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FRESHWATER IMPACT ASSESSMENT: PENNY LODGE, ZULULAND RHINO RESERVE, KWAZULU NATAL

EnviorSwift KZN has been appointed as the freshwater specialist for the proposed development of the Penny Lodge within the Zululand Rhino Reserve, KwaZulu Natal. A freshwater screening assessment was undertaken in 2016 (Zdanow, 2016). Following the screening assessment, the need for a Water Use Licence Application (WULA) was identified. This document serves as an addendum to the screening assessment and provides a detailed description and assessment of the impacts considered probable should the development be authorised.

1. Activity Description

The study area is located within the delineated riparian zone of both the Msunduzi River and an ephemeral drainage line (Figure 1). The proposed development would comprise of the following (Figure 2):

- A main single story lodge (543m^2);
- Four single story accommodation units linked by a raised timber walkway with services below (e.g. potable water and sewerage) (811.3m^2);
- A new dirt access road; and
- An evapotranspiration area (approximately 700m^2).

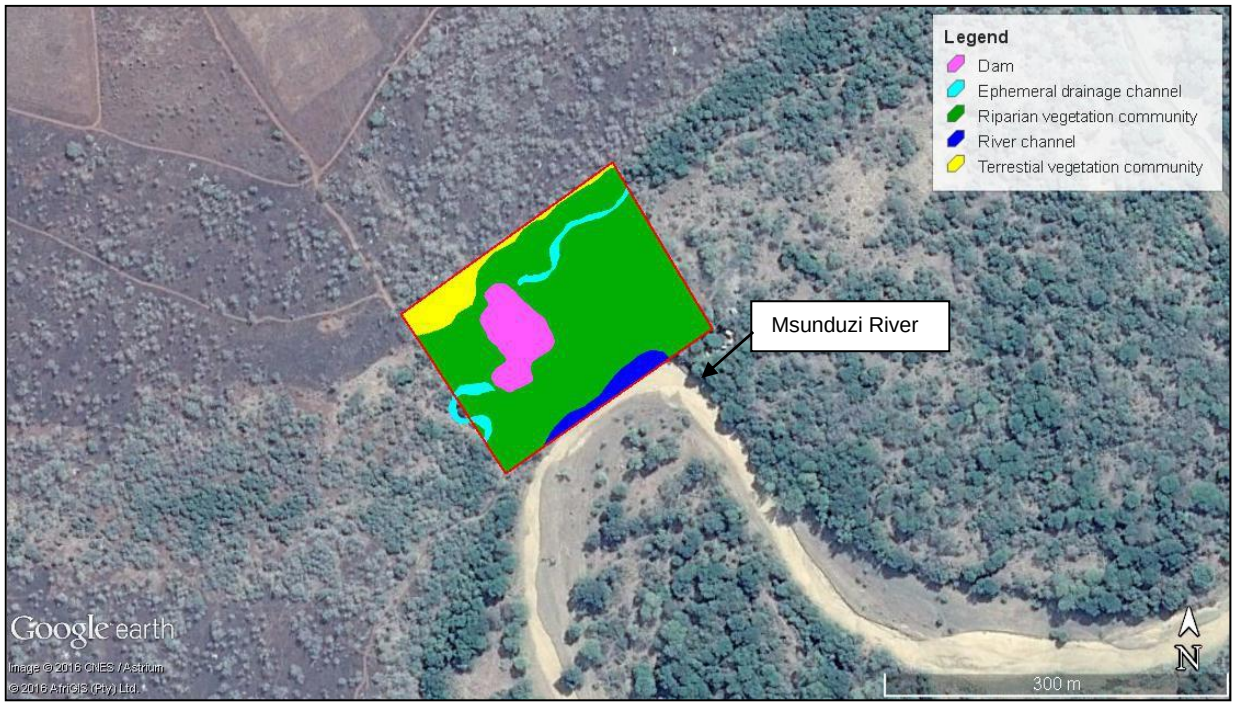

Figure 1: Study area (indicated in red) in relation to surrounding freshwater habitat (Google Earth Pro, 2016).

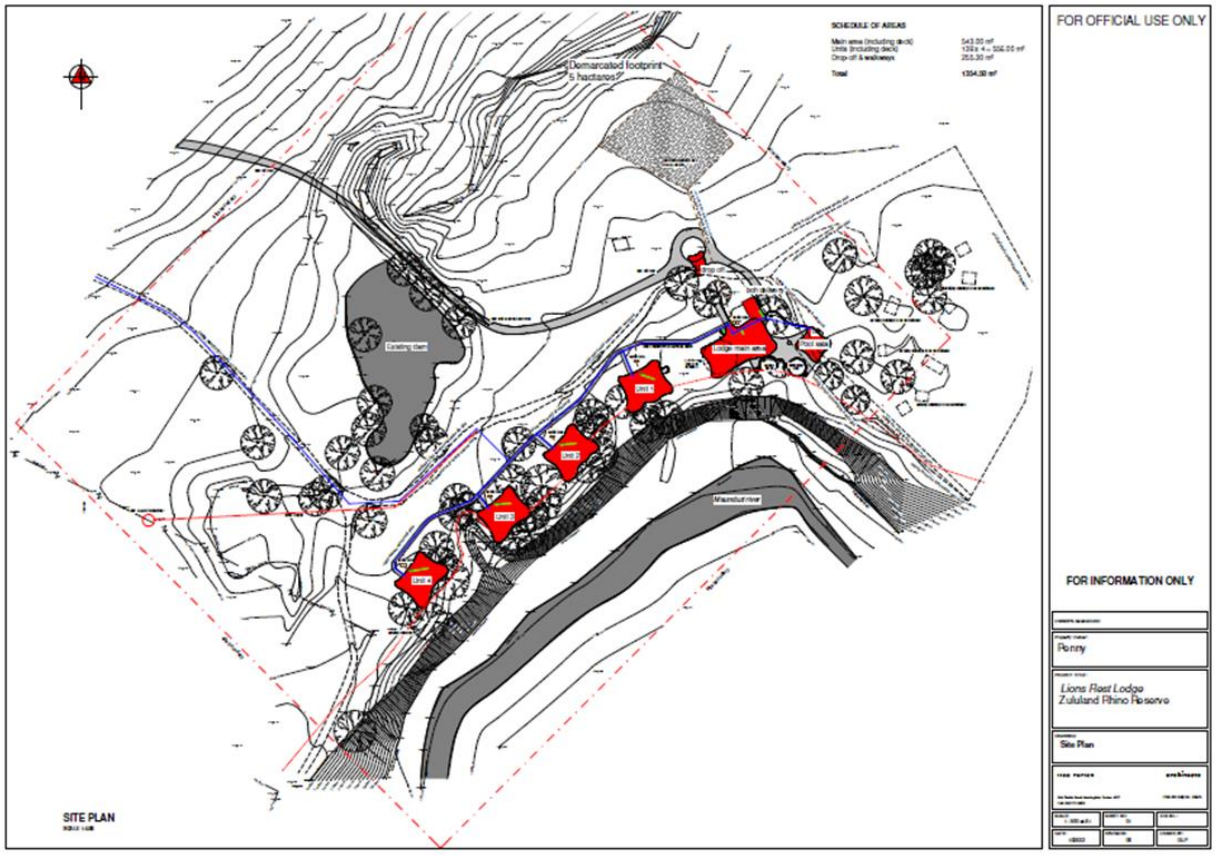

Figure 2: Penny Lodge site plan (refer to Annexure A for a higher resolution image).

2. Assumptions and Limitations

The findings of this report were based on a single site assessment which was undertaken in August 2016. Seasonal variation in watercourse and vegetation characteristics was therefore not considered as part of this assessment. However, general findings and results were considered sufficient to inform the assessment of any potential impact that could occur as a result of the proposed development activities.

The focus of this report was the assessment of impacts to surface water features. The report specifically excludes impacts to groundwater and groundwater quality. However, the impact to groundwater has been discussed within the geohydrological report (Joubert, 2017).

3. Assessment of Freshwater Impacts

3.1 Method

A method of assessment summary is provided below; the detailed method is provided in Appendix 1.

The following criteria were taken into consideration when determining the impact of the proposed development:

- The nature of the impact i.e. positive, negative, direct, indirect;
- The extent and location of the impact;
- The duration of the impact i.e. short term, long term, intermittent or continuous;
- The magnitude/intensity of the impact i.e. high, medium, low; and
- The likelihood or probability of the impact actually occurring.

Mitigation measures were subsequently identified and recommended for all impacts to reduce the overall impact significance to an acceptable level, where and if possible. Mitigation measures aim to ensure that:

- More environmentally sound designs / layouts / technologies, etc., are investigated and implemented, if feasible;
- Environmental benefits of a proposed activity are enhanced;
- Negative impacts are avoided, minimised or remedied; and
- Residual negative impacts are within acceptable levels.

3.2 Impact Identification

Following the screening assessment, the following direct impacts were identified:

Construction Phase

- Loss of riparian habitat (approximately 2000m^2 from main lodge, accommodation units, raised walkway and evapotranspiration area footprints)
- Disturbance of riparian habitat.
- Increased runoff, erosion and sedimentation.
- Water quality impairment due to the runoff of contaminants.

Operational Phase

- Water quality impairment due to the malfunction of the proposed septic tank and french drain system.
- Increased runoff from hardened surfaces resulting in erosion and sedimentation.

The main water source of the Msunduzi River is concentrated surface flow from upstream channels and tributaries, as well as diffuse and subsurface flow. Interflow from valley side slopes is considered to be marginal. The lodge, accommodation units and walkways will be built on stilts which reduces the probability of extensive foundations intercepting interflow and subsurface flow. The elevation of

buildings on stilts also reduces the probability that diffuse surface flow will be interrupted. The impact to hydrological flow patterns through the riparian area as a result of the development is therefore considered negligible.

The main lodge, the four accommodation units and the raised walkway are located within the 1:50 and 1:100 year flood lines which raises some concern regarding the flooding of the development. However, according to Scott-Shaw (2016) the risk of flooding of the units is low as the accommodation units will be elevated on stilts and the flood extent is likely to be characterised by low flowing inundation during such an event.

3.3 Construction Phase

Impact 1 – Loss of riparian habitat.

The development of the main lodge and four accommodation units will result in the loss of riparian habitat associated with the Msunduzi River. However, the proposed development is a bush lodge and it is therefore the intention of the proponent to preserve as much of the natural characteristics and sense of place of the area as possible. The main lodge will be located within a portion of the riparian zone that has been disturbed as a result of the historical development of a pipeline that serviced a camp just outside of the study area. Furthermore, natural vegetation will be incorporated into the design of the development as far as practically possible e.g. infrastructure will be developed around larger trees and low brush will only be removed where required. In addition, the accommodation units will be strategically situated in areas presently devoid of vegetation in order to reduce the footprint wherein riparian vegetation needs to be removed. Should smaller trees, shrubs and forbs be encountered within the construction footprint an attempt will be made to relocate them to areas that have historically been disturbed e.g. areas in the vicinity of the dam wall (plants will not be relocated to undisturbed areas as this would result in further impact to intact vegetation). A gravel access road to the main lodge will also be developed. This access road will cross an ephemeral drainage line and associated riparian habitat before reaching the lodge. However, the crossing of the drainage line will take place on an existing dam wall within the drainage line, and disturbance will therefore be limited.

The impact associated with the loss of a limited area of already disturbed riparian habitat (approximately 2100m^2) is considered to be of a medium intensity, will occur regardless of the implementation of mitigation measures and will remain permanently. The overall impact significance was therefore rated as medium (negative).

Table 1: Loss of riparian habitat.

	Intensity	Extent	Duration	Probability of impact occurring	Significance	Confidence
Without mitigation	Medium	Local	Permanent	Definite	Medium (-ve)	High
With mitigation	N/A					

Impact 2 - Disturbance of riparian habitat

The edge effects of construction related activities may result in the disturbance of riparian habitat. The indiscriminate movement of construction vehicles and personnel through the riparian areas of the Msunduzi River and the ephemeral drainage line, as well as the inappropriate storage or dumping of building material, will result in the destruction of vegetation and the compaction/disturbance of soils. Soil disturbance may also result in the proliferation of alien and invasive plant species. However, as mentioned above, the proposed infrastructure will be located within areas which have already been disturbed or within areas devoid of vegetation which will reduce the intensity of the impact.

The impact is considered to be of a low intensity, will be local in extent and will be of a long term duration should rehabilitation of disturbed areas not take place. The overall impact is therefore

considered to be of a low (negative) significance prior to the implementation of mitigation measures. However, with the implementation of the mitigation measures as listed below the overall impact may be reduced to a very low (negative) significance.

Essential mitigation measures:

- Limit the extent of the construction footprint area as far as practically possible to avoid unnecessary disturbance to riparian habitat.
- Demarcate the construction footprint clearly with the use of danger tape and strictly prohibit any activities outside of the demarcated footprint area. Danger tape must be removed after the completion of construction activities.
- Make use of the existing access road into the riparian area as far as possible (located within the western portion of the study area). The indiscriminate movement of construction vehicles through the riparian area must be strictly prohibited.
- Immediately rehabilitate any accidental disturbance to portions of the riparian areas falling outside of the demarcated construction footprint area. Rehabilitation may include the ripping and reprofiling of excessively compacted areas.
- Construction camps, storage areas, soil stockpile areas and laydown areas must be located at least 20m away from the riparian zone.
- Prohibit the dumping of excavated material within the riparian zone or within 20m of the riparian zone. Spoil material must be appropriately disposed of at a registered waste disposal facility.
- Any topsoil removed from the direct construction footprint must be stored at a designated stockpile area for use in rehabilitation activities. Stockpiles must be stabilised with geotextiles in order to prevent erosion.
- An environmental control officer (ECO) (or similar) must inspect the study area on a weekly basis and must take measures to address unforeseen disturbances to riparian habitat.
- Once construction has been completed all construction waste, rubble, and equipment must be removed from the study area.
- Alien and Invasive species control:
    - The construction site and surroundings must be checked by the ECO for alien and invasive species on the completion of construction and alien species noted must be removed by hand.
    - The use of herbicides should be avoided. However, if necessary, only herbicides which have been certified safe for use in aquatic environments by an independent testing authority may be considered. The ECO must be consulted in this regard.
    - Dispose of removed alien plant material at a registered waste disposal site or burn on a bunded surface where no stormwater runoff is expected.
    - Remove vegetation before seed is set and released.
    - Cover removed alien plant material properly when transported, to prevent it from being blown from vehicles.

Table 2: Disturbance of riparian habitat.

	Intensity	Extent	Duration	Probability of impact occurring	Significance	Confidence
Without mitigation	Low	Local	Long term	High	Low (-ve)	High
With mitigation	Low	Site specific	Short term	Medium	Very Low (-ve)	High

Impact 3 - Increase runoff, erosion and sedimentation

An increase in stormwater runoff from cleared, disturbed and compacted areas as well as from construction laydown areas may result in an increase in stormwater flows and flow velocities into the Msunduzi River and the ephemeral drainage line. This may result in the erosion of the banks and

channels of the features. Furthermore, earth moving activities and the disturbance of soils may result in an increase in the runoff of sediment into the adjacent watercourses. The banks of both the Msunduzi River and the ephemeral drainage line have already been significantly eroded and the existing riverbank is prone to erosion and collapse during flood events. The probability of additional impact due to erosion caused by disturbance during development is therefore considered to be high.

The impact is considered to be of a medium intensity and of a local extent. Although the construction period extends over a short term duration, erosion and sedimentation would remain long term should the rehabilitation of rills and gullies not take place, and the duration of the impact is therefore considered to be long term. The overall impact is therefore considered to be of a medium (negative) significance prior to the implementation of mitigation measures. However, with the implementation of the mitigation measures as listed below the intensity and duration of the impact may be reduced and the overall impact will be reduced to a very low (negative) significance.

Essential mitigation measures:

- If possible, undertake construction related activities during the dry winter months.
- Implement erosion control measures where required (e.g. covering steep, erosion prone banks of the Mzunduzi River and ephemeral drainage line which are in close proximity to the construction footprint with geotextiles, stabilizing areas susceptible to erosion with sandbags, diverting stormwater away from areas susceptible to erosion etc). Care must be taken to prevent additional disturbance to the banks of the river and drainage line during the implementation of these erosion control measures.
- Protect stockpiles, if required, from erosion using tarp or erosion blankets.
- Divert stormwater away from the construction footprint area. Stormwater must not be discharged directly into the Mzunduzi River or the ephemeral drainage line but should rather be discharged as diffuse flow into silt fences/traps/sediment settling ponds.
- All sediment trapping devices should be checked weekly by the appointed environmental control officer and cleared as needed.
- The contractor/ECO must check the site, the ephemeral drainage line and the river for erosion damage and sedimentation weekly. Should erosion or sedimentation be noted, immediate corrective measures must be undertaken. Rehabilitation measures may include the removal of accumulated sediment by hand, the filling of erosion gullies and rills, and the stabilization of gullies with silt fences.

Table 3: Increased runoff, erosion and sedimentation.

	Intensity	Extent	Duration	Probability of impact occurring	Significance	Confidence
Without mitigation	Medium	Local	Long term	High	Medium (-ve)	High
With mitigation	Low	Site specific	Short term	Medium	Very Low (-ve)	High

Water Quality Impairment due to the runoff of contaminants

The movement of construction vehicles through the study area increases the possibility of the contamination of the Msunduzi River and the ephemeral drainage line (including the dam) as well as the associated riparian areas by hydrocarbons which may leak from the vehicles and enter into the river and drainage line with runoff. In addition, there is a possibility that the watercourses will be contaminated as a result of the runoff of cement and other construction related materials. Extreme caution will need to be taken with these materials within the riparian area in order to prevent accidental spillage. Spillage should be cleaned up immediately and disposed of at an appropriately licensed facility. Furthermore, the use of infill material or construction material with pollution / leaching potential must be prohibited.

Although the construction period of the proposed development will be of a short term duration, the spillage of cements and hydrocarbons into freshwater habitat could have long term consequences and the impact was therefore considered to be of a long term duration. Prior to the implementation of mitigation measures the impact is considered to be of a medium (negative) significance. However, with the implementation of the mitigation measures listed below, the duration and probability of the impact may be reduced and the overall impact will be reduced to a very low (negative) significance.

Essential mitigation measures:

- Fuel, chemicals and other hazardous substances should preferably be stored offsite, or at least 20m away from the edge of the riparian zone in suitable secure weather-proof containers with impermeable and bunded floors to limit pilferage, spillage into the environment, flooding or storm damage.
- Construct temporary bunds around areas where cement is to be cast in-situ.
- Prohibit the use of infill material or construction material with pollution / leaching potential.
- Use bunded surfaces within designated areas at least 20m away from the riparian zone for servicing and re-fuelling vehicles.
- Inspect all storage facilities and vehicles daily for the early detection of deterioration or leaks.
- Dispose of used oils, wash water from cement and other pollutants at an appropriate licensed landfill site.
- Dispose of concrete and cement-related mortars in an environmental sensitive manner (can be toxic to aquatic life). Washout should not be discharged into the river, ephemeral drainage line or dam. A washout area should be designated, and wash water should be treated on-site.
- Clean up any spillages immediately and dispose of contaminated material at an appropriately registered facility.
- Prohibit the washing of vehicles or machinery within 20m of the riparian zone.
- Provide portable toilets where work is being undertaken. These toilets must be located at least 20m away from the riparian zone and must be serviced regularly in order to prevent leakage/spillage.

Table 4: Water quality impairment due to the runoff of contaminants.

	Intensity	Extent	Duration	Probability of impact occurring	Significance	Confidence
Without mitigation	Medium	Local	Long term	Medium	Medium (-ve)	High
With mitigation	Low	Site specific	Short term	Medium	Very Low (-ve)	High

3.4 Operational Phase

Impact 1 – Water quality impairment due to the malfunction of the proposed septic tank and french drain system

The proposed lodge and accommodation units are located within a remote area in which no wastewater treatment works currently exists. A septic tank and french drain system has therefore been proposed for the treatment of sewage generated by the development. However, with septic tank systems, a risk of malfunction always exists. This is of particular concern as the septic tanks are located within the 1: 100 year floodline of the Msunduzi River and potential leakage from septic tanks and associated pipelines may result in the contamination of the adjacent river and ephemeral drainage line. That being said, it should be noted that the Msunduzi River and ephemeral drainage line are ephemeral systems which only contain flowing surface water for a few hours or a few days after sufficient rainfall (Joubert, 2017). This reduces the probability that surface water within the river or drainage line will be contaminated should leakage occur. Furthermore, the study area is associated with a low gradient and the subsoils associated with the study area have a low permeability. This further reduces the possibility that contaminants will migrate through the soil into the adjacent river and ephemera drainage line (Joubert, 2017).

Effluent produced by the septic tanks will be conveyed to a french drain and evapotranspiration area by an underground pipeline. There is a risk that the flooding of the evapotranspiration area during heavy rainfall will compromise the system and will result in the release of effluent which may be conveyed in runoff into the portion of the ephemeral drainage line downslope of the evapotranspiration area and eventually into the Msunduzi River downstream.

The locality of the proposed swimming pool within the 1: 100 year flood line also poses a risk during flooding events. However, the pool will be raised on a platform which reduces the possibility of the contamination of the river with treated pool water.

Although there is a risk of leakage of effluent into the Msunduzi River and the ephemeral drainage line during heavy rainfall and flooding, in the event of a large scale flooding event, given the nominal volume of effluent to be produced on site and the volume of water associated with such a flooding event, the concentration of contaminants entering into the river and ephemeral drainage line would be negligible (Joubert, 2017). The impact as a result of the contamination of the Msunduzi River and ephemeral drainage line by sewage is therefore considered to be of a medium intensity. However, should malfunctions not be sufficiently attended to, the impact would of a long term duration. The overall impact is therefore considered to be of a medium (negative) significance prior to the implementation of mitigation measures. There will always be a risk that a malfunction will occur and should spillage of sewage into the river or drainage line occur, the intensity of the impact will remain medium. However, should the mitigation measures as listed below be strictly adhered to, the possibility that the impact will occur and the duration of the impact will be reduced, and the overall impact may be reduced to a low (negative) significance.

<u>Essential mitigation measures</u>

- Sludge must be removed from the septic tanks before sludge levels build up to the extent that solids are carried over into the french drain. Such maintenance is normally required at three to four-year intervals (Joubert, 2017). However, it is recommended that sensors are placed within the tanks that measure the level of effluent and trigger alarms when the tanks will need to be emptied.
- Tanks should be located so as to be accessible to the ‘honey sucker’ tanker which will remove the sludge (Joubert, 2017).
- An emergency protocol must be put in place to rapidly remove effluent should any accidental spillage occur during the routine removal of effluent from the tanks.
- Stormwater from all roofed and paved areas should be piped and discharged into soakpits located well away from the french drain and evapotranspiration area (Joubert, 2017).
- The infiltration area should be densely grassed and, in addition, hydrophilic (water loving) vegetation should be planted on and around the lower portion to increase evapotranspiration and to increase the assimilation of contaminants from the effluent. Any existing mature trees on the site should be maintained where possible (Joubert, 2016).
- Strictly prohibit the movement of heavy vehicles or machinery within the infiltration and evapotranspiration area.
- The ultimate occupiers of the completed lodge, guests and staff, should be informed that a french drain system exists, and that it is dependent on biological action for the breakdown of waste products (Joubert, 2017).
- Materials such as antiseptics, petrol, oil or other chemicals must not enter the system, since these may kill the bacteria, resulting in complete failure of the bacteriological process (Joubert, 2017).
- Do not allow excessive quantities of fat, waste food, etc., from the kitchen to enter the drain. Dose the septic systems with an approved bio-enzyme (generally available from supermarkets or hardware stores) periodically in order to improve the long term viability of the system (Joubert, 2017).
- Do not introduce materials such as newspaper or cloth into the system as these will reduce the efficiency of the bacteriological processes (Joubert, 2017).

- Monitor for signs of a blocked septic tank. Signs include:
  - Septic tank effluent surfacing on the property;
  - Wastewater backing up into drains,
  - Gurgling in drains;
  - Overflows into shower or bath when the sink empties;
  - Slow flushing of toilets;
  - Ground movement (depressions) near the septic tanks or evapotranspiration area;
  - Bright green, spongy grass on the evapotranspiration area, even during dry weather.
  - Pooling water or muddy soil around the septic system.
  - A strong odor around the septic tank and evapotranspiration area.
- Should any of these signs be noted, a professional must be contacted immediately to inspect the system and immediate corrective measures must be undertaken.
- Monitor sewage pipelines for leaks. Should leaks be noted repairs must be undertaken immediately and spillages must be cleaned up immediately.
- Closely monitor the septic tanks and the french drain and evapotranspiration area after heavy rainfall events to ensure that malfunction and leakage is not taking place.
- Additional design measures must be implemented in order to ensure leakage does not take place from septic tanks during flooding events.
- In the event of flooding:
  - Cease use of water during flood events in order to prevent the flooding of septic tanks and leakage of sewage.
  - Cease use of water if soils within the evapotranspiration area have been saturated by heavy rainfall. The use of water should only resume once the evapotranspiration area is sufficiently dry to once again allow percolation of effluent through the soil.
  - Divert water away from the evapotranspiration area and septic tanks in order to prevent flooding and saturation of the soil.
  - The septic tanks must be professionally inspected and serviced after flooding events. Septic tanks must be checked in order to ensure that silt and debris has not accumulated within the system. Any silt or debris within the system must be cleaned out by a professional.
  - Do not pump the septic tank straight after flooding events when the soil is still saturated as this may result in the tank dislodging from the ground.
  - Inspect the septic tanks manhole cover after flooding to ensure that it remains secure.
  - Inspect areas above septic tanks as well as the evapotranspiration area for disturbance. Repair any erosion damage and reseed areas as necessary to provide cover.
- Water quality monitoring should be undertaken as and when possible in order to determine whether water quality is being impacted as a result of the septic system. Water quality monitoring must take place upstream of the development and downstream of the development and the results of the testing compared.
- Should a malfunction occur in the septic tank system, immediate measures must be taken to extend or amend the system to accommodate any problems which may arise from the indeterminate nature of the subsoils, seasonal effects and future developments (Joubert, 2017).
- Do not discharge grey water from the swimming pool into the adjacent river channel or ephemeral drainage line during backwashing.

Table 5: Water quality impairment due to the malfunction of the proposed septic tank and french drain system.

	Intensity	Extent	Duration	Probability of impact occurring	Significance	Confidence
Without mitigation	Medium	Local	Long term	Medium	High (-ve)	Medium
With mitigation	Medium	Local	Short term	Low	Low (-ve)	Medium

Impact 2 – Increased runoff from hardened surfaces resulting in erosion and sedimentation

The increase in hardened surfaces associated with the development will be minimal. The lodge and accommodation units as well as the walkway will be raised on stilts, however there is still likely to be an increase in runoff from the rooves of the structures, from the parking area as well as from the proposed gravel access road into the development area. The increase in runoff from the parking area, the lodge and the accommodation units may result in the erosion and sedimentation of the adjacent Msunduzi River banks and channel. An increase in stormwater runoff from the proposed gravel access road which traverses the ephemeral drainage line may also result in the erosion of this feature. It is therefore considered essential that stormwater and erosion control measures such as those listed below are put in place.

The impact is considered to be of a medium intensity and of an overall medium (negative) significance prior to the implementation of mitigation measures. However, with the implementation of the mitigation measures listed below the overall impact may be reduced to a very low (negative) significance.

Essential mitigation measures:

- The implementation of erosion control measures as specified within the construction phase mitigation measures (e.g. covering steep, erosion prone banks of the Mzunduzi River and ephemeral drainage line which are in close proximity to the construction footprint with geotextiles, stabilizing areas susceptible to erosion with sandbags, diverting stormwater away from areas susceptible to erosion etc.) will prevent erosion during the operational phase.
- Keep hard surfaces to a minimum.
- Stormwater must not be discharged directly into the Msunduzi River or the ephemeral drainage line. Where possible, discharge stormwater from rooftops into vegetated soakaway pits or into rain harvesting tanks. This will limit the volumes of stormwater runoff that will reach the Msunduzi River and the ephemeral drainage line.
- If possible, intercept stormwater runoff from hardened surfaces such as the gravel access road and the parking area with vegetated swales. Vegetated swales will allow for infiltration, therefore reducing the water volumes ultimately reaching watercourses as well as enhancing water quality due to the assimilation of nutrients.
- Monitor stormwater discharge points as well as the banks of the Msunduzi River and the ephemeral drainage line for erosion after heavy rainfall events. Should erosion or sedimentation be noted, immediate corrective measures must be undertaken. Rehabilitation measures may include the removal of accumulated sediment by hand, the filling of erosion gullies and rills, and the stabilization of gullies with silt fences.

Table 6: Increased runoff from hardened surfaces resulting in erosion and sedimentation.

	Intensity	Extent	Duration	Probability of impact occurring	Significance	Confidence
Without mitigation	Medium	Local	Long term	High	Medium (-ve)	High
With mitigation	Low	Site specific	Short term	Low	Very Low (-ve)	High

4. Indirect Impacts

No indirect impacts were identified, provided that mitigation measures as listed for the direct impacts are adhered too.

5. No-Go Scenario

The study area is located within the Zululand Rhino Reserve which is a protected area. Should the proposed development not proceed, the watercourses will be subjected to very limited disturbance as

a result of the continued movement of wildlife through the area during foraging activities, and the status quo of the watercourses is therefore likely to remain the same.

6. Cumulative Impacts

Cumulative impacts are impacts that result from the incremental impact of the proposed activity on freshwater systems within a greater catchment, ecoregion and wetland vegetation group when added to the impacts of other past, present or reasonably foreseeable future activities. The development of the proposed Penny Lodge will result in the minimal loss of riparian habitat from the construction footprint (approximately 2100m^2). However, the study area is located within the Zululand Rhino Reserve which is a protected area in which disturbance to watercourses is limited, and the loss of a small area of largely degraded riparian habitat is therefore not likely to add significantly to the cumulative loss of freshwater habitat from the region.

7. Conclusion

The majority of the impacts associated with the construction and operational phase of the proposed development of the Penny Lodge can be reduced to low and very low significance levels with the strict implementation of the mitigation and monitoring measures as listed within this report. The proposed development will result in the unmitigable loss of riparian habitat, however the habitat that will be removed as a result of the development of the main lodge has already been degraded as a result of the historical development of a pipeline that serviced a camp just outside of the study area. Furthermore, the accommodation units will be strategically situated in areas presently devoid of vegetation in order to reduce the footprint wherein riparian vegetation needs to be removed. The impact associated with the loss of a limited area of already disturbed riparian habitat is therefore only considered to be of a medium (negative) significance and is not seen as a fatal flaw to the proposed development. It is therefore the opinion of the freshwater specialist that the proposed development is considered favourably, provided that the mitigation and monitoring measures as listed above are strictly adhered to.

8. Specialist Details and Experience

Louise is the Managing Director of EnviroSwift KZN (Pty) Ltd. She has a BSc Honours degree in Botany from the University of Cape Town. She began working as an environment specialist in 2012 and has since gained extensive experience in conducting freshwater as well as botanical assessments in the residential, mining and infrastructure development industries. Louise is a registered Professional Natural Scientist (Pr. Sci. Nat.) with the South African Council for Natural Scientific Professions (SACNASP Reg. no. 114072, registered under the field of Botany) and is a member of the South African Wetland Society, the Botanical Society of South Africa and the International Association of Impact Assessments South Africa. She has received a certificate of competence for the Tools for Wetland Assessments course attended at Rhodes University and has attended the SASS5 Aquatic Biomonitoring course presented by Dr Mark Graham as well as a soil classification course presented by Jon Atkinson of the KZN Department of Agriculture and Rural Development.

9. Disclaimer

The findings of the impact assessment are based on the authors professional knowledge as well as available information. EnviroSwift KZN (Pty) Ltd does not accept responsibility for any errors or omissions in the impact assessment and therefore does not accept any consequential liability arising from commercial decisions made, which are based on the information contained in this report. Opinions presented in this report apply to conditions/site conditions applicable at time of assessment and those conditions which are reasonably foreseeable.

10. References

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11. Appendix 1 – Impact Assessment Criteria[1]

The criteria used to determine impact consequence are presented in the tables below.

Table 1: Description of criteria considered when assessing potential impacts.

CRITERIA	DESCRIPTION OF ELEMENTS THAT ARE CENTRAL TO EACH ISSUE	
Extent of the impact	SITE SPECIFIC	Site specific: Extends only as far as the activity
	LOCAL	Limited to the site and its immediate surroundings
	REGIONAL	Regional/Provincial: Will have an impact on the region/province
	NATIONAL	National: Will have an impact on a national scale – particularly if an ecosystem or species of national significance is affected
Duration of impact	SHORT TERM	Construction phase
	MEDIUM TERM	Operational phase
	LONG TERM	Where the impact will cease after the operational or working life of the activity, either due to natural processes or by human intervention
	PERMANENT	Where mitigation or moderation by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient or temporary
Intensity of impact	VERY LOW INTENSITY	Natural, cultural and social functions and processes are not affected
	LOW INTENSITY	Affects the environment in such a way that natural, cultural and social functions and processes continue, although in a slightly modified way
	MEDIUM INTENSITY	Affects the environment in such a way that natural, cultural and social functions and processes continue, although in a modified way
	HIGH INTENSITY	Natural, cultural or social functions or processes are altered to the extent that they will temporarily or permanently cease
Probability of impact occurring	LOW	Improbable
	MEDIUM	Probable
	HIGH	Highly probable
	DEFINITE	Impact will occur regardless of any prevention methods
Determination of significance		
	LOW	The impacts will have a minor or insignificant influence on the watercourse.
	MEDIUM	The impacts will have a moderate influence on the watercourse. The impact can be ameliorated (lessened or improved) by a modification in the project design or implementation of effective mitigation measures.
	HIGH	The impacts will have a high influence on the watercourse. The impact can be ameliorated (lessened or improved) by a modification in the project design or implementation of effective mitigation measures. Should have an influence on decision, unless it is mitigated
	VERY HIGH	The impacts will have a major influence on the watercourse. The impacts could have the no-go implications on portions of the development regardless of any mitigation measures that could be implemented. Influence decision, regardless of any possible mitigation.

[1] Adapted from SRK Impact assessment methodology

SIGNIFICANCE RATING	LIST OF CRITERIA USED IN ASSIGNING A SPECIFIC SIGNIFICANCE RATING		
	INTENSITY	**EXTENT**	**DURATION**
Very High	High	National	Permanent / Long Term
	High	Regional	Permanent / Long Term
	Medium	National / Regional	Permanent
High Significance	High	Regional	Medium Term
	High	National	Short Term
	High	Local	Long Term / Permanent
	Medium	National	Medium Term
	Medium	Regional	Long Term
Medium Significance	High	Local	Medium Term
	Medium	Local	Permanent
	High	Regional	Short Term
	Medium	National	Short Term
	Medium	Regional	Medium Term
	Medium	Local	Long Term / Permanent
	Low	National	Medium Term
	Low	Regional	Long Term
Low Significance	High	Local	Short term
	Medium	Local	Short Term / Medium Term
	Medium	Regional	Short Term
	Low	National	Short Term
	Low	Regional	Medium Term
	Low	Local / Site specific	Long Term
	Low	Local	Permanent
Very Low Significance	Very Low	Local	Long Term / Permanent
	Low	Local	Short term
	Low	Site specific	Medium / Short Term
	Very low	Site specific / Local	Short Term