water & forestry

Department:
Water Affairs & Forestry
REPUBLIC OF SOUTH AFRICA

SUPPLEMENTARY WATER USE INFORMATION
Section 21(c) and (i) Water Uses
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

Please read:

(1) The requirements of this form should be discussed with the relevant Regional Office and Primary Responsible Official for these water uses during a pre-application consultation meeting and documented agreement reached in terms of:
   (a) Assistance and information to be supplied by the Department (e.g. procedures (refer items 1.2.3 and 1.2.4), management objectives etc.) - this is of particular reference to emerging water users that are not in a position to provide the information as required in this form; and
   (b) The scale and level of detail required.

(2) Should any of the supporting documentation to the licence application (e.g. Technical Report, Environmental Impact Assessment Report, Environmental Management Plan or Programme) already contain the requested information below, the applicant is not required to duplicate the information. In such instances, a comprehensive list of these documents must be compiled and this form must be completed by referring to the relevant sections in the supporting documentation.

(3) All maps, Google images, drawings and plans must be at an appropriate detailed scale and have sufficient annotations (North arrow, line scale, legend, co-ordinates, etc.) and must be recent (at least 6 months) representations.

(4) All supporting documentation and reports must be final documents signed off by both the applicant and the compiler of the report.

(5) Information requirements in respect of Section 27 of the National Water Act, 1998 (Act No. 36 of 1998)[NWA] that have to be considered in the issuing of a licence, are appropriately incorporated and indicated in this form (e.g. item 2.2.3 <Provide information to support efficient and beneficial use of water in the public interest [refer Section 27(1)(c)]>).

(6) This form may be updated from time to time as required to comply with best practice and legal requirements. When completing this form, clearly date it since it will be evaluated against the information requirements related to the edition of the form at that time.

1. Watercourse Attributes

1.1 *Locality*

1.1.1. <Provide a description of the location of the watercourse at which the water use/s is to take place>

The watercourse at which the water uses is to take place is located in approximately 12 km south east of Emalahleni (refer to attached **Appendix A** for locality map), Mpumalanga Province, within on Portion 0 of the farm Duvha Kragstasie 337 as indicated in water use table (refer to Error! Reference source not found.).

1.1.2. <Provide a locality map/s indicating the relevant catchment[1], surrounding land use, towns, infrastructure etc.>

Refer to attached **Appendix A** for the locality, quaternary catchment and land use maps.

1.1.3. <Provide the catchment reference number>

The project is located in the B11G quaternary catchments. See **Appendix A** for Catchment map.

[1] The order of the catchment is to be verified with the relevant Regional Office and Primary Responsible Official

1. Watercourse Attributes

1.2 Description

1.2.1. <Provide the name and/or description of the affected watercourse>

Wetlands associated with the unnamed or "unknown" tributaries of Olifants River and associated wetlands (Refer to attached **Appendix B** for the map indicated the affected watercourse). All surface water within the study area drains toward the Olifants River.

The hydrogeomorphic forms of the wetland units that were surveyed for Duvha Power Station are shown in **Table 1** below.

Table 1: The hydrogeomorphic forms of the wetland units that were surveyed for Duvha PS.

Wetland unit	Wetland HGM unit	Connected to watercourse
A	Depression pans	Yes, but only under exceptional circumstances
B	Channelled valley bottom	Yes
C	Hillslope seep zone	Yes
D	Channelled valley bottom	Yes
E	Hillslope seep zone	Yes
F	Channelled valley bottom	Yes
G	Hillslope seep zone	No

1.2.2. <Provide a map with accompanying photographs (dated) indicating the segment and affected reach/es of the watercourse in which the water use/s is to take place and which indicates/delineates the regulated area[2] including:

1.2.2.1. The extent of the riparian habitat; and

Refer to attached **Appendix B** for the delineated affected water reaches of the watercourse and the associated photographs.

1.2.2.2. The 1:100 year flood line>>

The flood line determination and assessment was not conducted, however a 100m buffer has been included on the Master Plan (**Appendix C**).

1.2.3. <Describe within context of the immediate catchment and segment, the historic as well as current state (Present Ecological State or PES) of the affected reach/es of the watercourse with regards to the following characteristics (attributes)[3]:

1.2.3.1. Flow and sediment regimes (quantity, pattern, timing, water level and assurance of in stream flow);

[2] The applicant will require a water use authorisation from the Department for any activity within the *regulated area* which is the outer edge of the riparian habitat or 1:100 year flood line, whichever is the greatest distance from the watercourse. The outer edge of the watercourse must be delineated using the Departmental guideline, *A Practical Field Procedure for Identification and Delineation of Wetlands and Riparian Areas* or *Field method for the delineation of Riparian Zones for South African Rivers*

[3] Refer to the WRC Reports on Ecoclassification, specifically Report no TT 329/08 on determining EcoStatus

1. Watercourse Attributes	
	There are limited defined channels and watercourses associated with the study area, but the region is rich in endorheic (a pan wetland with no outlet) and exorheic (a pan wetland with external drainage) pan-type wetlands (EnviRoss, 2017). The water volume is supplemented through receipt of a waterborne effluent discharge from the Duvha Power Station. Therefore the predominant means of water leaving the depression is through soil percolation or evaporation, with evaporation being the dominant mechanism, and, to a lesser extent, passive overflow into adjacent local catchment areas. As water evaporates the dissolved salts remain, and therefore it would be expected that these pan-type wetlands have a relatively high salt content (as reflected in the electro-conductivity (EC) value. The Olifants River being the main river in the catchment drains northwards and then eastwards through the Kruger National Park and eventually through Mozambique to ultimately drain into the Indian Ocean. The Olifants River is a well-established and permanent river, with flow volumes and hydraulic regimes governed by the flows from the Tweefonteinspruit and the Noupoort rivers. *1.2.3.2. Water quality (including the physical, chemical and biological characteristics of the water) in relation to the flow regime* Water quality plays an integral role in determining the overall integrity of the wetland system as it would be a definitive limiting factor to the biodiversity that could potentially inhabit the system. The water quality in Upper Olifants sub-area is under threat from the coal mines. The management of mine water decant volumes is being addressed by the mining industry with a number of projects addressing treatment and irrigation management options (Golder, 2011). The water quality results for most of the samples surrounding Duvha Power Station indicate poor water quality (Lefastshe Minerals and Consulting (LMC), 2016). The results suggest most of contamination is from the Ash Disposal Facility (ADF) as most of the samples are located downstream of the ADF. However, when compared to the SANS limits the effluent sample (PE01), Witbank dam (AP08), seepage north of LAWRD near R03 (AS04) and storm water canal (AC02) are the only sample which indicate parameters which fall well within the SANS limits (LMC, 2016). The influence of the tributaries causes significant water quality deterioration in the Upper Olifants River. However regular routine in-stream water quality monitoring of the Upper Olifants River is required to monitor and better

understand the situation.

Water quality is a function of the surrounding land use. Many of the wetland units surround the ash dam facility and water reticulation ponds and systems associated with the power station functions. Water seepage from the ash dam generally is high in salts and other toxicants. Agriculture within the local catchment means that runoff water that enters into the wetlands will be high in nutrients and toxicants (from agro-chemicals) and sediments that will increase the turbidity of the water. Overall, however, the wetland units were seen to be largely functional and no wetland units were singled out as particularly problematic. This is largely due to the wetland units themselves being self-regulating and remaining relatively undisturbed. This is largely due to vegetation units that are generally healthy.

Water temperature plays an integral role in biochemical processes and therefore governs the rate of associated metabolic processes of poikilothermic ("cold-blooded") aquatic organisms (EnviRoss, 2017). The water temperatures recorded by EnviRoss (2017) at the time of sampling (in 2016) was 16.48°C.

1.2.3.3. Riparian and In stream Habitat

1.2.3.3.1. Morphology (physical structure)

The threat level to the habitat unit is relatively high (scored 3 out of 4), which is due to the imposing land use of the catchment area and the potential for contamination from effluent of poor quality. Some impoundments along the watercourse, although minor, have also impacted the hydrological and geomorphological characteristics of the unchanelled valley bottom wetland unit.

1.2.3.3.2. Vegetation

The wetland units within the region incorporate an azonal vegetation unit of the Freshwater Wetlands biome, namely Eastern Temperate Freshwater Wetlands, which is conservationally regarded as a Least Threatened unit due to limited transformation having occurred. The surrounding region is dominated by the Grassland biome, Mesic Highveld Grasslands bioregion and the vegetation unit is Eastern Highveld Grasslands. This vegetation unit is regarded as an Endangered vegetation unit through largescale transformation for farming, mining and dam construction as well as limited conservation within formally protected areas (SANBI, 2006). Vegetation structures are generally good, although cattle activity and grazing within the wetland units have influenced the overall integrity of this feature.

1.2.3.4. Biota>

1. Watercourse Attributes	
	Soils Hydromorphic soils and associated iron mottling were observed within some areas that are seasonally saturated with water (inundated) and therefore become anaerobic for varying degrees of prolonged periods of the year (EnviRoss, 2017). Under such conditions, the iron within the soil is leached out, but cannot undergo reduction due to the lack of oxygen. The iron undergoes reduction to iron oxide during periods when the water table recedes and oxygen is able to penetrate the soil. This remains localised and tends to be visible in the form of reddish mottles within the soil profile. The wetland soils observed within the study area were generally melanic (black) and clay rich with a very low percolation rate. These soil types do not readily show the mottling effects of ferrolysis. **Vegetation and Flora** **Eastern Highveld Grassland** This vegetation type occurs on slightly to moderately undulating planes, including some low hills and pan depressions. The vegetation is a short dense grass land dominated by the usual highveld grass composition (Arsitida, Digitaria, Erafrostsis, Themeda, Tristachya etc.) with small scattered rocky outcrops with, wiry sour grasses and some woody species. Some 44% transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams. No serious alien invasions are reported. **Rand Highveld Grassland** The vegetation type occurs on a highly variable landscape with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper slopes. There is a high diversity of herbs. Rocky hills and ridges carry sparse (savannoid) woodlands accompanied by a rich suite of shrubs. Poorly conserved, only small patches protected. Almost half has been transformed mostly by cultivation, plantations, urbanisation or dam-building. **Eastern Temperate Freshwater Wetlands Vegetation** This vegetation type occurs on flat landscapes or shallow depressions filled with water bodies supporting zoned system of aquatic and hygrophilous vegetation of temporary flooded grasslands. Eastern Temperate Freshwater Wetlands are regarded as a Least Threatened unit due to limited transformation having occurred. (EnviRoss, 2017). **Fauna** During the biomonitoring sampling conducted, no fish species were observed in the habitat. Various species of birdlife were observed to use the wetlands for breeding and foraging though no Red Data Listed species were noted. Aquatic macro- and micro-invertebrates were sampled**.** All of these observed species are regarded as having a medium tolerance to

1. Watercourse Attributes	
	poor water quality. Again, these results were similar to those gained during the previous survey, indicating the overall ecological integrity of the wetland unit has not significantly degraded since the initial survey. As a result, no further aquatic biodiversity monitoring has been recommended by the specialist. The following bird species are likely to utilise the wetlands (Ansara, 2004): • Greater and Lesser Flamingo; • African march Harrier; and • African Grass-owl.
	1.2.4. <Describe the ecological importance and sensitivity (EIS)[4] as well as the Socio-cultural Importance (SI)[5] of the affected reach/es of the watercourse including the functions[6]> The Upper Olifants Catchment (B1) is extremely used and impacted due intensive coal mining and associated energy and manufacturing economy (Golder, 2011). The study area falls within the Olifants North (B) Primary Catchment, within the Highveld aquatic ecoregion in the upper Olifants Water Management Area (WMA) - WMA B1. The area falls within B11G quaternary catchment. The main watercourses draining the quaternary catchment are Tweefonteinspruit and the Noupoort River that drain toward the Olifants (North) River, with Witbank Dam having been constructed at the confluence of these three rivers within the WMA. All of the major rivers within the region are shown to have a largely modified state *i.e.* Present Ecological State (PES) – D (EnviRoss, 2017). The wetlands in the area are viewed as a moderate to high ecological service level, which, as per the definition, is regarded as Wetlands that are considered to be ecologically important and sensitive (EnviRoss, 2017). The biodiversity of these wetlands may be sensitive to flow and habitat modifications. These wetlands play a role in moderating the quantity and quality of water of major rivers. The threat level to the habitat unit is relatively high (scored 3 out of 4), which is due to the imposing land use of the catchment area and the potential for contamination from effluent of poor quality. The levels of opportunity, which could be interpreted as the degree to which the wetland habitat units could perform these services, also scored at 3 out of 4, which show that the wetland functionality could be enhanced to better perform ecological functions through management intervention and the

[4] The EIS of a watercourse is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. Ecological sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred. Both biotic and abiotic components of the system are taken into account.
[5] SI reflects the dependency of people on a healthy functioning watercourse and also to its cultural and tourism potential.
[6] Refer to the RDM procedure for determining Ecological Importance and Sensitivity

1. Watercourse Attributes	
	implementation of an appropriate rehabilitation plan.
	1.2.5. <Discuss existing land and water use impacts (and threats) on the characteristics of the watercourse> The local catchment pertaining to the wetland is generally surrounded by impacting features, from the Duvha power station, runoff water contamination and effluents, farming, infrastructure development, exotic vegetation and inhabitation. All of these impacts have a cumulative impact on the overall ecological integrity of the wetland unit. Land use in the Olifants WMA is diverse, consisting of irrigated and dryland cultivation and unimproved grazing, mining, industry, forestry and urban and rural settlement.
	1.2.6. <List and map sensitive environments in proximity of the project locality - sensitive environments include wetlands, nature reserves, protected areas, etc.> Refer to the attached **Appendix A** for the following maps: • Quaternary catchment map; • Study area in relation to the Mpumalanga Biodiversity Sector Plan; and • C-Plan aquatic biodiversity sub-catchments category map. Refer to **Appendix B** for the map showing the affected watercourse reaches.

2. Water Use Information

2.1 Description and Methodology

2.1.1. <Describe the activities associated with the water use/s>

The water uses associated with the Integrated Water Use Licence Application (IWULA) for Duvha Power Station are described in **Table 2** below.

Table 2: Water uses

Water Use	Description	Applicable Water Uses to this project
S21 (a)	Taking of water from a water resource.	Taking water from Driefontein Dam (3 650 000 m^3/annum (10 000 m^3/day)). Eskom currently has excess water and as a result, they are not taking water from the Driefontein dam but they are required as per existing Water Use Licence (WUL) condition to undertake monitoring at Driefontein dam. An amendment is therefore, required in terms of the monitoring frequency. **Eskom Duvha Power Station proposes that monitoring by Eskom at Driefontein dam only be undertaken during the period when Eskom have taken water from Driefontein dam** - Amendment
S21 (c)	Impeding or diverting the flow of water in a water course.	Power station and the associated existing infrastructures including - New Application: • Power Station • ADF; • Coal Stockyard; • Low level AWRD including silt traps; • High level dams; • Station drains; and
S21 (i)	Altering the bed, banks, course, or characteristics of a watercourse. This includes altering the course of a watercourse (previously referred to as a river diversion).	

		• Sewage plant.
S21 (g)	Disposing of waste in a manner which may impact on a water resource.	The WUL authorised the disposal of 10 000 m^3/day water containing waste from the Driefontein dam into the AWRD. Eskom proposes the amendment of the above to the following: **"disposal of water containing waste from the Driefontein dam into the ash disposal facility"** – Amendment.
		Coal Stock Yard - New Application.
		Dust suppression on Coal Stock Yard with dirty water from Cooling water.
		Dust suppression on ADF with dirty water from Low Level AWRD.
		Low level AWRD including silt traps;
		High level dams;
		Station drains;
		Maturation ponds

2.2

2.2.1. <Describe the project phases for each activity (i.e. planning, construction, operation and maintenance, decommissioning) including, but not limited to, the programme for and duration of the various phases

Pre-Construction and Construction Phase

No construction is envisaged on this proposed application.

Operational and Maintenance Phase

Eskom will continue with their operational activities related to power generation within the Duvha Power Station. Maintenance activities are specialised and are, therefore, carried out by Eskom employees and/or designated subcontractors.

Duvha Power Station is anticipated to be operational until 2044.

Decommissioning Phase

The following are assumed:

- The physical removal of the Duvha Power Station and the associated infrastructures would entail the reversal of the construction process.
- A rehabilitation programme would need to be agreed upon with the landowners (adjacent, if applicable) before being implemented.
- Materials generated by the decommissioning process will be disposed of according to the Waste Hierarchy i.e. wherever feasible materials will be reused, then recycled and lastly disposed of. Materials will be disposed of in a suitable manner, in a suitably licensed facility. All of the aforementioned decommissioning activities would be subject to a separate Environmental Impact Assessment (EIA) and Environmental Authorisation at the appropriate time.

2.2.2. <Provide a site lay-out plan/s (master plan) indicating the various activities and existing and proposed infrastructure in relation to the 1:100 flood line and edge of the watercourse, etc. – a letter or certificate by a qualified surveyor must also be submitted that verifies the correctness of the site lay-out plans, in particular for wetlands>

Refer to the attached **Appendix C** for the master plan.

2.2.3. <Provide work method statements for the various water use activities>

No construction is envisaged on this proposed application.

2.2.4. <Provide engineer design drawing(s) for construction activities within the watercourse>

Refer to the attached **Appendix D** for the existing Design Drawings.

2.2.5. <Provide a description and a map/s indicating any Storm Water Management Practices (SWMPs) specifically addressing 'end of pipe' practices>

Stormwater at Duvha Power Station is managed through the Power Station Terrace, Coal stockyard and associated infrastructure; and ADF and associated infrastructure (Zitholele, 2017). Water areas within the terrace are confirmed to be contaminated; however, this water is managed accordingly. The concrete lined perimeter drains around the facility intercept runoff generated in this area and transfer it to the stations the station drains located on the north-eastern side of the coal stock yard. The station drains overflow gravitates to the Low Level Dam. Runoff from the side slops of the facility are intercepted by bench drains which eventually drain to the toe perimeter drains (Zitholele, 2017). The Low Level Dam is located at the lowest point of the power station operations and essentially turns out to be the ultimate interception of dirty water runoff from the power station. The Low Level Dam operates in tandem with the High Level Dam by pumping water to it when it reaches its maximum storage level. Overflow from the High Level Dam discharges to a concrete lined channel draining to the Low Level Dam and innately forms a closed circuit with it (Zitholele, 2017).

Duvha Power Station has an effective stormwater management system is place and with proper operations and maintenance of it will ensure environmental compliance.

2.2.6. <Provide information on all existing lawful water uses [refer Section 27(1)(a)]>

The proposed amendment of, and licensing of new, existing water uses is, being undertaken to ensure that the existing WUL is a true reflection of the current state of the Power Station. Water uses considered in this IWULA and Integrated Waste and Water Management Plan (IWWMP) that requires amendment and licensing at Duvha Power Station are included in **Table 2** and **Appendix E** of this form.

2.2.7. <Provide information on investments already made and to be made by the water user in respect of the proposed water use/s [refer Section 27(1)(h)]>

The water uses infrastructures at Duvha Power Station are existing. Eskom will therefore, not significantly invest in terms of the water use infrastructures for the station. However, Eskom has invested to the amendment and licensing of water uses by initiating the gap analysis, water balance update and stormwater management plants update.

To date, the water user has invested in the following manner:

- WUL gap analysis including specialist studies and water balance compilation; and

	• Tendering and appointment processes for undertaking this application process including the Public Participation process and compilation of stormwater management plan. Investments will also be made in terms of human resources development through training, skills development and capacity building.
	2.2.8. <Indicate and motivate the probable duration of any undertaking for which the water use/s should be authorised [refer Section 27(1)(k)]> The total operation or lifespan of the Duvha Power Station is estimated to be until 2044. However, the lifespan of Duvha Power Station may be extended or decommissioning of the power station may require authorisations to be in place. It is therefore, recommended that the water use be authorised for the maximum period as allowed for in the NWA S.28 (1)(e), namely; 40 years and be subjected to a review every 5 years.
2.3 Motivation	*2.3.1. <Provide information on the need/intention/objective of the water use/s>* The proposed amendment and licensing of existing water uses is required to reflect the actual water uses taking place at the Duvha Power Station. This project is needed to continue ensuring compliance with the NWA while generating electricity, which has been declared by the National Water Resource Strategy (NWRS) as a strategic water use. In addition, this will also ensure use of water in an environmentally responsible and sustainable manner, promoting the water conservation and management in the Power Station water use activities.
	2.3.2. <Provide information on contributions to rectify the results of past racial and gender discrimination[7] [refer Section 27(1)(b)[8]]> Eskom have issued an Integrated Report for 2016 (Eskom, 2016b). This report explains in detail how much Eskom have invested into transformation and social responsibility. Refer to **Appendix F** for a 4-page extract from the report, focussing specifically on this aspect.
	2.3.3. <Provide information to support efficient and beneficial use of water in the public interest [refer Section 27(1)(c)]> The NWRS has declared the generation of electricity to be of strategic importance. This project is aimed at the efficient use of water for the good of the country from a social, economic and environmental perspective.
	2.3.4. <Provide information on relevant catchment management strategies[9] and local government planning frameworks that support the proposed water use [refer Section 27(1)(e)]>

[7] Refer to the DWAF *Broad-Based Black Economic Empowerment (BBBEE) Guidelines For Water Allocation, Final Draft, June 2007* and the Department of Trade and Industry's requirements relating to compliance with the BBBEE Act, 2003 (Act No. 53 of 2003)
[8] The applicant must provide information on how he/she implements the seven elements of BBBEE (i.e. Ownership, Management, Employment equity, Skills development, Procurement, Enterprise development, Socio-economic development) and how this complies with the relevant Sector Charter and score card (e.g. Construction, Agriculture, Mining, Tourism etc). A BBBEE certificate or external verification must accompany the application (refer list of Verification Agents on the Department of Trade and Industry's website)
[9] Consult the relevant Regional Office and Primary Responsible Official

	The Olifants Catchment Management Agency has been established in July 2014 but to date no strategy has been developed.
	2.3.5. <Provide information on the strategic importance of the water use to be authorised [refer Section 27(1)(i)]> The proposed amendment and licensing of existing water uses is required to reflect the actual water uses taking place at the Duvha Power Station. This project is needed to continue ensuring compliance with the NWA while generating electricity, which has been declared by the NWRS as a strategic water use. In addition, this will also ensure use of water in an environmentally responsible and sustainable manner, promoting the water conservation and management in the Power Station water use activities.

3. Impact Assessment and Management	
3.1 Impact Prediction and Assessment	*3.1.1. <Provide a prediction and assessment of the likely environmental and socio-economic impacts or effects[10] associated with the water use/s for the different project phases:* *3.1.1.1. On the watercourse and its characteristics as set out in 1.2.3 above [refer Section 27(1)(f)]* No new activities or construction is included in this IWULA for Duvha Power Station. As a result, there was no EIA process undertaken in terms of the EIA regulations, 2014 for this proposed project as well as the EIA and Socio-economic impacts ratings. Therefore, this IWULA will focus mainly on the management measures for the operational activities related to the existing water uses to be amended and licensed. The potential project impacts due to Duvha Power Station operational activities are identified and summarised in **Table 3** below. This IWULA only focused on the water-related impacts. **Table 3: Summary of the possible impacts related to the operational activities at Duvha Power Station**

PROJECT PHASE	ACTIVITY	POSSIBLE IMPACTS
Operational Phase	Routine cleaning, repair and maintenance of infrastructure	• Soil compaction and increased erosion. • Increase in hydrocarbon concentrations.
	Daily operational activities (including operations of the water treatment plant, coal stockyard, ash dams, emergency pan, service roads, etc..) at Duvha Power Station	• Modification of biota's and animal 's habitats • Dust generation • Deterioration of water quality • Change in water flow regime

[10] Assess the potential impacts with regard to their nature, extent, magnitude, duration, probability and significance – each impact must be described in terms of source of impact, pathway (propagation of impact) and receptor (target that experience the risk or impact)

3.	Impact Assessment and Management
	3.1.1.2. On other water users [refer Section 27(1)(f)] *Refer to section 3.1.1.1 above.* *3.1.1.3. On the broader public and property* The NWRS has declared the generation of electricity to be of strategic importance. This project is aimed at the efficient use of water for the good of the country from a social, economic and environmental perspective. Refer to section 3.1.1.1 above for further details. *3.1.1.4. If the water use/s is not authorised [refer Section 27(1)(d)]>* Duvha Power Station and the associated infrastructures related to this proposed amendment and licensing of new existing water uses are existing. No construction is envisaged on this proposed application. Therefore, the current impacts resulting from Duvha Power Station activities will remain the same. However, granting authorisation on this application will lead to enhanced use of water at the Power Station through necessary monitoring and implementation of the water related management measures in ensuring compliance with the WUL. This will in the long run, improve the condition of water in the surrounding areas through the said water monitoring and implementation of water related management measures. Formal economic activity in the WMA is highly diverse and is characterised by commercial and subsistence agriculture (both irrigated and rain fed), diverse mining activities, manufacturing, commerce and tourism. Large coal deposits are found in the Emalahleni and Middelburg areas (Upper Olifants). The WMA is home to several existing large thermal power stations, which provide energy to large portions of the country. The development of the Olifants WMA economy is to a large extent, dependent upon the agricultural and mining sectors. South Africa's National Development Plan identifies South Africa's mineral wealth as a key driver of economic development and also identifies the Agriculture sector as the key sector for developing an inclusive rural economy. Both these sectors, and their respective value chains, are dependent on water as an input to production. Economic production activities use water as an input to their production processes. Production outputs are the gross income or turnover of each user activity. The Agriculture, Mining, Electricity and Water, and other sectors are all significant value adding sectors, with significant multiplier effects into the rest of the economy. The Gross Domestic Product (GDP) of economic sectors directly dependent upon WULs in the Olifants Water Use Area (WUA)

in 2010 was R72 billion. This was 55% of the WUA GDP. Thus, more than 50% of the GDP produced in the Olifants WUA are dependent upon WUL.

The water balance for the Olifants River catchment as a whole indicates a small surplus in 2010, but a deficit from 2016. The future demand for water by mining and rural communities precipitated the De Hoop Dam development. However, even the additional yield provided by the De Hoop Dam and the raised Flag Boshielo Dam, will not be sufficient to supply future demand.

3.1.2. <Provide a description of the methodologies employed to undertake impact prediction and assessment as well as a motivation for these>

WET-Ecoservices was used to assess the goods and services that individual wetlands provide (EnviRoss, 2017). This is taken as a combination of both ecological services and provision of services and resources to users. Through a series of scoring matrices for 15 different goods and service characteristics of a particular wetland, a rating score (out of 4) is provided. This is then compared to the class categories presented in **Table 4**. This sensitivity categorisation is based on strategic ecological functionality classes typical of present environmental scoring systems (EnviRoss, 2017).

Table 4: Recommended ecological importance and sensitivity categories (*adapted from* Kotze *et al.*, 2009). Interpretation of the median values and categories is also provided (EnviRoss, 2017).

Ecological Importance and Sensitivity Category (EIS)	Range of Median	Recommended Ecological Management Class
Very high Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	>3 and ≤4	A
High Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	>2 and ≤3	B
Moderate Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	>1 and ≤2	C

Low/marginal Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	>0 and ≤1	D

3.2 Risk Assessment

3.2.1. <Provide an assessment of the risks associated with the water use/s and related activities>

After application of the methods in WET-Ecoservices, the wetlands averaged out at between 1.3 and 2.0 out of a possible 4 (**Table 5**). This is viewed as a moderate to high ecological service level, which, as per the definition, is regarded as Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers. The threat level to the habitat unit is relatively high (scored 3 out of 4), which is due to the imposing land use of the catchment area and the potential for contamination from effluent of poor quality.

Table 5: The results of the WET-Ecoservices methodologies.

Wetland functional feature/service	Wetland survey units				
	B	D	E	F	G
Flood attenuation	2.0	1.9	1.9	1.4	1.7
Streamflow regulation	2.5	2.5	2.5	1.5	0.7
Sediment trapping	2.3	2.3	2.3	1.6	1.5
Phosphate trapping	2.4	2.8	3.1	2.3	2.0
Nitrate removal	2.5	3.0	3.5	2.5	1.8
Toxicant removal	2.5	2.7	3.0	2.2	2.0
Erosion control	1.9	2.1	2.1	1.7	1.8
Carbon storage	2.0	2.3	2.3	1.3	0.7
Maintenance of biodiversity	2.3	2.3	2.7	1.3	1.5
Water supply for human use	1.8	1.8	1.4	1.3	0.3
Natural resources	0.0	0.0	0.0	0.0	0.0
Cultivated foods	0.4	0.4	0.4	0.0	0.0
Cultural significance	0.0	0.0	0.0	0.0	0.0
Tourism and recreation	0.7	1.1	1.1	0.1	0.0
Education and research	0.8	0.8	0.8	0.5	0.3
Threats	3.0	3.0	3.0	3.0	3.0
Opportunities	3.0	3.0	3.0	3.0	3.0
Runoff intensity from the wetland unit's catchment	2.0	1.8	1.8	2.0	1.8
Alteration of sediment regime	3.0	1.0	3.0	3.0	3.0
Alteration of nutrient/toxicant regime	3.0	1.0	3.0	4.0	2.0
Overall ecological services rating	1.9 (C)	1.8 (C)	2.0 (B)	1.6 (C)	1.3 (C)

The various input features and how they scored for the wetland units are presented in **Figure 1**. This shows which features (services) that are

performed by the wetlands are currently scoring the highest, and which ones are ranked lower. The wetland unit falls within an area with population that suffers a high poverty level and therefore would have a dependence on the resources that are offered by the wetland unit. It can therefore be seen that the factors including the dependency on the resources offered by the wetlands are rated relatively high, whereas cultural significance and tourism potential are rated relatively low. The wetland physical functionality and maintenance, including purification, nutrient removal, sediment trapping, stream flow regulation, sediment trapping and toxicant removal all have a medium to high rating, as do the scores related to biodiversity support. The wetland features with a lower ranking include education and research and are therefore not viewed as the most significant contributing services of the wetlands.

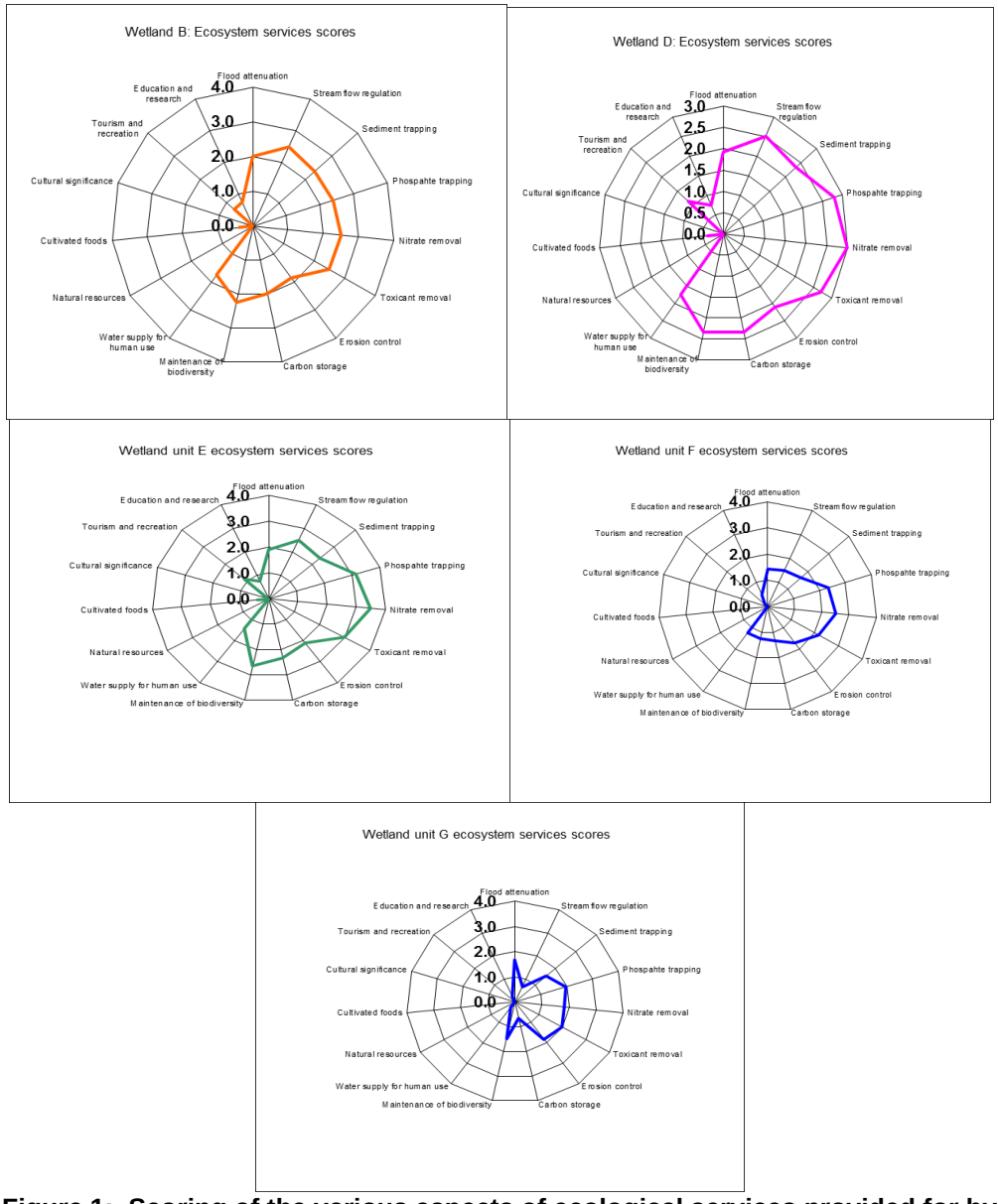

Figure 1: Scoring of the various aspects of ecological services provided for by the wetland habitat unit associated with the power station area.

3.	Impact Assessment and Management
3.3 Alternatives	*3.3.1. <Describe the alternatives considered to prevent negative impacts on the watercourse with regard to locality, procedures, materials, etc.>* There are no alternatives considered for this particular IWULA for the reason that Duvha Power Station and the associated infrastructure are existing. There are no planned constructions associated with this IWULA. Duvha Power Station will continue with their operational activities related to power generation within the Duvha Power Station in an environmental sustainable manner and in accordance with the existing licence requirements.
3.4 Mitigation and Management Measures	*3.4.1. <Provide mitigation measures[11] to prevent, reduce, remediate or compensate the pre-determined impacts; also provide emergency responses>* The objectives of the mitigation measures identified is to minimise disturbance to the environment (reduce the significance of impacts) and maximise potential environmental benefits. **Table 6** below serve to summarise the measures deemed necessary in order to ensure protection of the water resources and to ensure environmental protection during the operation of Duvha Power Station: **Table 6: Summary of the proposed mitigation measures**

Item no.	Aspect	Operational
1	**Surface water**	• Ensure full containment of dirty water from the ADF through successful implementation of the dirty water containment system; • Minimise area of vegetation clearing; • Where practical, undertake the clearing of vegetation during the dry season to minimise erosion; • Maintain sediment traps as part of the storm water management plan where necessary and especially upstream of discharge points where erosion protection measures and energy dissipaters should be in place; • Clean spills as quick as possible; • Store and handle potentially polluting substances and waste in designated, bunded facilities; • Monitoring of water quality within the receiving environment must also be routinely undertaken. This should be undertaken before the onset of any construction activities both upstream and downstream of the impact area to gain baseline data. Routine monitoring at the same points must be undertaken to gain comparative data to determine trends to water quality emanating from the construction activities; • Waste should be frequently removed from the site by suitably equipped and qualified

[11] The mitigation measures should be collated in an Environmental Management Plan (EMP) - refer to the Department of Environmental Affairs and Tourism's regulations, Government Notice No. R. 385 in Government Gazette No. 28753 of 21 April 2006 for minimum standards

		operators and disposed of in approved facilities; and • Locate temporary waste and hazardous substance storage facilities out of the delineated wetland sites.
2	**Groundwater**	• Any waste and spills (during operation) need to be managed according to the departmental (DEA) requirements; • The monitoring network should be kept update in terms of the activities taking place at the power station and according to the DWS requirements; • Authorities need to be notified in the event of a spill or leachate should they occur; • Proper operation and maintenance of contaminated water trenches and dams; and • All pollution control facilities (dams, trenches) must be operated to have a minimum freeboard above full supply level as recommended by GN 704 in terms of the National Water Act (36 of 1998).
4	**Aquatic ecology**	• Ensure that PCDs are designed according to strict safety requirements and are regularly inspected for leaks, damage or maintenance requirements. Where irregularities are detected, they should be speedily remedied to avoid the risk of structural failure; • Road crossings of wetlands should be regularly inspected for erosion, mechanical problems, leaks or spillages. These should be timeously repaired; • Should larger spillages occur due to malfunctioning of the any infrastructure or for any other reason on-site, clean-up of the spillages should be undertaken as soon as possible following the incident. In this regard regular inspection of all infrastructure on-site that have potential to spill should be undertaken; • An emergency response plan should be compiled to address structural failures and major accidental spillages; • Storm water should be used for dust suppression on-site if required to avoid the need for abstraction from natural water resources; • Sediment trapping mechanisms should prevent soils from being washed into wetlands; and • Movement of machinery and vehicles must be strictly controlled to prevent disturbance to wetland areas.
5	**Wetlands**	• Water management infrastructure should be regularly inspected and maintained fully functional at all times; • An emergency response plan for handling large spills or leaks due to infrastructure failure on-site must be compiled and put in place, with regular practice drills to ensure its effectiveness; • All discharge points should incorporate

		sediment barriers or sediment traps designed to cope with the flow velocities and volumes at the point of discharge; • All discharge points should be regularly inspected for signs of erosion, sediment deposition or obstructions; • Implement corrective measures to address any water quality impairment that may be observed; and • A suitably qualified specialist should be appointed to monitor wetland ecological functionality as well as to interpret water quality trends, with report feedback being provided at least monthly for a three-month period, and thereafter at a six-monthly (biannual) interval. A final sign off of rehabilitation works can be considered after 12 months following completion of any civil works. This end-point must be determined by the ECO or otherwise suitably-qualified specialist as dynamics of the system may also evolve due to local site conditions
6	**Sewage treatment Plant**	• It is recommended that regular testing of effluent water be undertaken in order to manage the performance of the water treatment works that will ensure that the quality of the effluent is of adequate quality so as not to have a significant impact to the receiving environment.
8	**Soils and land capability**	• If soils have been removed (for example during excavations or entrenchment) then soil layering must be observed, removed and stored in such a way that the same layer can be preserved during reinstatement; • The surface of the impacted soils must be lightly ripped to a depth of at least 150 mm in order to aid in revegetation; • Re-vegetation of the disturbed area must be done using species that occur naturally and appropriate zonation of wetland species must be observed. The ECO must approve the process as well as the appropriate seed mixtures; • Routine monitoring of success of re-vegetating disturbed soils must be undertaken and remedied if seen to be unsuccessful; • Routine monitoring of emerging erosion must take place and remedied is necessary; • Minimisation of the area that can potentially be impacted (eroded, compacted, sterilized or de-nutrified); • Effective soil cover and adequate protection from wind (dust) and dirty water contamination; • Regular servicing of all vehicles in well-constructed and bunded areas; • Regular cleaning and maintenance of all haulage ways, conveyancing routes and service ways, drains and storm water control facilities; and • Containment and management of any spillage.

3.	Impact Assessment and Management	
	9	**Social**	• Create a grievance mechanism, *e.g.* complaints register, to ensure nuisances can be reported and dealt with quickly; • Create an employment policy and communicate it to the stakeholders. Employ local people where possible; and • Compile a stakeholder communication strategy and appoint a community liaison officer;

3.4.2. <Provide a site map/s that marks the limits of disturbance to the watercourse and in particular indicates erosion and sediment controls>

Refer to attached **Appendix C** for the Master Plan.

3.4.3. <If the developer (applicant) of water use related infrastructure is not the end user/beneficiary and will not be responsible for long term maintenance of the infrastructure, provide a programme for hand over to the successor-in-title[12] including a brief management/maintenance plan for infrastructure along with allocation of responsibilities>

Eskom is the end user and responsible for the long term operations and maintenance of the any Duvha Power Station Infrastructure.

3.5 Changes to the Watercourse

3.5.1. <Assess to what extent the impacts after mitigation will bring about changes in respect of the PES (and recommended ecological category, if this information is available at the stage of study) and functionality of the watercourse; as well as the socio-economic environment (including redress considerations as well impacts on other water users)>

The main watercourses draining the quaternary catchment (B11G) are Tweefonteinspruit and the Noupoort River that drain toward the Olifants (North) River, with Witbank Dam having been constructed at the confluence of these three rivers within the WMA. All of the major rivers within the region are shown to be suffering from a largely modified state, classified as an overall D PES. Transformation and degradation of habitat and runoff from opencast mining and agriculture are the main drivers of ecological change within the catchment area. Emergency Pan is classified as a natural wetland system that has suffered limited degradation and transformation and therefore classified as an overall C PES class (EnviRoss, 2017).

Implementation of mitigation measures will not change the PES status. The area will remain in a largely modified state for a long time.

3.6 Monitoring and Compliance

3.6.1. <Provide a detailed monitoring programme and describe the auditing, compliance and reporting mechanisms to ensure execution of the mitigation measures and for informing DWAF of incidents – ensure that these measures are appropriate in relation to the impacts, mitigation measures, status of the watercourse, etc.>

Surface and Groundwater Monitoring

[12] Refer Section 51 of the NWA

Quarterly surface and groundwater quality monitoring (refer to **Appendix F** of the IWULA Technical Report) is being carried out at the Power Station since June 2006 (LMC, 2016). The sampling sites are divided into five (5) regions of possible impact, namely;

- The Power Station Area;
- The Coal Stock Yard Area;
- The ADF;
- The Sewage Plant; and
- Non-perennial streams around the power station.

The following constituents are monitored at Duvha Power Station surface water monitoring network:

- pH;
- Electrical Conductivity (EC) (mS/m);
- Total Dissolved Solids (TDS) (mg/l);
- Alkalinity as CaCO3 (mg/l);
- Nitrate (NO3) as N (mg/l)
- Sulphate (SO4) (mg/l)
- Carbonate as CO3 (mg/l)
- Aluminium (Al) (mg/l);
- Calcium (Ca) (mg/l);
- Chloride (Cl) (mg/l);
- Fluoride (F) (mg/l);
- Iron (Fe) (mg/l);
- Magnesium (Mg) (mg/l);
- Manganese (Mn) (mg/l);
- Potassium (K) (mg/l); and
- Sodium (Na) (mg/l).

The following constituents are monitored at Duvha Power Station surface water monitoring network:

- pH;

- Electrical Conductivity (EC) (mS/m);
- Total Dissolved Solids (TDS) (mg/l);
- Alkalinity as $CaCO_3$ (mg/l);
- Nitrate (NO_3) as N (mg/l)
- Sulphate (SO_4) (mg/l)
- Carbonate as CO_3 (mg/l)
- Aluminium (Al) (mg/l);
- Calcium (Ca) (mg/l);
- Chloride (Cl) (mg/l);
- Fluoride (F) (mg/l);
- Iron (Fe) (mg/l);
- Magnesium (Mg) (mg/l);
- Manganese (Mn) (mg/l);
- Potassium (K) (mg/l); and
- Sodium (Na) (mg/l).

Biomonitoring

Eskom undertakes biomonitoring assessments at the selected biomonitoring sites (**Appendix J** of the IWULA Technical Report).The objectives of the bio monitoring assessments were to:

- Detect or identify any deterioration in ecological integrity by conducting the specialist assessments on the aquatic ecosystems;
- To build a strong reliable database that can be used for trend analysis and other analysis; and
- Maintain, review and/or refine the integrated biomonitoring program (protocols) for different power stations.

Two (2) sites are monitored at Duvha Power station and details are provided in **Table 7** below.

Table 7: Duvha Power Station Biomonitoring locations (Eskom, 2016a)

Monitoring site	River / Stream	Associated Power station	Description	Biomonitoring protocols		GPS coordinates	
				Protocol	Frequency per annum	Latitude (South)	Longitude (East)

DV-trib-US	Unnamed Northern tributary	Duvha	Unnamed tributary, downstream site to the north of the power station	SASS 5	Twice, if flowing	25° 55' 28.920" S	29° 20' 45.600" E
				Fish	Once		
				Toxicity testing	Twice		
DV-trib-DS			Unnamed tributary, downstream site to the north of the power station	SASS 5	Twice, if flowing	25° 55' 23.880" S	29° 20' 40.560" E
				Fish	Once		
				Toxicity testing	Twice		

EnviRoss also conducted biomonitoring sampling in December 2013 followed by another survey in May-June 2016 and the following were observed:

- Electro-narcosis and cast-netting along the peripheral areas was undertaken, but no fish were noted, which is similar to the results gained following the December 2013 survey. However, this does not unequivocally preclude the presence of fish within the system;
- Low observations of amphibians were noteworthy, but the survey was undertaken during the inactive season and therefore these results are expected;
- A rich diversity of birdlife was observed utilising the wetland area for breeding and foraging purposes;
- No Red Data Listed species were noted, but species such as Phoenicopterus ruber and Phoenicopterus minor (Greater and Lesser Flamingo), Circus ranivorus (African march Harrier) and Tyto capensis (African Grass-owl) (Ansara, 2004) would very well utilise the habitat;
- Aquatic macro-invertebrates sampled included species from the following families: Gyrinidae, Hydraenidae, Culicidae, Chironomidae, Belostomatidae, Corixidae, Dytiscidae, Notonectidae and Pleidae; and
- Micro invertebrates included species from the families of Daphniidae (Branchiopoda) and the class of Ostracoda.

Waste monitoring

The Waste assessment for the Duvha Power Station was carried out in terms of the National Norms and Standards for the assessment of waste for landfill disposal (R635 of 23 August 2013), SANS 10234 and SANS 10324 (ISO-Q); refer to **Appendix K** of the IWULA Technical Report for detailed reports. The ash sludge and sewage solid waste are classified as a Type 3 waste (low hazard waste). Therefore, these wastes require disposal on a landfill with a Class C barrier system. This classification was the result of the leachable

concentration of boron and the total concentration of barium and fluoride in the ash and sludge.

Performance objectives / goals

The performance objectives for Duvha Power Station (water and waste) are set out in **Table 8** below.

Table 8: Performance objectives for Duvha Power Station

Theme	Performance Objective
Surface Water	Prevent clean water contamination through clean and dirty water separation
	Prevent pollution of surrounding water resources through AWRDs
	Manage air quality and dust nuisance through dust suppression
	Prevent downstream pollution and erosion impacts through controlled releases from the dams
Groundwater	Prevent deterioration of groundwater quality through effective design, management and monitoring
	Prevent aquifer contamination through active management, monitoring and implementation of mitigation measures, if needed
Waste	Ensure legally compliant waste disposal operations

Audit and report on performance measures

In terms of condition 12.4 of the existing WUL for Duvha Power Station received in July 2007, all audit reports shall specifically state whether conditions of the licence are adhered to and must include an interpretation of all available data and test results regarding the operation of the sites and all its impacts on the environment. Condition 12.5 further states that all audit reports shall contain recommendations regarding non-compliance or potential non-compliance and must specify target dates for the implementation of the recommendations by the Licensee.

In addition, Duvha Power Station is subject to regular 3rd party audits by recognised companies that comply with the requirements of the standards for certification laid down by appropriate Accreditation Federation to maintain ISO 14001 certification.

Reports outlining the results of the sampling are to be compiled after each sampling activity. These reports will highlight any negative impacts on the water due to operations as well as determine the sources of the impacts. The reports should also discuss possible actions which can be used to mitigate any negative impacts. Relevant results will be graphed so that trends may be

3. Impact Assessment and Management	
	visually observed.