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## **VELD PV NORTH – HYDROLOGICAL ASSESSMENT REPORT REVIEW**

### **EXPERTISE OF PRIMARY AUTHOR**

Mr Mark Bollaert has over 12 years of experience working as consulting hydrologists in both the United Kingdom and South Africa, having completed a Master of Science (MSc) degree in Hydrology at the University of KwaZulu-Natal in 2007. Since then he has supplemented his tertiary education with professional qualifications which represent his on-going effort towards maintaining a professional approach and continuing in his professional development. These include qualifications from the UK (Chartered Scientist, Chartered Environmentalist and Chartered Water and Environmental Manager) and South Africa (Professional Natural Scientist in Water Resources). Mark's CV is presented at the end of this report.

### **DECLARATION OF INDEPENDENCE**

In terms of the requirement to be independent as per NEMA (2014) Appendix 6, Hydrologic Consulting and affiliated consultant Mr Mark Bollaert hereby declares that other than fair remuneration for the work undertaken, he has no business, financial, personal or other interest in the proposed activity or application and that there are no circumstances that may compromise his objectivity.

### **REPORT REVIEW**

The PDF with filename *Ann D9 Veld PV North Hydrology Impact Assessment Report - Hydrologic Review.pdf* forms the foundation of this review and should be considered along with this writeup.

In broad terms, the proposed development is located within a part of South Africa with low rainfall and high infiltration potential. This amounts to hydrologically insensitive site due to the combination of the natural hydrology (i.e. low rainfall, high infiltration) and the limited surface disturbance (specifically the limited addition of hardstanding areas and expected intention to retain as much of the natural landscape as possible). Consideration should nevertheless be given to the various review comments, with the primary findings outlined below:

- The title of the report refers to a storm water impact assessment whereas the title should instead refer to a hydrological assessment.
- An overview map of the proposed Namakwa 300 MW Combined Solar Technology Facility should be included to enable the reader to understand the project setting of the site being reviewed. This would assist comprehension at various points in the report.

- The report should include reference to its intended level of assessment (i.e. a basic assessment) and should ideally also include reference to the assessing authority (i.e. the DEA).
- Listed NEMA activities are not included in the report and while not necessary (given their expected inclusion by the EAP in the introduction to the basic assessment), they would assist the reader in understanding what is relevant with relation to the proposed development, from a NEMA perspective.
- Coordinates for the site of interest should ideally be placed in the text as this would aid in locating the site where needed.
- The inclusion of rivers in figures early in the report would assist in the understanding the hydrological context of the site as well as the understanding of the regional hydrology.
- At least one of the locality maps should be more 'zoomed' in to show detail about the site more clearly. This will require an additional map showing the 'original' north site given its absence from the report. Proposed linear infrastructure (i.e. roads and transmission lines) should also be more clearly illustrated with alternatives labelled as such (labels could tie in with labels later used in the impact assessment – e.g. 'A1', 'B2' etc.)
- The site layout map should include as much of the proposed infrastructure as possible with the addition of laydown areas, operations/maintenance buildings and internal roads.
- The report includes a reference to the Eskom loop in/out line however, this does not appear in any of the figures.
- The 'original' north site and 'new' north site including associated linear infrastructure are referred to at various points, however, it is unclear for a large part of the report whether both of these sites are being assessed.
- The hydrologist who undertook the site visit is not identified in the report. The relevance of this specialist to the report should be more clearly defined given the changeover in report ownership that is understood to have occurred.
- Flooding has not been considered in this report, however, it appears to be one of the core impact considerations. While flood-lines may not be necessary, an assessment of flood potential and recommended mitigation should be included.
- There are a lot of figures (specially photographs) in the report which make comprehension cumbersome at times. It is recommended that photograph locations either be presented on a locality map or that the number of photographs be reduced to aid more simple referencing of photographs in the text.
- The farms within which the sites are located are incorrectly the focus of the assessment at times which distracts the reader from what should be the focus (i.e. the site).
- Ephemeral rivers exist about the site and are referred to in various ways throughout the report. It is the recommendation that firstly, the word ephemeral is clearly defined to aid in comprehension (by the lay person) and secondly, that ephemeral rivers be more consistently used through the report given the confusion that results from using alternative descriptors.
- Only Watercourse 1 is referred to as an exclusion area in the report (although no buffer distances are provided). Watercourse 1 is, however, well outside of the site (North – original) and therefore doesn't have any relevance (unless linear infrastructure intersects it, which Figure 10 does not show).
- Rivers in Figure 10 are not the latest versions provided by the National Geo-spatial Information (NGI) which has a bearing on this study. The impact of this is significant since any buffers which utilise these rivers could be incorrect (once buffers are added to the report).
- Catchments (or subcatchments) relevant to the assessment are not included in any of the maps and should be to aid in understanding the hydrological setting.

- Relevant datasets which include a soils dataset (including site observations) and DEA land-cover dataset are not included in the report despite their significant influence on the hydrology of the site.
- A map which superimposes the hydrological setting of the site (i.e. rivers and catchments) with proposed infrastructure (including proposed linear infrastructure outside of the site boundary), should be included.
- A specialist study area is referred to in the map but is not defined in the text.
- A phrase used in the report is as follows – “*Existing road design and crossings are very simple with no drainage works. This has resulted in low impacts on drainage and flows and clearly has been successful. It is recommended that a similar design philosophy is followed in this project*”. This phrase is the motivation behind the management of road drainage (or lack thereof). This needs to be more clearly described with clearer reference to applicable photographs since essentially it concludes that no management is needed (which needs proper motivation).
- River buffers are not referred to in this report but are clearly required. An exclusion zone for the (irrelevant) Watercourse 1 is referred to as is placing pylons of the transmission lines outside of watercourse channels. These are cursory thoughts that suggest applicable buffering with none being proposed. Buffers are likely the most substantial part of the proposed impact mitigation and need to be more clearly defined and motivated. Additionally, all rivers (not just Watercourse 1) need to form part of the buffering of rivers associated with the site.
- The section of the report which deals with storm water (i.e. Section 3.4) is too high-level with hardly any actual storm water management proposed. Storm water management ties in with erosion control and will form part of the proposed mitigation in the impacts section. An assessment of storm water which includes subcatchments areas (for all subcatchments on site and draining to the site) and expected changes in hydrological conditions (such as increases in hardstanding and compaction) needs to be undertaken. This should be accompanied by a map which illustrates relevant catchment areas, rivers and infrastructure. The Aurecon Hotazel Report (Proj. No 112667) includes relevant details by Cook and McCuen, with regards to stormwater management associated with a PV development and should be considered.
- A methodology is needed at the start of the *Impacts Assessment and Mitigation Measures* section (Section 4) to inform the reader as to how impact significance has been calculated and how ratings have been assigned (e.g. a long term rating for Duration).
- The alternatives listed in Section 1.2 should be listed at the start of Section 4 to assist the reader in understanding the various impact tables.
- A map or series of maps should be referenced at various points in the impact assessment (i.e. applicable maps) which aid the readers understanding of the position of the infrastructure being referred to.
- In the case of the proposed roads (specially the access roads), a distinction is required as to what is upgraded road and what is new road.
- The linear infrastructure (i.e. access roads and transmission lines) needs to be included in the impact assessment and will likely need to refer to river crossings (which should be identified on an associated map).
- Impact tables are presently grouped according to alternatives with a single impact identified. Impact tables need to be split out to include additional impacts with three being of relevance (i.e. increased runoff (and associated erosion potential), water quality (from hydrocarbons and other pollution sources due to construction and maintenance) and flooding (from rivers)).
- Impact significance (and associated ratings) consider alternatives but only account for impacts pre or post mitigation (it is not clear which). Impact significance pre and post mitigation needs to be quantified.
- Cumulative impacts have not been reported (although there are likely none).

- Listed mitigation included is rudimentary and should be more comprehensive. An example of this is erosion control which can include construction methods, promoting infiltration, reducing the kinetic energy of runoff from the PV panels etc.
- The summary includes new information that is glossed over and not presented in preceding and relevant sections.
- A reasoned opinion as to whether the proposed activity should or should not be authorised has not been included.

## COMPLIANCE WITH DEA TERMS OF REFERENCE AND NEMA APPENDIX SIX

Table 1 presents the DEA specific terms of reference, while Table 2 presents comments as per the requirements of Appendix Six from NEMA (2014). These comments are not complete as some information is missing.

**TABLE 1: DEA SPECIFIC TERMS OF REFERENCE**

A CV clearly showing expertise of the peer reviewer;	<i>Included.</i>
Acceptability of the terms of reference;	<i>The terms of reference as they relate to the report were not clearly explained as illustrated by the absence of the purpose of the report (i.e. to inform a basic assessment).</i>
Is the methodology clearly explained and acceptable;	<i>No. There are significant gaps in the methodology including the absence of an assessment of flooding, the use of river buffers and the consideration of storm water management. See primary write-up for more detail</i>
Evaluate the validity of the findings (review data evidence);	<i>Most of the findings are acceptable. The primary concern, however, is for what should have been considered but wasn't. See primary write-up for more detail</i>
Discuss the suitability of the mitigation measures and recommendations;	<i>The mitigation measures are rudimentary and require significant revision if they are to be considered comprehensive. Absence of a methodology that outlines the way in which impacts have been assessed, means that the impact ratings and final impact significance cannot be assessed. See primary write-up for more detail</i>
Identify any shortcomings and mitigation measures to address the short comings;	<i>Mitigation measures need to be reworked according to specific impacts likely made up of increase in runoff, change in water quality and flooding. Impacts pre and post mitigation also need to be separated so they can be assessed. See primary write-up for more detail</i>
Evaluate the appropriateness of the reference literature;	<i>References included are appropriate although there is at least one instance of a reference in the text not being included in the References Section (at the end of the report).</i>
Indicate whether a site-inspection was carried out as part of the peer review (site visit not mandatory); and	<i>No site-inspection was carried out as part of the peer review.</i>
Indicate whether the article is well-written and easy to understand.	<i>The report was well written but would benefit from addressing review comments as well as structural changes and a read through to improve the flow.</i>

**TABLE 2: APPENDIX SIX (NEMA, 2014) - SPECIALIST REPORTS**

<b>A specialist report prepared in terms of Regulation GNR 982 Appendix 6, must contain:</b>		
(a)	details of-	
(i)	the specialist who prepared the report; and	<i>Indicated on document control record</i>
(ii)	the expertise of that specialist to compile a specialist report including a curriculum vitae	<i>Indicated in Appendix A</i>
(b)	a declaration that the specialist is independent in a form as may be specified by the competent authority	<i>Not provided</i>
(c)	an indication of the scope of, and the purpose for which, the report was prepared	<i>Partially indicated in the Introduction but missing reference to the Basic Assessment</i>
(d)	the date and season of the site investigation and the relevance of the season to the outcome of the assessment	<i>Specified in Section 1.3.2 Season is not included – although outcome of investigation is independent to season.</i>
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process	<i>Missing with regards to flooding, storm water management, river buffers and impact methodology. See primary write-up for more detail.</i>
(f)	the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	<i>Partially accounted for but missing specific impacts (i.e. runoff, water quality and flooding). Impact pre or post mitigation is not clearly defined so an assessment of mitigation significance is not possible. See primary write-up for more detail.</i>
(g)	an identification of any areas to be avoided, including buffers	<i>Not included beyond a cursory comment related to the aquatic ecologist buffers. See primary write-up for more detail.</i>
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	<i>Limited in most instances with only aquatic ecologist buffers included (i.e. buffers confirmed as suitable by the specialist for this report have not been included). See primary write-up for more detail.</i>
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge	<i>Partially described, however, the absence of relevant data and deliverables identified in this review has not been acknowledged. See primary write-up for more detail.</i>
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment	<i>This has been undertaken (including alternatives), however, the impact assessment has shortcomings. See primary write-up for more detail.</i>
(k)	any mitigation measures for inclusion in the EMPr	<i>Included, but rudimentary in most instances and lacking in the division between impacts (i.e. runoff, water quality and flooding). See primary write-up for more detail.</i>
(l)	any conditions for inclusion in the environmental authorisation	<i>None included.</i>
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	<i>None included.</i>
(n)	a reasoned opinion-	
(i)	as to whether the proposed activity or portions thereof should be authorised	<i>Not included.</i>
(ii)	if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	<i>Not applicable since no opinion provided.</i>

(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report	<i>Unknown</i>
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto	<i>Unknown</i>
(q)	any other information requested by the competent authority	<i>Unknown</i>

Mark Bollaert  
MSc, PrSciNat, CSci, CEnv, C.WEM  
(Reviewer)

**Mark Bollaert****Curriculum Vitae**

Hydrologist

Hydrologic Consulting

**Qualifications**

Pr.Sci.Nat	2012	Professional Natural Scientist - Water Resources (Reg. 400115/12)
C.WEM	2011	Chartered Water and Environmental Manager (Reg. 36849)
CEnv	2011	Chartered Environmentalist (Reg.6623)
CSci	2011	Chartered Scientist (Reg. WEM/105/000508)
MSc	2007	Hydrology, University of KwaZulu-Natal
BSc (Honours)	2003	Hydrology, University of KwaZulu-Natal
BSc	2002	Hydrology and Geography, University of Natal

**Key Areas of Expertise**

Mark's key areas of expertise are summarised below.

Catchment Modelling	Modelling of hydrological catchments for the purposes of defining average and low-flow conditions, as well as the impact of land use change
GIS	Application of project-oriented GIS for the purposes of mapping and modelling as well as provision of technical GIS support
Flood Hydrology	Catchment delineation, flood peak and hydrograph estimates, using a variety of techniques
Hydraulic (Flood) Modelling	Development and review of 1D, 2D and 1D/2D hydraulic models for fluvial, tidal and storm water investigations, including flood-line delineation
Integrated Catchment Management	Assessment of the individual and cumulative impacts of mining operations on water resources.
Reserve Determination	Calculation of environmental flow requirements to assess potential utilisation of streamflow
Storm Water Management	Storm water management plans designed as per requirements of GN 704 and IFC guidance (where applicable)
Surface Water Impact Assessments	Reporting on surface water impacts, constraints and opportunities as part of Environmental Impact Assessments (EIAs)
Water Balances	Development and evaluation of dynamic and static mine wide water balances
Water Quality Monitoring	Surface and groundwater monitoring as per authorised or investigative monitoring programs including sampling, analysis and interpretation
Water Sensitive Urban Design	Conceptual design and layout of sustainable drainage systems in order to enable a low impact development, mimicking the natural hydrological regime.
Water Use Licencing	Water use license applications (WULAs) according to DWS standards

## Summary of Experience

Mark has over 12 years of experience working as a hydrologist in both the United Kingdom and South Africa during which time he has completed hydrological studies within the residential, industrial, commercial, mining, power, transport and government sectors. Mark began his professional career in London, following the completion of a Master of Science degree in hydrology at the University of KwaZulu-Natal. During his three years in London, he primarily worked on flood modelling (1D and 2D), flood risk assessments, storm water management plans, water-sensitive urban design and surface water impact assessments. Upon his return to South Africa, Mark joined the environmental engineering consulting company Metago (now SLR) for two years where he continued in his professional development. From July 2012, Mark founded Hydrologic Consulting where his responsibilities include the application of his skills as a hydrologist to projects primarily within South Africa, but also including Botswana, Ethiopia, Democratic Republic of Congo, Mozambique, Papua New Guinea, Suriname, Tanzania and Zimbabwe.

## Recent Project Experience

Some of Mark's more recent project experience is summarised below and includes a combination of roles as presented in the key areas of expertise.

Client	Project	Country	Year
City of Cape Town	Detailed Stormwater Master Plan and River Corridor Plan for the Elsieskraal River Catchment.	South Africa	On-going
Anglo American Platinum	Mogalakwena Complex Flood Study	South Africa	2019
KZN Department of Public Works	Rietvlei Hospital Hydrological Assessment	South Africa	2019
Wildschutskraal Farm	Tierhoek Dams Environmental Water Requirement	South Africa	2019
WWF South Africa	Collation of Hydrological Information for Catchment H10B (Titus River)	South Africa	2018
Kumba Iron Ore	Sishen Plant 1D/2D Surface Water Flooding Assessment	South Africa	2018
	Sishen Airport Surface Water Flooding Assessment		2017
	Sishen Opencast Pit Flooding Assessment		2017
ACWA Power SolarReserve	Redstone PV Hydrological Impact Assessment	South Africa	2018
Marataba Section of the Marakele National Park	Marataba Hydrological Impact Assessment	South Africa	2018
Electricidade de Moçambique	Temane Gas Power Plant Hydrological and Hydrogeological Assessment	Mozambique	2018
Anglo American	Limpopo Water Resources Mapping	South Africa	2017
Aurecon	Hotazel Solar Park Surface Water Specialist Report Review	South Africa	2017
Anglo American	Unki Mine Rainfall Assessment	Zimbabwe	2017
Paddock Farmers Association	Assorted farm dam modelling (water supply/environmental water requirements)	South Africa	2017
Water Research Commission	Regional Water Sensitive Urban Design Scenario Planning for Cape Town	South Africa	2016
Gestamp Wind	Copperton Wind Farm Hydrological Assessment and Flood Study	South Africa	2016
Circum Minerals	Sustainable Water Resource Options for the Danakil Project	Ethiopia	2016