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To Whom It May Concern

DEVELOPMENT GEORGE REX SPORT & ADVENTURE CENTRE ERF 12403, REX DRIVE, KNYSNA

STORMWATER MANAGEMENT – RESPONSE TO CONSULTATION BAR

The 'Preliminary Report on Provision of Bulk Civil Services to Proposed Development – September 2018' as issued on 13 November 2018 for the above proposed development refers. The following has been prepared in response to some of the comments received from the Consultation BAR.

Several of the comments received revolved around stormwater management for the proposed development. While this has been covered in detail in the above-mentioned report, specifically in Section 8 and Sub-section 8.5 thereof, further commentary is provided below. Firstly, however an extract of the summary provided in Sub-section 8.5 from the above report is provided below:

Extract from Report:

For the most part Storm Water Management has been addressed elsewhere is this report under a myriad of separate items. Below is both a summary of these separate items and some additional points that form part of the Storm Water Management Plan:

- Existing site characteristics are addressed under Section 2 above.
- Rainwater harvesting of runoff from roofs will form a substantial part of the planned water resources for the project. This water will not be collected in rainwater tanks, but rather will be directed to a lined surface water dam located within the open space portions allocated within the wetlands. This pond can be developed in such a way that it looks natural and part of the environment. It will also form a surface water for bird and aquatic life and therefore contribute to the environmental benefit of the project.
- Existing site topography and existing storm water drainage are covered in Section 8.1 and 8.2 above.
- Proposed storm water drainage is addressed in Sections 8.3 and 8.4 above. These sections are summarized as follows:
    - Overgrown storm water channels on site are to be rehabilitated.
    - Surface runoff from hardened areas, such as roads and parking areas is to be diverted and discharged onto the surface of the open space areas/wetlands. In doing this one is able to promote natural treatment of pollutants in the water through environmental contact time and exposure to UV. In addition to this it will have the added benefits of promoting attenuation and recharge of ground water resources.
    - Surface water that does not percolate into the ground water system but that continues to travel across the surface of the wetlands will ultimately discharge into the existing rehabilitated surface channel around the perimeter of the site and leave the site via further formal drainage infrastructure.

- Upgrades to the existing offsite storm water infrastructure will further ensure better management of peak runoff and prevent or minimize the current localized flooding experienced in the immediate vicinity of the site.
- Erosion and siltation during and after construction will be achieved by the use of silt traps and silt screens, at suitable locations along with energy dissipators at storm water outlets.

Sections 8.1 and 8.2 (as referenced above) of the above report explain in detail the existing conditions on the site and off the site. Sizes of existing culverts along with their proximity to the site and their impact on the drainage of the site are covered.

Section 8.3 (as referenced above) of the same report explains the proposed upgrades of the stormwater infrastructure on the site and off the site along with **proposed culvert sizes and levels** and the **expected impact** that this will have on the drainage of the development.

Drawings provided in Appendix C to the report detail the above graphically. These are namely:
- N15/60-3 – Layout of Proposed Master Stormwater Drainage with Diversion to Golf Course
- N15/60-4 – Layout of Proposed Master Stormwater Drainage with On-Site Improvements

From the above it can be seen that both the broad picture and to a large extent the detail thereof, for the proposed stormwater management of the site, is adequately covered in the report. This should suffice in answering most of the questions raised in Consultation BAR. However, Section 8.4 (as referenced above) of the same report is perhaps lacking in detail and is therefore expanded upon hereunder:

Section 8.4 of the report deals with the proposed on-site improvements with respect to the storm water infrastructure. In this case, 'on-site', primarily means the portion of the site to be formally developed and not the wetland. However, this infrastructure does connect to the wetland and therefore does have an impact on it.

Typical sustainable drainage systems, often referred to as **SuDS**, and the associated stormwater infrastructure and management thereof take the following key principles into account:
- Storing runoff and releasing it slowly (attenuation)
- Harvesting and using the rain close to where it falls
- Allowing water to soak into the ground (infiltration)
- Slowly transporting (conveying) water on the surface
- Filtering out pollutants
- Allowing sediments to settle out by controlling the flow of the water

Each of the above and how they are accommodated/included in the proposed stormwater system are discussed below:

1. Storing runoff and releasing it slowly (attenuation):
   This will be achieved in two ways. Firstly, all runoff from the roofs on the development will be harvested and stored in a lined surface water dam located within the open space portions allocated within the wetlands (refer to Section 8.5 of the report). This is a form of retention and will therefore have the benefit of attenuation.

   Secondly, the remaining surface water from grassed areas, parkings, etc. will be discharged into the wetlands as sheet flow (refer to Sections 8.3 and 8.5 of the report). This will dramatically increase the time that the water takes to reach the formal 'bulk' stormwater system and thus

attenuating the runoff and therefore releasing it slowly. In addition to this, a substantial amount of this water can be expected to soak into the ground causing further attenuation, albeit somewhat permanent.

2. Harvesting and using the rain close to where it falls:
   As discussed above, all runoff from the roofs will be harvested by collecting and storing it within the wetlands (refer to Section 8.5 of the report). This is immediately adjacent to the area to be developed on the site. This water will be treated on-site and stored in reservoirs as potable water for use in the development. This will achieve the objective of both harvesting the rain water and using it close to where it falls.

3. Allowing water to soak into the ground (infiltration):
   As discussed above, the surface water from grassed areas, parkings, etc. will be discharged into the wetlands as sheet flow (refer to Sections 8.3 and 8.5 of the report). As the wetland area is for all intents and purposes flat, a substantial amount of this discharged water will initially soak into the ground and promote recharge of the aquifer.

   Some developments also encourage infiltration within the parking areas through the use of permeable paving, etc. In this case this is not recommended as the in-situ soils are not amenable for development directly on top of them. Therefore, an engineered fill will be constructed within the area to be developed. If one was to encourage infiltration through the parking surface and onto/through the engineered fill it would cause it to fail and substantially reduce the service life thereof. This would not be sustainable and therefore would be counterproductive to the purpose of a sustainable development.

   However, by recharging the aquifer in the wetland adjacent to the area to be developed, it would be quite likely that ground water mounding would take place and cause some lateral movement of the ground water. This would cause a measure of recharge to the aquifer below the developed area without having compromised the engineered fill above.

4. Slowly transporting (conveying) water on the surface:
   This is covered in items 1 and 3 above as it pertains to flow across the surface of the wetlands. Insofar as it pertains to the area to be developed; the site is particularly flat and will essentially be developed as such. Accordingly, with very flat lawns and parking areas the net result is slow flow of water across these surfaces and thus achieving the principle of this item.

5. Filtering out pollutants:
   All rainwater from the roofs is to be harvested. This water will be treated on-site prior to use as a potable water. This treatment would remove any pollutants in this water.

   Water discharging from the remaining surface areas, namely grassed and parking areas, etc., will be discharged into the wetlands. This water will be treated in the wetlands through environmental contact and exposure to UV in the wetlands (refer to Section 8.5 of the report). The extent to which this treatment will act will require input from a suitable specialist.

6. Allowing sediments to settle out by controlling the flow of the water:
   Some silt can be removed from surface water runoff prior to discharging into the wetlands through the use of silt traps. These are however typically high maintenance and unreliable in long term use with the net effect that the storm water system fails or does not operate optimally. We would recommend against the use of these.

We trust that the above assists in further clarifying the proposed stormwater infrastructure and the management system. Please do not hesitate to contact the undersigned should further clarity or information be required.

Yours faithfully,

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