZN Wildlife, EKZNW) and the Department of Environment, Forestry & Fisheries (DEFF) is also acknowledged.

[2] **Buffer zones** or "development set-backs" are essentially strips of land typically designed to act as a protective barrier between human activities and sensitive ecosystems/habitats such as natural forests, grasslands, wetlands and rivers. *Research shows that buffer zones are useful at performing a wide range of functions such as sediment trapping and nutrient retention, and in doing so, play an important role in protecting natural resources from the adverse impacts that are typically associated with various forms of land-use and development.*

- Based on precedents set by the EPCPD at Hawaan Forest and Beechwood Mangroves, the forest on site (or portions thereof) are not in the same condition (being secondary / early successional seral forest) and there be options to reduce the buffer width from 40m to 30m, or even 20m - thus a variable buffer width may be most appropriate for the site;
- Critical areas of intact/core primary forest habitat need to be identified and larger buffers are more likely suitable for these areas – as such a forest classification and mapping exercise will be required;
- Factors and criteria such as forest condition, tree height, canopy cover, slope gradients, etc. will need to be considered when recommending suitable buffer widths for different portions of the site;
- Areas of potential forest expansion should also be identified as far as possible, to allow for natural expansion of forest to occur unhindered in these areas; and
- There will be a need for a transitional zone (where low impact activities, such as recreation and possibly some storm water infrastructure) can take place and a full buffer that forms the forest ecotone and allows for noise, visual and ecosystem process buffering.

2 Site Ecological Conditions (Status Quo): *A review of the Vegetation Report (Styles, 2018)*

The original Vegetation Assessment Report (Styles, 2018) was reviewed, and the key findings are briefly summarised below to provide the relevant background, ecological context and a basis to inform further discussions and recommendations around forest management and conservation buffer zones:

- A review of aerial photography shows that between 1937 and 1968 the vegetation overwhelmingly comprised grassland. While a very small amount of woody vegetation had begun to appear by 1968, by 1996 it had converted to mosaic of grassland and woody vegetation. By 2017 the emergent woody vegetation had closed up, with only a small 0.16 ha instance of grassland remaining.
- All or nearly all of the woody vegetation is considered to be of recent origin and this is reflected in the species composition. However, a distinction is made between older forest (that is estimated to have included trees that established 30 years ago), and younger/seral successional forest and thicket (where trees appear to have been emergent or absent 30 years ago).
- The botanist expressed difficultly in determining the precise boundary between older and early successional forest, due to lack of resolution in aerial imagery, and interpolation and graduation between the two. Therefore, an approximate boundary only has been defined.
- In spite of the forest being of recent origin, the definition of forest in the National Forests Act No. 84 of 1998 is broad and captures both the older-growth forest and the early successional forest and thicket.
- Some protected tree species also occur. Protected trees include: *Pittosporum viridiflorum* (Cheesewood).
- Vegetation within the planned development areas comprised alien-dominated communities (especially *Chomolaena odorata*, Triffid weed), with much vegetation having been cleared in 2017 with re-growth by 2018.
- Although transitioning into forest, the botanist and author of the report, David Styles, expressed his opinion that the vegetation community would be better described as thicket as the canopy is mostly low.

Further consultation with the botanist and author of the original Vegetation Assessment Report, Mr. David Styles, was undertaken to obtain additional insight into the classification of the young, seral forest occurring on the properties, which remains relatively unclear in the Vegetation Assessment Report of 2018. According to Mr. Styles, the presence of Scarp Forest on the site is uncertain, however based on the composition and structure of the forest and the location on Dwyka Group Tillite geology with clay soils in the eThekwini Municipality coastal zone, this is markedly different to that of most Northern Coastal Forest on sandy soils in the same area. The forest vegetation is therefore inherently difficult to classify according to Provincial and National forest classification systems and types.

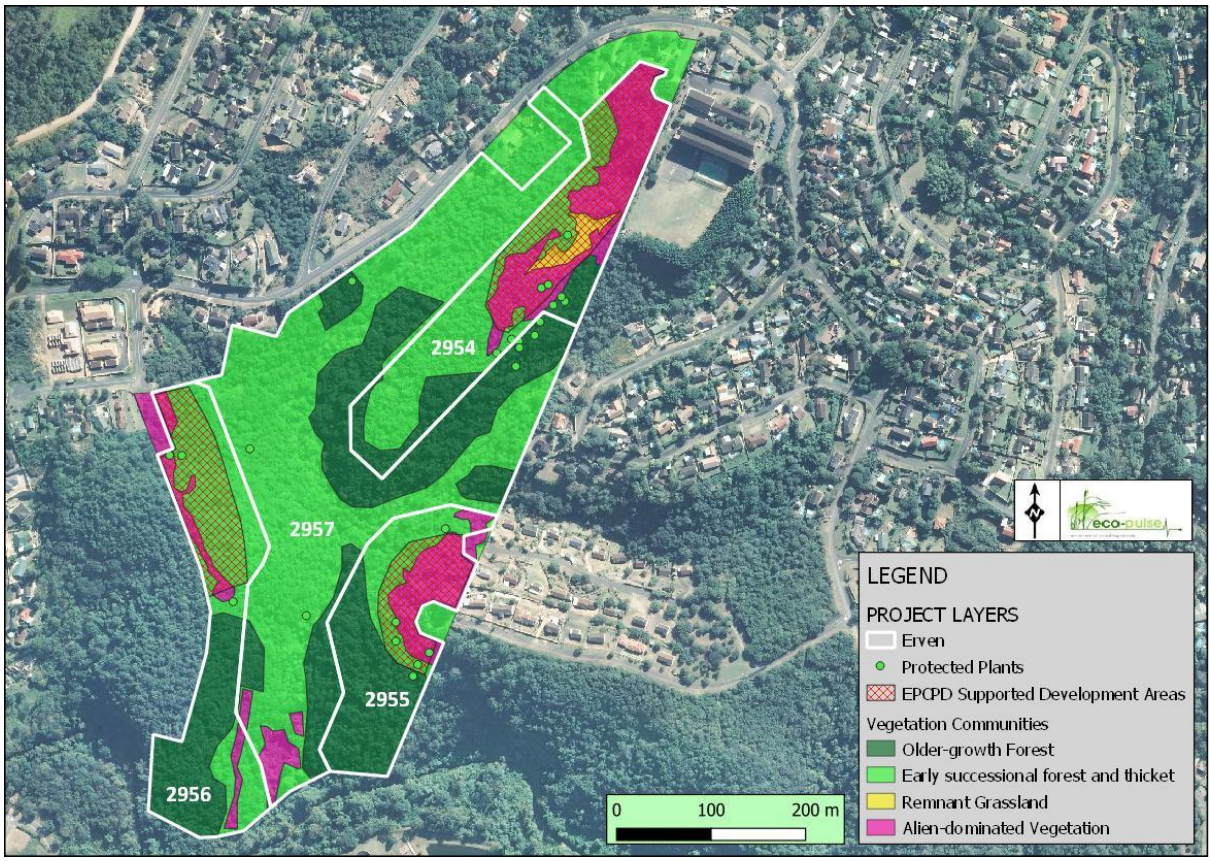

Figure 1. Vegetation map (after Styles, 2018).

3 Key Recommendations contained in the original Vegetation Report (Styles, 2018)

The relevant impact mitigation recommendations contained in the original Vegetation Assessment Report (Styles, 2018) were reviewed, to inform further discussions and recommendations around forest management and forest buffer zones for the development properties. These include the following measures:

- In order to minimize impacts on forests and the concern of DAFF, it is recommended that development avoid older, better-developed forest and minimize loss of early successional forest and thicket and that these areas be buffered from proximate development to the extent that this may otherwise disturb the more intact vegetation.
- The botanist and author of the report, David Styles, expressed his opinion that it may be possible to mitigate the loss of early successional forest and thicket, providing that undeveloped parts of the properties are zoned to conservation (as the EPCPD will likely require) and a long-term rehabilitation

and management plan is implemented in the conservation zones. The main component of the plan will be control of alien vegetation. This plan should be approved of by EPCPD and DEFF, and the implementation mechanism and funding resolved to their satisfaction. Development of such a plan, and its implementation and funding, should become the subject to consultation and negotiation between the developer, EPCPD and DEFF as soon as possible.

- Based on vegetation surveying which occurred in 2017, subsequent presentation of results to, and negotiation with the eThekwini's Environmental Planning and Climate Protection Department (EPCPD), development areas were provisionally agreed that will least impact on better quality vegetation. The EPCPD's support is subject to conditions including that future management of the undeveloped parts of the properties be addressed.
- Development should also avoid or minimize cutting or clearing of protected indigenous trees.
- Based on the mitigation measures outlined in the Vegetation Report (Styles, 2018), the botanist and author expressed his opinion that if these are well-implemented, they will offset or largely offset the loss of early successional forest and thicket lost in consequence of the proposed development. However, DEFF will need to comment on and approve the acceptability of the recommended mitigations.
- Special recommendations for ERF 2956:
    - General coverage of the property by forest does not commend it as suitable for any kind of extensive development and it is not possible to develop this property to any more than very minor extent without impacting on some of this forest;
    - However, if confined to the eThekwini supported development area it will have lower impact than if situated elsewhere.
- Special recommendations for ERF 2955:
    - The property includes an area invaded by alien vegetation (mainly *Chromolaena odorata*) with the balance covered by thicket transitional to early successional forest, earlier successional forest and older forest.
    - The older-growth forest should be avoided.
    - The 'eThekwini supported development area' is mostly situated on the alien plant invaded area but includes early successional forest and thicket.
    - The botanist expressed his opinion that he considered it a "good trade-off" if the eThekwini-supported development area was moved 15 metres from the older-growth forest edge, with a comparable area of early successional forest on the western edge included instead.

4 Forest Conservation Buffer Zones in South Africa

A review of available national, provincial and local level policy and guidelines supporting forest conservation buffer zones and recommendations associated with buffers was undertaken to inform the recommendations for buffers for the site in question. These include policy and guidelines compiled at a National Level by the Department of Environment, Forestry and Fisheries (DEFF, formerly DAFF), at a Provincial level by Ezemvelo KZN Wildlife (EKZNW) and at a local municipal level by the eThekwini Municipality (EPCPD).

a. National Level Forest Management Policy & Guidelines

In South Africa, the mandate for the management of natural forests and the responsibility for implementing the National Forest Act No. 84 of 1998 (NFA) resides with the national Department of Environment, Forestry and Fisheries (DEFF), formerly DAFF (Department of Forestry & Fisheries). DAFF in the past compiled a relevant policy and guideline document for development potentially affecting natural forest, titled "*Policy Principles and Guidelines for Control of Development Affecting Natural Forests*" (DAFF, 2010). According to this document and in line with the 'precautionary principle' in environmental impact management, due consideration must be given towards incorporating the following forest management principles into project design and planning:

- Keeping the dynamic forest processes intact;
- Preventing disturbance to forest ecosystems, fauna and flora;
- The most sensitive parts of forests are to be avoided;
- Keeping forest margins and surrounding mosaics of habitats in place as far as possible (inter alia through sufficient buffer zones, corridors and protected areas);
- Natural corridors linking forests and other habitats must be retained as far as possible; and
- Not allowing disturbance caused by poor land management to be used as a motivating factor for land use change that transforms natural forest.

Further guidance is provided in terms of forest conservation 'buffer zones' as follows:

- Due consideration must be given to the minimum width of corridors and buffer zones and the minimum size requirements of natural habitats to enable fully functional ecosystems to be retained;
- Building structures must be placed outside the forest with a sufficient buffer area to keep the forest margin intact (**buffer usually more than 20m**); and
- The ecotones and vegetation types surrounding forest patches must be kept intact as a vital part of maintaining the forest habitat and its fauna and flora.

b. Provincial Level Forest Management Policy & Guidelines

The Provincial "*Guidelines for Biodiversity Impact assessments in KZN*" (EKZNW, 2013) recommends buffer widths for forests (measured from the forest edge), which generally range from 20m up to 200m. Based on the guideline document, whilst a **40m buffer is generally applied**, this standard buffer width may not always account for the forest and development type and has been inappropriate in some instances in the past. As such, the determination of an appropriate and site-specific buffer depends rather on a number of factors, which EKZNW have proposed an iterative and scaled approach to buffer width determination (Table 1, below).

Table 1. Forest buffers recommendations guidelines (after EKZNW, 2013).

KEY CRITERIA	
Key criteria influencing buffer width	**Minimum buffer width recommended**
1 Forest comprising younger trees, pioneer plants and low species diversity typical of uniformly secondary vegetation or representing recent succession from grassland, woodland or scrub.	20m
2 Threatened (Critically Endangered, Endangered or Vulnerable) forest types	100m

KEY CRITERIA	
Key criteria influencing buffer width	**Minimum buffer width recommended**
3 Old forest growth more than 5ha in extent or part of a forest mosaic more than 5ha in extent, comprising mature forest not recently having succeeded from grassland, woodland or scrub.	100m
SECONDARY SCALING CRITERIA	
Secondary Criteria & Scaling Guide	**Modification to buffer**
Shading: no unnatural shading of the forest and ecotone.	Buffer to be adapted to reduce shading from infrastructure
Erosion: forests are particularly vulnerable to erosion due to sparse ground cover and therefore buffers from activities that tend to exacerbate erosion risk should be large enough to protect the forest and ecotone.	Steep slopes and less permeable soil types will tend to increase the buffer width

c. Local Level Forest Management Policy & Guidelines

Development Assessment Guidelines have also been developed by eThekwini Municipality's Environmental Planning & Climate Change Protection branch (eThekwini Municipality, 2010) and include guidelines for development potentially affecting indigenous forest ecosystems within the Municipality:

- Development within a natural forested area is generally not supported;
- Generally, **a minimum development buffer of 40m must be maintained** from the forest canopy drip line;
- The size of the standard 40m buffer may however be increased or decreased depending on the forest size, its ecological functionality and the form of the proposed development; and
- The buffer area must be managed as an ecotone area (i.e. an area of transition from one ecosystem to another) as this ecotone is often more diverse - containing elements from both ecosystems and allows for development-associated impacts to be absorbed before impacting on the forest.

5 Forest Conservation 'Buffer Zone' Recommendations

5.1 Buffer zone recommendations according to the Vegetation Assessment Report (Styles, 2018)

The Vegetation Report (Styles, 2018) makes reference to buffer zones in order to protect the more intact forest communities on the property from disturbance associated with proximate development. The main comments made by the botanist and author, David Styles, have been summarised as follows:

- Ordinarily, buffers are situated between the edge of better-quality natural vegetation and development in order to protect it from disturbance. Smaller buffers (ca. 15 m) often accepted within an urban edge. On the Kingsburgh properties, however, more limited buffering is relevant for the following reasons:
    - The forest is of recent origin and pioneer trees are conspicuous. As a result, impacts are less important compared to older growth forest (and there is no very old growth forest (i.e. > 80 years old).
    - Most of the properties are covered by woody vegetation and it is already difficult to develop them without clearing of at least some early successional forest and thicket, so that it is also difficult to accommodate buffers.

- Unless there is open vegetation between the development footprint and woody vegetation, which can only be maintained through burning (which will not be feasible) or mowing, the buffer will quickly infill with pioneer woody plants and other successional thicket and forest growth. In other words, the vegetation will assume the character of adjacent thicket and early successional forest and extend very close to the footprint edge nonetheless.

- As a result, the criterion should be to what distance from the edges construction can occur without disturbing the older-growth forest, as approximately mapped.

5.2 Buffer zone widths to account for forest types:

The National (DAFF, 2010), Provincial (EKZNW, 2013) and local Municipal (eThekwini, 2010) guidelines for establishing suitable forest conservation 'buffers' were used to inform the recommendation of a suitable variable buffer zone for the development project and site, based on the site specifics, criteria and forest types occurring. The most important characteristics to consider when recommending suitable buffer zone widths probably include:

(i) the scale of impacts that need to be addressed;
(ii) the specific land use context; and
(iii) the ecological importance and/or sensitivity of the environment (forest type).

With this in mind, the approach summarised in Table 2 has been formulated based on the available guidance to better inform forest buffer width recommendations for the development project.

Table 2. Recommended approach to calculating suitable forest buffer widths based on available guidelines.

Forest Classification[3]	Relevance to Project	Minimum buffer width recommended
1 Primary northern coastal forest (Critically Endangered): older/mature forest growth	Not represented at the site	**100m**
2 Primary scarp forest (Least Concern): older/mature forest growth	Unknown or Poorly represented at the site	**40m**
3 Older forest growth (unclassified)	Represented at the site	**40m**
4 Degraded secondary forest / thicket (seral forest in early successional stage)	Dominant type	**20m**

Note that whilst buffer zone requirements have been informed by best available science/literature, there is still no formally accepted method for determining appropriate buffer zone widths for forests in South Africa. There is therefore a risk that Authorities may differ in their interpretation of appropriate buffer zone/setback requirements.

[3] The botanist (David Styles) who undertook the original Vegetation Assessment for the project site was consulted with regards to his opinion on the classification of the wooded vegetation communities on the various properties assessed. In his opinion, the presence of Scarp Forest on the site is uncertain, however based on the composition and structure of the forest and the location on Dwyka Group Tillite geology with clay soils in the eThekwini Municipality coastal zone, this is markedly different to that of most Northern Coastal Forest on sandy soils in the same area. The forest vegetation is therefore inherently difficult to classify according to Provincial and National forest classification systems and types.

5.3 Modified buffer zones to account for erosion & sedimentation control:

In addition, in areas with steep slopes where erosion & sedimentation potential is likely to be significant (i.e. sites associated with storm water runoff from bare exposed soils during construction and storm water discharge during operation), a modified buffer zone may be required to assist with controlling erosion. Land slopes exceeding 1 in 10 have been documented in the literature as being particularly significant in increasing erosion risk to downslope areas (Finér *et al.,* 2018 ; Bentrup, 2008). Given that the average slopes for the properties concerned has been estimated to range between 1:2.5 (40% slope) and 1:3.5 (30% slope) (based on available 2m elevation contours and calculations performed using GIS), erosion risk is considered to be potentially of high significance at the site.

A brief review of available international literature was therefore undertaken to inform buffer zone width recommendations to assist with erosion & sediment control, however this is not an exhaustive review given the time and budget limitations of the project and given the limited information available for the South African context. Based on the review undertaken, the following is highlighted:

- The structural characteristics of the buffer zone (including size, shape, structure of the vegetation, soil type, runoff characteristics and slope) largely determine how well a buffer is capable of functioning at a given location (Bentrup, 2008);
- Well-vegetated buffer strips approximately 10m wide can reduce sediment loss by >90% in moderately sloping soils (Baumhardt & Blanco-Canqui, 2014).;
- Significant removal of nutrients and trapping of sediment has typically stemmed from studies with buffer widths of 30m and greater (Hebblethwaithe & Somody, 2008);
- A 30m buffer width is typically regarded as effective in trapping most sediment from cleared areas (Croke, 2004);
- Narrow buffers (<15 ft or <5m) can be effective for sediment removal in some locations where relatively lower slopes, smaller runoff areas and permeable soils dominate (Bentrup, 2008); and
- According to the "*Buffer Zone Guidelines for Rivers, Wetlands & Estuaries*" (Macfarlane & Bredin, 2016), vegetated buffers with buffer zone widths upwards of 15m have been generally shown to be highly effective in controlling sediment.

Furthermore, the limitations of buffers in terms of managing erosion and sediment risks linked to catchment activities that influence runoff volumes, flow patterns and flow velocities are important to note, with some of the key limitations being:

- Buffers for removing nutrients and trapping sediment work best on slow, shallow diffuse flows, with concentrated flows being inherently difficult to mitigate using buffers and requiring alternative means of control (Hebblethwaithe & Somody, 2008);
- For steep sloping soils, the effectiveness of grass buffers for reducing concentrated flow and gully formation is likely to be limited (Baumhardt & Blanco-Canqui, 2014);
- In some instances, the buffer width required to achieve sufficient erosion control and risk management, or sediment trapping efficiency, may exceed what a landowner is willing to set aside as

a buffer, and in these situations alternative or additional conservation practices are likely to be required as part of a mixed-management approach (Bentrup, 2008);

- Buffers for erosion control and sediment trapping should only be used as a final defence, with soils needing to first be retained in place through appropriate sediment and erosion control best management practices (Bentrup, 2008);
- According to the "*Buffer Zone Guidelines for Rivers, Wetlands & Estuaries*" (Macfarlane & Bredin, 2016), buffer zone requirements are only advocated where scientific studies have shown that they can be an effective mitigation measure: erosion related risks and threats associated with altered flow volumes and altered patterns of flows (e.g. increased flood peaks and flow velocities) are therefore best addressed through 'source-directed controls' for managing water inputs and releases to the environment rather than through the prescription of buffer zones; and
- If one considers erosion control and sediment trapping for example, standards for runoff and erosion control, or implementation of other better soil conservation practices are likely to be more effective than buffers in controlling sedimentation (Macfarlane & Bredin, 2016).

Overall, given the steep sloping nature of the general topography at the site, buffer zones of 5m, 10m or 15m are unlikely to be efficient at trapping sediment or controlling erosion. A **buffer zone of 30m** or more is more likely to be relevant to the site for the purpose of managing erosion and sedimentation risk (see Table 3).

This is however dependent on the buffer zone being maintained in an appropriate functional state so as to maximise buffer functioning and efficiency in controlling erosion and trapping sediment (*see 5.4: 'Buffer zone management recommendations', below*). It also needs to be recognised that buffer zones for steep sloping sites and where concentrated flows may be involved are likely to have limited effectiveness for reducing concentrated flow/gully formation and in trapping sediment - regardless of their size and state (Baumhardt & Blanco-Canqui, 2014 ; Hebblethwaithe & Somody, 2008 ; Bentrup, 2008). In this instance, rather than relying on buffer zones, buffer should be viewed as one of a number of possible approaches and specific 'source-directed controls' aimed at controlling surface flow volumes and velocity are recommended as part of a broader suite of best management practices to reduce erosion risks & impacts (Macfarlane & Bredin, 2016).

Table 3. Minimum buffer widths recommended based on slope and erosion risk.

Slope / Gradient of the Buffer	Minimum buffer width recommended
Gently sloping sites	**10m**
Moderately sloping sites	**15m**
Steep sloping sites (1 in 10 or more)	**30m** (or more)
Sites with concentrated flow paths	*Buffers will be largely ineffective*[4]

[4] According to the "*Buffer Zone Guidelines for Rivers, Wetlands & Estuaries*" (Macfarlane & Bredin, 2016), where concentrated flows and flow paths dominate, buffer zones have been shown to be largely ineffective at mitigating erosion and sediment impacts.

5.4 Buffer zone management recommendations:

Buffer zone width recommendations provided in this document are subject to the following assumptions and conditions being met:

- Construction phase impacts including pollution, sediment risk, noise disturbance and physical destruction of forest vegetation can potentially be quite easily managed and mitigated by implementing a range of on-site management and source-directed control and mitigation measures;
- The developer commits to implementing the impact mitigation/management recommendations detailed in the specialist Vegetation Assessment Report, DBAR and EMPr compiled for the project;
- An appropriate Storm Water Management Plan (SWMP) will be developed for the project to attenuate storm water to approximate pre-development conditions, with suitable erosion protection to prevent soil erosion and sedimentation; and
- A Forest Conservation Management Plan (FCMP) is compiled to address long-term forest conservation and management at the site, including the implementation and maintenance of forest buffers (*see below also).*

The following general buffer zone management and maintenance guidelines (based on a number of guidelines and literature reviewed) will apply to the development site and will be expounded on further in the FCMP where necessary:

- In order to maximise their effectiveness, buffer zones will need to be established and maintained with indigenous vegetation cover (without erosion features/concentrated flow paths) as open space natural grassland areas with appropriate alien plant control and/or slashing to maintain grass cover where appropriate;
- Buffers consisting of sparse trees may not be as effective as those mixed with grasses for reducing incoming runoff and filtering sediment and nutrients, therefore a mixture of woody vegetation with dense ground cover (grasses / herbaceous plants with fibrous root systems) to provide roughness and flow resistance is recommended for the buffer zones;
- Maintain vegetation cover, avoid soil compaction and rutting within the buffer and overland flow area (i.e. minimize driving in this area and use ground protection on soft ground);
- Woody species with deeper roots will be better at increasing soil cohesion and reducing mass slope failure and this should guide species selection when re-vegetation buffer zones;
- Reduce soil erosion risk by locating any eco-trails within the buffers on soils with low erodibility (e.g., coarse-textured, low organic matter, low soil moisture);
- Design trails located within buffers to follow the contour;
- Use relevant measures to route any concentrated runoff away from trails;
- Construct small bridges across wet soils in buffer zones where trails are to be maintained and avoid steep slopes as far as possible; and
- Consider using trail surface materials such as mulch or crushed gravel to reduce erosion risk within the buffer.

6 Conclusion & Way Forward

Ultimately, a 'common-sense approach' to buffer zone prescriptions for the property is advocated, that takes into account the following:

- The benefits of buffers and situations where buffers are beneficial in protecting adjacent ecosystems (forest) from development risks and impacts;
- Situations where buffers are not recommended due to their ineffectiveness to control erosion/sediment risks in the context of concentrated flows and altered catchment hydrological processes involving enhanced volume and runoff rates/velocities; and
- The development context and potential significance of development-related risks and impacts;

Based on the site ecological context, planned residential development type (and risks/threats associated with this change in land use), site conditions/specifics, as well as the various limitations and constraints associated with buffer zone applications for the property, the following preliminary forest buffer zone widths have been recommended (*see Table 4 and the map in Figure 2*):

1. A buffer zone width of 20m to be applied uniformly to the dominant vegetation types, that being 'Degraded secondary forest / thicket' (seral forest in early successional stage);
2. The 20m buffer zone be increased to 30m width where slopes are steep (1 in 10 or more); and
3. A conservative 40m buffer zone width be applied uniformly to the older forest growth in the absence of formal classification (not possible given the context of new growth on sites which historically lacked woody vegetation and given the geology and soil type).

Table 4. Preliminary recommended forest buffer widths.

Forest Classification	Minimum buffer width recommended
Older forest growth (unclassified)	**40m**
Degraded secondary forest / thicket (seral forest in early successional stage)	**20m**
Degraded secondary forest / thicket (seral forest in early successional stage) on steep slopes (exceeding 1 in 10)	**30m**

The proposed buffers should also function to ensure that key policy principles around forest management/conservation expressed in the DAFF Forest Management Policy Document (2010):

- Maintenance of dynamic forest processes;
- Prevention of disturbance to forest ecosystems and the relevant fauna and flora;
- Assurance that the most sensitive parts of forests are avoided;
- Maintaining forest margins (ecotones) and surrounding mosaics of habitats as far as possible; and
- Retention of natural corridors linking forests and other habitats as far as possible.

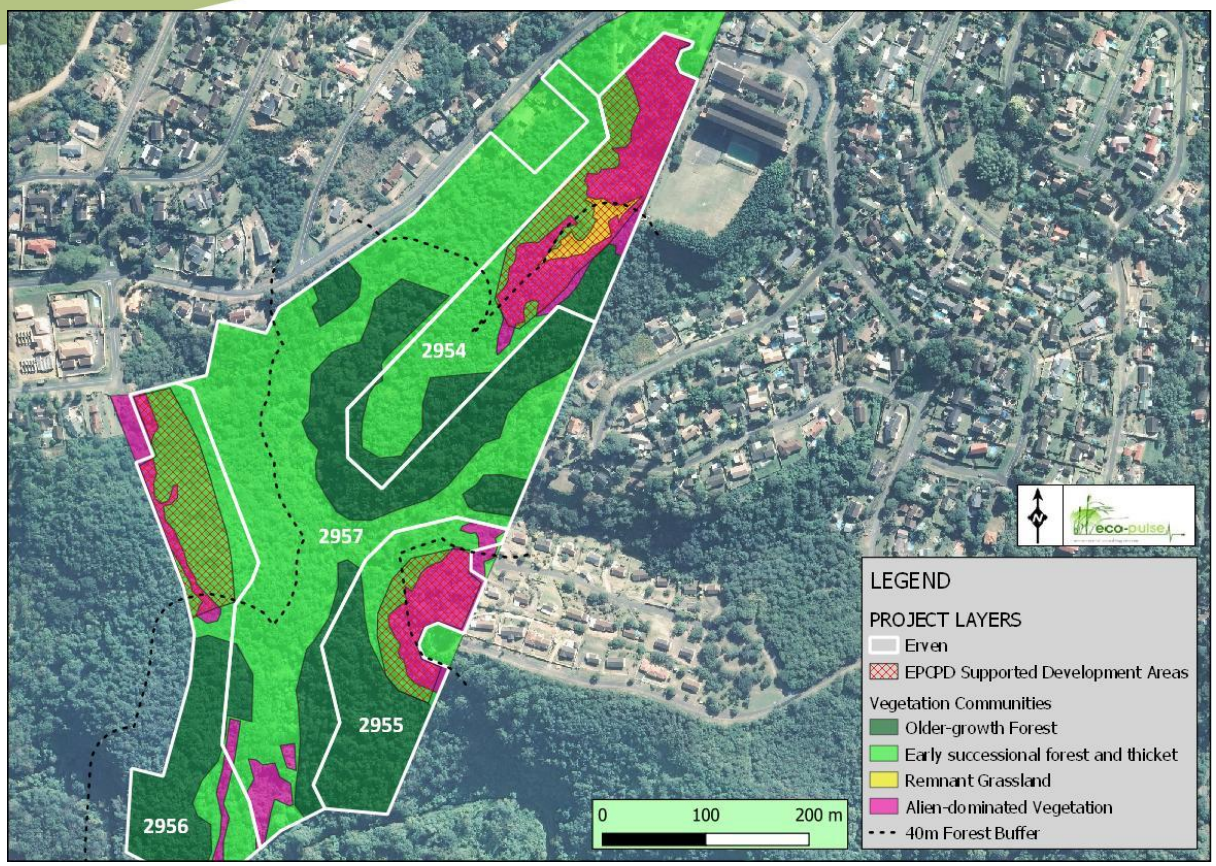

Figure 2. Preliminary forest buffers map, indicating the 40m buffer width recommended from 'older-growth forest' and implications for development planning.

The map in Figure 2 shows only the 40m buffer zone prescribed conservatively for the 'older-growth forest' and not the 20m and 30m buffers from the 'early successional forest/thicket'. Where buffers from the early/seral forest and thicket vegetation are applied, this effectively sterilises the majority of the properties from development altogether. In light of the severe development constraints that would be imposed through an absolute approach to buffer zone application for this project, the botanist involved in the original Vegetation Assessment (David Styles) was consulted further with regards to the approach to buffer zone recommendation for the project, with the following being key opinions and recommendations expressed (David Styles, per. comm):

- Development-related impacts associated with a residential development of this nature are unlikely to be significant enough to warrant very large conservation buffer zone widths (upwards of 40m to 100m, for example).
- Since buffer zones function not only to protect sensitive vegetation and habitat from proximate land uses and potential impacts, but also ensure that the forest vegetation can be managed and/or exposed to natural processes such as fire (David Styles, per. comm.), the forest 'ecotone' is important. However, since this is the interface of open vegetation and grassland, it will still be important for fires to continue to burn along the forest edge. In an urban or sub-urban environment where there is no contiguous open vegetation, where forest is flanked only by other development, or forms part of other vegetation which has already closed and succeeded to woodland, forest or alien plants, smaller buffer zone widths of 20-40m are more appropriate in this context, depending on the quality of the vegetation.

- What needs to be borne in mind on properties such as the Kingsburgh site and many properties on the KZN Coast which now comprise early successional forest, even if alien-invaded, development can only realistically occur if some of the wooded vegetation is utilized/transformed, and in this case then buffers can also not be realistically applied in these areas. In this context therefore, if one simply maps the forest on the property (including the early successional forest and woodland) and then uniformly applies buffers in an absolute sense, this will ultimately render the properties undevelopable.
- If development could rather be focused away from the more mature, older growth parts of the forest system, and could also otherwise be mitigated by minimizing impacts and rehabilitating the vegetation that remains, a form of sustainable development that balances the needs of the ecology and environment could potentially be achieved.
- There must also be some caution exercised when interpreting the situation on properties such as Kingsburgh that comprise open space in the more coastal parts of the eThekwini Municipal Area. In these contexts, the vegetation is mainly closed and comprises woodland or forest, albeit with sections dominated by alien plants. Historically, as the aerial imagery shows, the vegetation was more open (grassland, savanna) with very little woody vegetation occurring and nearly everything that occurs in its present state as young, seral forest and woodland/thicket has succeeded since 1937 and mostly some time thereafter.

It has therefore been recommended that a modified variable buffer zone be implemented, with a reduction from 40m width to **20m width** from the older forest growth in selected areas where the following applies:

- The buffer zone is already heavily degraded/transformed;
- Dense alien vegetation dominates the 40m buffer area;
- Proposed development is separated from adjacent forest by a steep valley and watercourse (stream/river); and
- Where small, isolated patches of forest occur with the vegetation being in poorer condition.

The modified buffer zone map is shown in Figure 3 and provides a potential solution that will favour both development (within financially viable areas) and the conservation of the most sensitive forest habitats on the property.

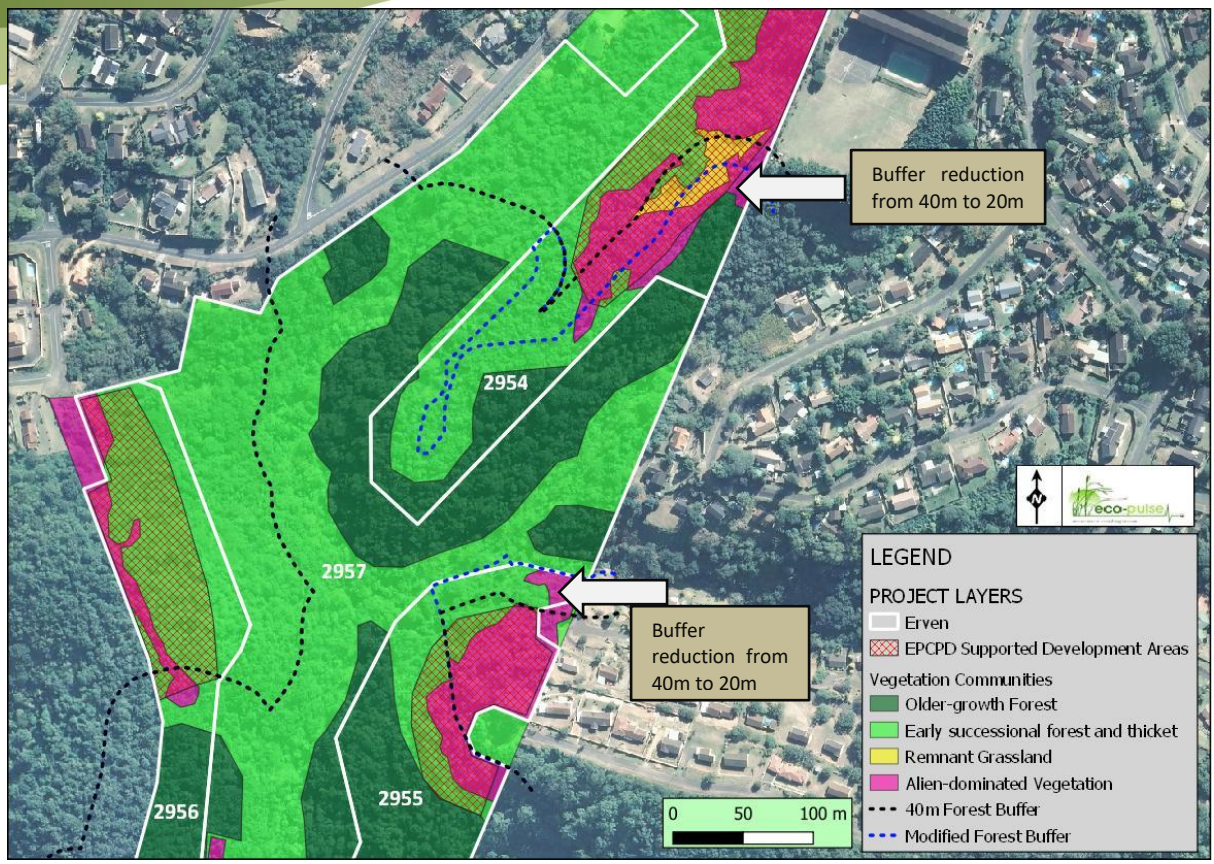

Figure 3. Modified variable buffer zone map, indicating the 40m buffer width recommended from 'older-growth forest' reduced to 20m width in places, and implications for development planning.

The forest conservation buffer zone recommendations contained in this document are to be submitted to the EPCPD for their consideration, comment and final approval. Following endorsement by the EPCPD, the buffer zone recommendations will need to be incorporated into a revised development layout plan and included in a Forest Conservation Management Plan (FCMP) which Eco-Pulse will be developing for the developer and applicant.

Should the EPCPD dispute the buffer zone recommendations and specifications contained in this report, an additional meeting should be held to discuss and reach a suitable alternative option concerning buffers that all parties can agree to.

What also needs to be borne in mind is that all 'natural forest' is protected in terms of the National Forest Act (No. 84 of 1998) and subject to a formal licensing / permitting process, and it is therefore necessary that the Department of Environment, Forestry & Fisheries (DEFF) be approached early on in the process to obtain their inputs also into appropriate buffer zone widths, developable and non-developable areas, and forest destruction licensing processes. It is therefore highly recommended that the buffer zone recommendations should also be distributed to the relevant DEFF official(s) reviewing the development application for formal comment.

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