

## **ERF RE 1627 SEDGEFIELD**

### **Review of the Flood Management Report**

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|                             | <b>Name</b>                                            | <b>Signature</b>                                                                     | <b>Date</b>      |
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## 1 INTRODUCTION

GCS (Pty) Ltd was requested by Mr Clifford Elion to review the flood assessment report of ERF RE 1627 Sedgefield compiled by Mr Alistair Fraser of Fraser Consulting Engineers, Sedgefield, dated 30 March 2022 (Report AF1101-1-r0.). The report together with associated figures were provided to GCS by Mr Elion. In addition, Mr Elion supplied the SANParks National Garden Route Management Plan

The aim of the assignment was to review the flood assessment report and recommendation in terms of the proposed development on ERF RE 1627. GCS subcontracted Prof Denis Hughs of the Hydrological Research Unit at Rhodes University to assist in the study because of his knowledge and previous work completed in the Sedgefield & Wilderness catchments.

Recommendations are made in the final chapter of the report.

## 2 REVIEW

The full title of the original report is 'Multi-use development of ERF RE1627 Sedgefield: Flood Management Study' and was intended to provide information on flood risks associated with the proposed land use changes (housing development) of ERF RE1627 located within the area known as 'The Island (Sedgefield Extension 1).

The objectives of this review are:

- To assess the appropriateness of the methods used in the flood risk assessments.
- To assess the validity and likely accuracy of the data used in the assessments.
- To assess the validity of the conclusions reached in the report in terms of the risks of flooding, as well as the recommendations made to mitigate against flood damage.
- To make any additional comments that might be of value to the developers in making future decisions about the nature of the development or any further assessments that are possibly needed.

### 2.1 Methodology

The report indicates that the flood assessment is based on 'a range of historical flood data', mainly comprising photographic evidence of flooding during the August 2006 and November 2007 floods together with some maximum flood levels reached during the November 2007 floods based on debris marks surveyed by Fraser Engineers cc. Additional information from other reports and data sources are used to provide some background information on expected storm rainfalls and estimated flood characteristics for different return periods (in the absence of any measured streamflow data for the total catchment area).

The authors of the Fraser report note that the alternative of using complex hydrological and hydraulic modelling approaches would have been excessively time consuming and expensive and would not significantly affect the conclusions. We generally concur with this opinion and very much doubt if a very complex modelling approach would have been justified for this study. However, given that the condition of the estuary mouth is a critical factor in the overall flood assessment, we believe that a somewhat more detailed assessment of the hydraulic conditions at the mouth would have been useful. We refer to this point in a little more detail later in this report.

## **2.2 Data used in the Fraser assessment**

Section 4 of the report refers to historical rainfalls and correctly (in our opinion) focusses on 2-day rainfalls. Our experience suggests that many large floods (excluding localised flash flooding, usually in urban areas) along the Southern Cape coast are likely a result of quite long duration rainfalls (2 to 3 days or more) associated with cut-off low systems. Therefore, the authors comments about the impact of antecedent moisture conditions and saturated catchment conditions are highly pertinent. Under these conditions flood events can not only have higher peaks, but also longer durations which might be very important for impacts of flooding in an estuary situation with restricted outflows at the mouth.

Arguably some of the most important data in the report are the surveyed flood debris levels in Table 5 and Drawing AF1101-03. The report suggests that the Island Village Main Gate level of 3.715m amsl appears to be an outlier, but the nearby Wally vd Walt Street level is close at 3.692m amsl. We would suggest that these elevated levels could be due to the effects of the causeway over the Perdespruit River, which will be less evident since the culverts have been increased in size as noted in section 7 of the original report.

The other data that is of vital importance is the condition of the mouth and the management of any artificial breaching. While the importance of this issues is covered in detail in the report there were some aspects that we think could have been explained, or examined, in a bit more detail. Most of these relate to the hydraulic conditions at the mouth. Table B4 refers to some previous literature about the mouth and the effects of different mouth opening strategies on upstream flooding. It would have been useful to have some further information about the mouth conditions and how these vary under natural conditions, as well as under managed conditions. For example, what is the height of the sand bar at the mouth under natural conditions and do large floods open the mouth naturally, and if so, at what level? If the mouth opens naturally during flooding, does this then scour an outflow channel that will reduce storage in the estuary? If the mouth is breached artificially, does the flow through the initial

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breaching channel then scour a larger channel, thus helping to reduce the volume of water in the estuary more quickly?

These details are discussed in the Garden Route National Park Management Plan 2020-2029. ( ? ) . The estuarine management plan Section 10.2.3.2 discusses artificial mouth breaching “as required”. The Swartvlei case the report sets the premature breaching of the estuary at 2 mamsl. There are however other conditions whereby the estuary can be breached at 1.8m if 50 mm of or more rain as measure at a recognised meteorological station and 1.6m from rainfall exceeding 100mm or more and 1.4 m if 150mm or more is received.

These interventions are intensions and will only be implemented if flood levels reach the prescribe levels and natural breaching of the estuary has not occurred. The authors do know if the necessary protocols in place and this is an active system to manage the Swartvlei Estuary.

### **2.3 Validity of conclusions and recommendations**

We are in agreement with the conclusions and recommendations made in the report are supported by the available information. We believe that the recommendations regarding minimum building levels are reasonable (and not excessively) conservative given the inherent uncertainties in the limited available data. One of the important conclusions is that the estimated flood levels and recommendations for minimum floor levels are independent of the early mouth breaching policy. While this suggests that the recommendations are expected to be very conservative with respect to current management policies, there is no guarantee that these policies will remain in place or will be implemented during all future floods. Some of the additional recommendations regarding the policies for Floodplain and River Corridor Management also appear to be appropriate to the proposed development, although these were not key issues that are addressed in this review.

Section 9 refers to ‘Development Possibilities’ and includes a recommendation to excavate stormwater detention ponds. While the excavated material may achieve the objective of raising the ground level of localised low areas, we seriously doubt if the limited amount of additional water storage volume in the ponds will have a significant impact on the extent of large floods, given the large volumes of water involved (see Table 2 in the original report).

### **2.4 Additional comments and suggestions**

Apart from the earlier comments about more information on the hydraulics of the estuary mouth under different conditions, we only have one other comment and that relates to the possibility of the impacts of future storm surges.

Recent evidence in South Africa and worldwide suggests that the frequency of sea storm surges is increasing and that they are getting more severe. For example, we understand that there have been three occasions this year when the N2 approaching Port Elizabeth from the north has been inundated and a large amount of material from the beached deposited on the road.

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We are not aware of many reports of this happening previously. There are also several other reports of high tide levels and damage that have occurred due to storm surges.

We are not aware of any data (or observations) from Sedgefield or other parts of the Southern Cape coast of the impact of recent storm surges, but believe that this is an issue that should not be ignored. Obviously, the greatest impact will be if a storm surge occurs simultaneously with a flood due to high rainfall in the catchment area of the estuary. We are not aware of the likelihood of these events. We recommend that climate change data be considered and further information on the possible effects of storm surges should be gathered from suitably qualified professionals. We assume that there are individuals or organisations within South Africa who have further information about, for example, the maximum expected sea water levels during storm surges.

### **3 CONCLUSIONS**

- The Fraser report used the most appropriate methodology to assess the flood risk for the proposed development of Erf 1627 Sedgefield. In our view complicated rainfall runoff modelling with closed estuary mouths are expensive and time consuming and only as accurate as the data available
- The proposed development is in a flood risk area and any proposed development must consider these risks
- The risk of flooding is likely to be highly variable in future to the climate change.

### **4 RECOMMENDATIONS**

The following recommendation are made for the proposed development

- Mitigations measures should be included into the proposed designs to eliminate the risk of flooding of any proposed development.
- These mitigation measures must be incorporate in the proposed development plan
- The mitigation measure must be appropriate to the risk and should eliminate the risk in terms of potential damage to infrastructure and ultimately human life. For example, flooding of pathways has a low risk in terms of damage when compared to a residential dwelling.
- The mitigation measure should be designed not to require active management. For example, pumping due to the dependability of pumping schemes during floods (electricity outages, flooding of pump houses).

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The proposed development plan will have to conform with statutory requirements in terms of the National Environmental Management and Water Acts.

## **References**

Fraser Consulting Engineers (2022) Flood Management Assessment for proposed Multiuse development on Erf 1627 Sedgefield and associated drawings

SANParks (2020) Garden Route National Parks Management Plan, SANParks Pretoria

Planning Space (2022) Proposed Subdivision of Erf 1627 Sedgefield