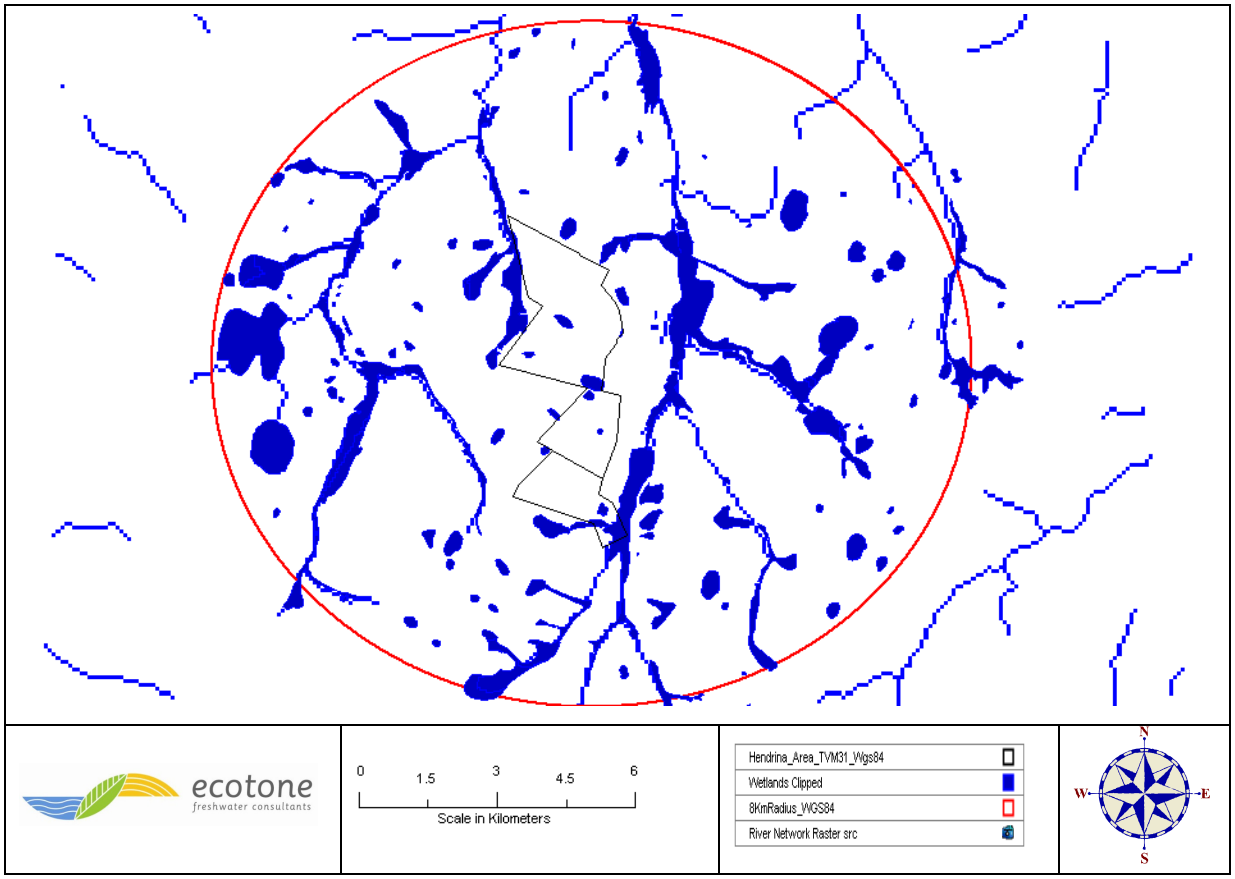

Figure 4.3: Map showing river network and permanent zones associated with rivers and wetlands in the study area.

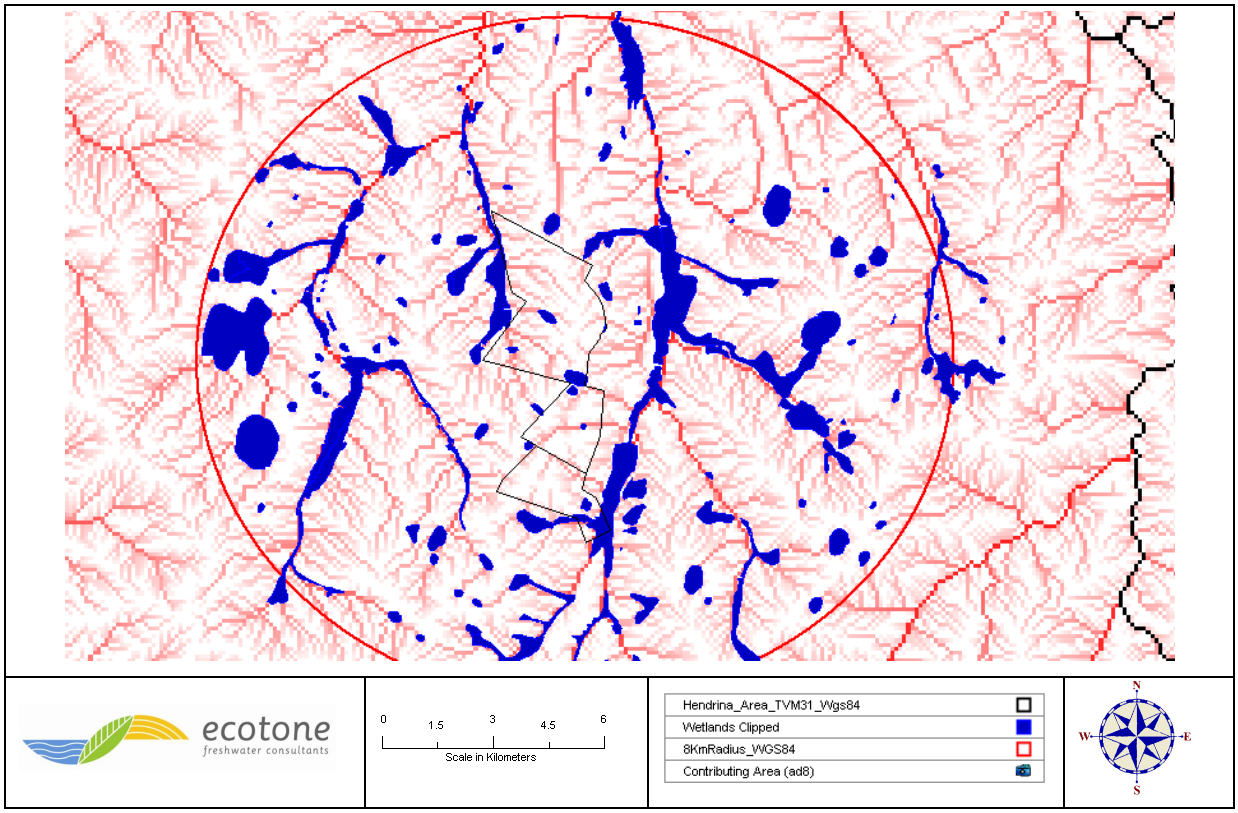

Figure 4.4: Map reflecting the area of influence associated with each first and second order drainage line.

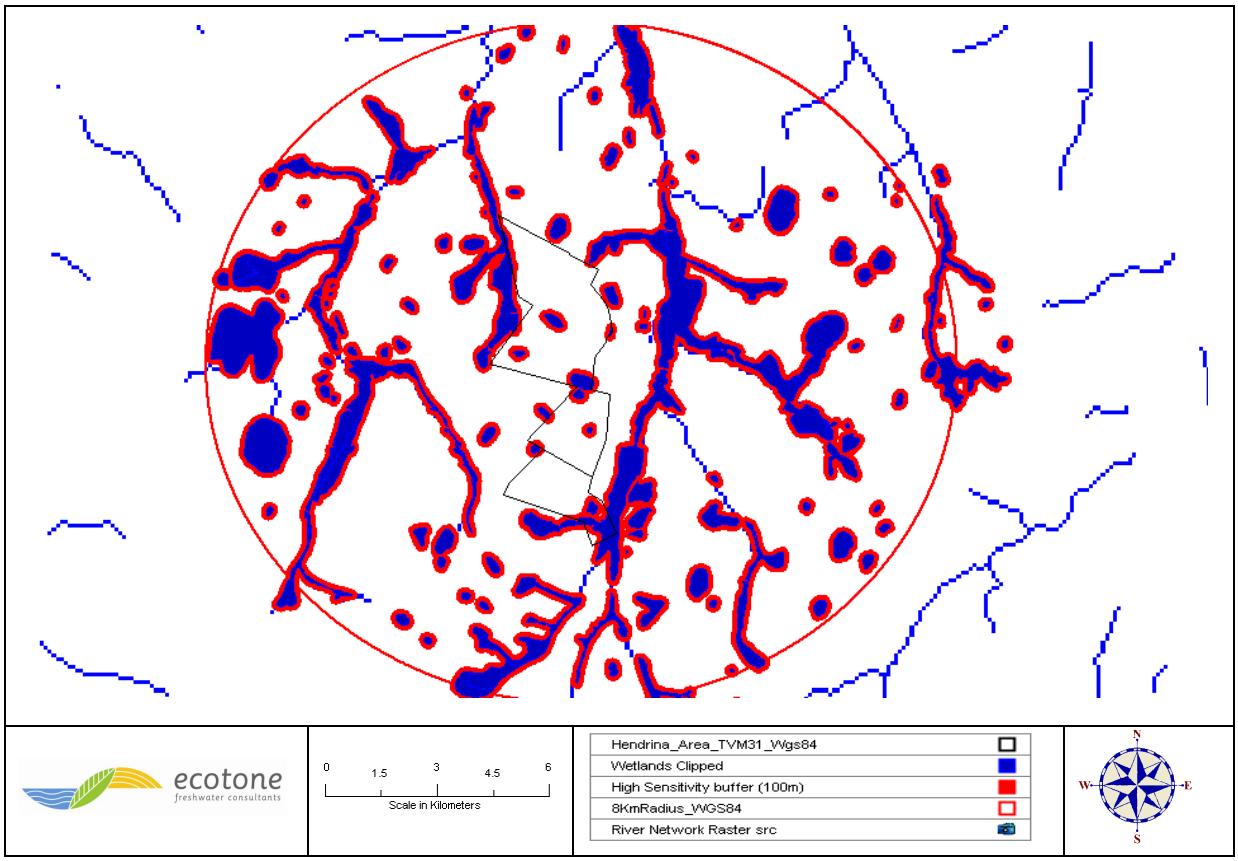

Figure 4.5: Area of high sensitivity (100 m from edge of permanent wetness).

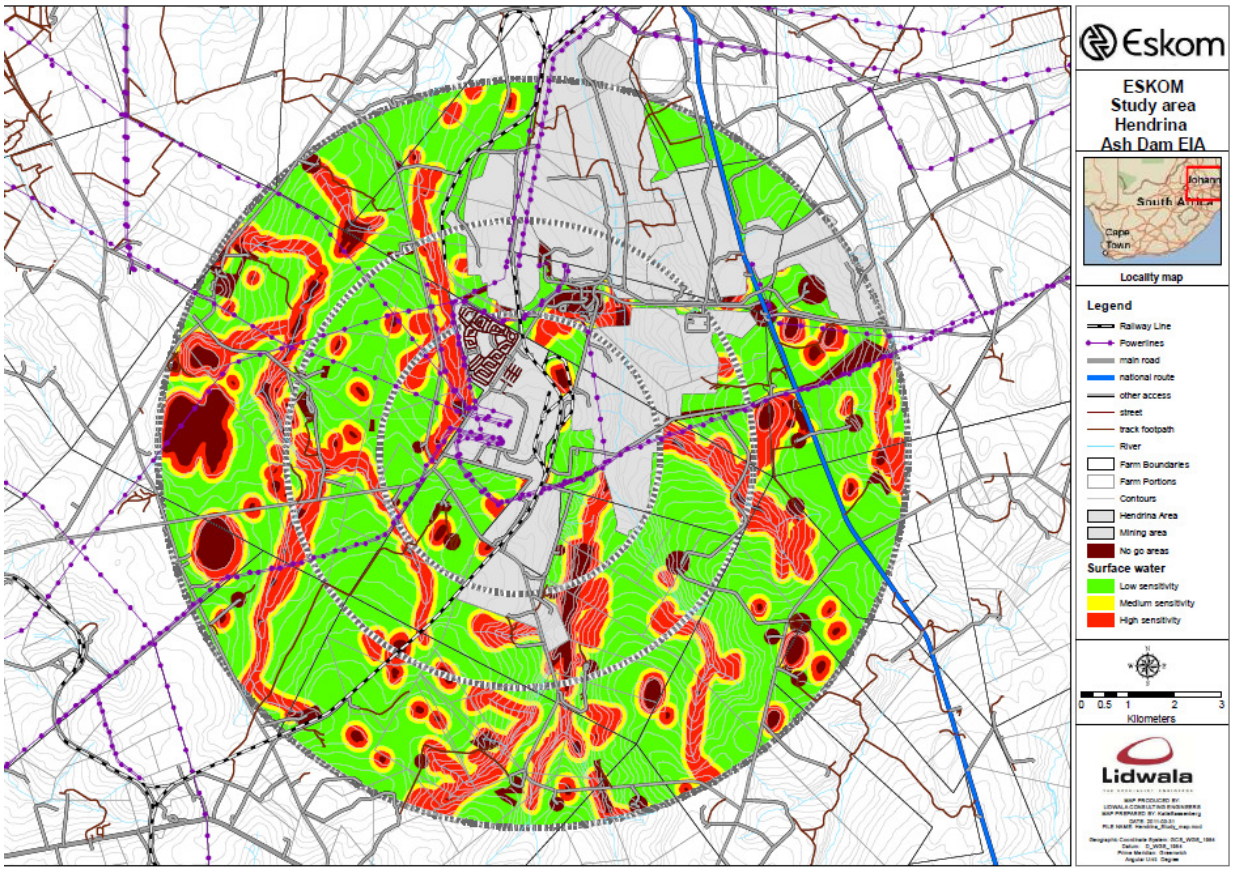

Figure 1.6: Sensitivity map for surface water aquatic systems.

The overall sensitivity assigned to surface water systems in the study area takes a precautionary approach and attempts to highlight areas that are likely to accommodate surface and perched hydrology (**Figure 4.6**). Areas that show permanent wetness and their associated boundaries (i.e. seasonal and temporal wetness for wetlands and riparian zones for rivers) are classified as highly sensitive, while a medium sensitivity buffer is added from the edge of the highly sensitive zone. The main aims in identifying areas of sensitivity regarding freshwater ecosystems are:

1. To identify areas that will be best suited for the placement of ash dam six and which will minimise the potential risk of pollution and subsequent impact to surface water ecology.
2. To avoid any additional legal obligations concerning developments within a watercourse and the associated buffer zones.

4.1.4 Ground water

Intrinsic vulnerability of groundwater to surface-derived contamination is often assessed using a standardized technique that takes into account a series of vulnerability "factors", and assigns each factor a weighting. For example, the most commonly used groundwater vulnerability assessment technique worldwide is known as the DRASTIC model. The acronym DRASTIC refers to the six vulnerability factors considered in the technique – namely **D**epth to groundwater, net **R**echarge, **A**quifer media, **S**oil media, **T**opography, **I**mpact of vadose zone media, and hydraulic **C**onductivity of the aquifer. There are also specialist vulnerability methodologies developed for karstic rocks (e.g. COP and VUKA) that consider the nature of material overlying the aquifer, zones of rapid infiltration (e.g. sinkholes) and the nature of the unsaturated zone. Vulnerability assessment methods generally weight each factor considered so that the total better reflects local conditions, and all depend on adequate data to produce a successful result.

In the case of the Hendrina power station area, recharge, aquifer media and vadose zone media are assumed to be constant across the site. No data are currently available to differentiate between soils across the site. Hydraulic conductivity is closely related to the median borehole yield for any particular area, and this information is the basis for the Department of Water Affairs' general hydrogeological map series (also known as the groundwater resource assessment phase 1 project, or GRA1). The general map series classification has therefore been applied across the site, and whilst most of the area is classified as "D2" (intergranular and fractured aquifer with median borehole yield of 0.1 to 0.5 litres per second), there is a small area classified as "D3" (intergranular and fractured aquifer with median borehole yield of 0.5 to 2.0 litres per second) in the NW. Depth to groundwater (i.e. water table elevation) is often assumed to be a subdued reflection of the topography in the absence of other information, and surface water features tend to occupy the lowest-lying areas in the site. Surface water features have therefore been buffered by 250 m using ARC-GIS software to provide a proxy for depth to groundwater. In some

cases (e.g. wetlands) it is possible that shallow groundwater is in hydraulic continuity with surface water features. The final map is a combination of the buffered surface water features, and the small area classified as "D3".

Efforts will be made to obtain more detailed groundwater levels for the study area, better soil data, as well as any geological features (e.g. fractures, dykes, fault zones) that may have a bearing on groundwater vulnerability, and which will allow this vulnerability assessment to be updated.

Table 4.3: Sensitivity analysis

Category	Description
Lower Sensitivity	Areas falling outside of the 250 m buffer around surface water features, and outside of the area classified as "D3" on the general hydrogeology map series (GRA1 data)
Medium Sensitivity	Areas falling within the area classified as D3, but still outside of all areas within the 250 m surface water buffer zone.
Higher Sensitivity	Those areas within the 250 m surface water buffer zone.

The following sensitivity map essentially classifies the study area into two zones, based on the buffer around surface water features, and the area classifed as "D3" on the general hydrogeological map series. These zones can be extended to three zones (see **Table 4.3** above) if distinction is made between the surface water buffer zone and the D3 area.

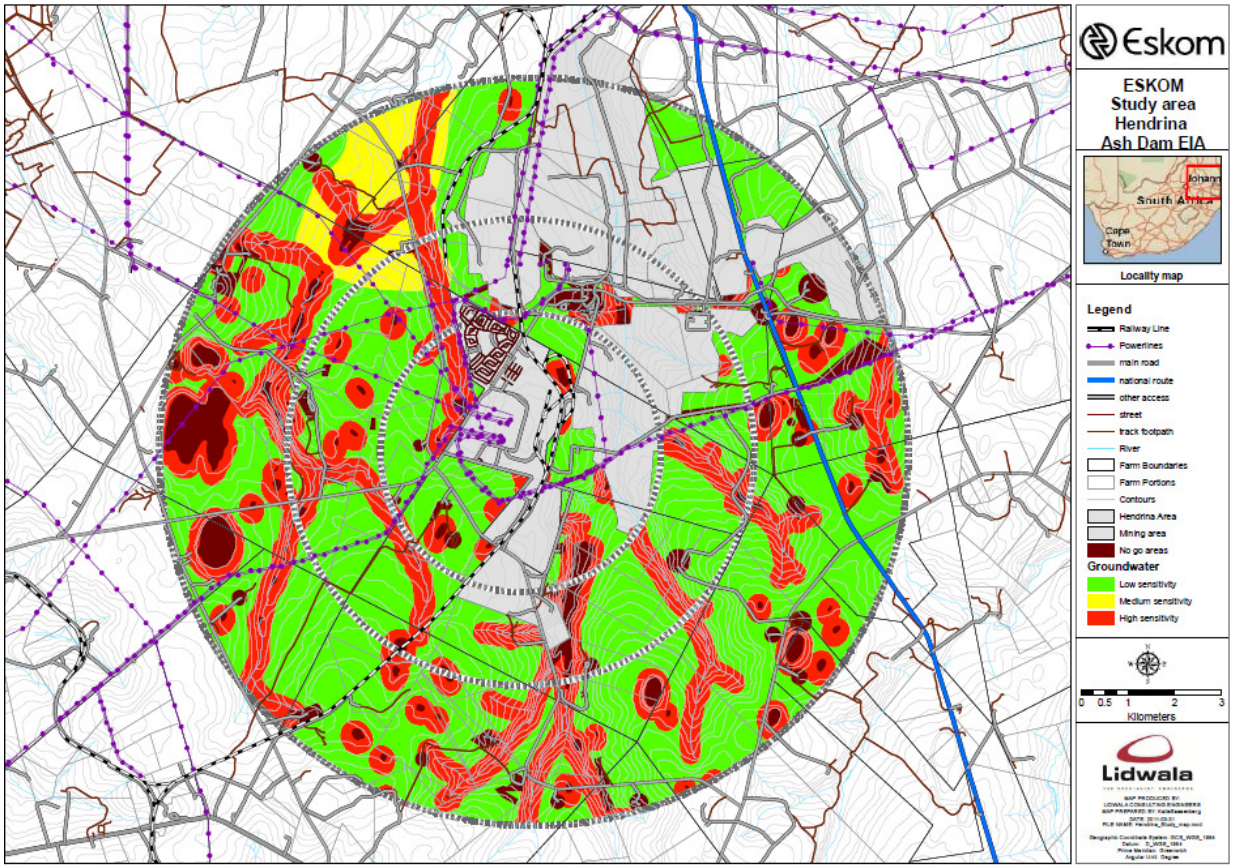

Figure 4.7: Screening map for Groundwater sensitivity