

APPENDIX F: IMPACT ASSESSMENT

1. IMPACT ASSESSMENT METHODOLOGY

The following criteria will be utilized to assess the predicted impacts. Results will be based on qualitative data and will be presented in a summary table for each impact. In each instance, individual variables will be compared with the 'no-go' option, and a distinction will be made between the effects that the activities will have on the receiving environment with and without mitigation measures in place.

Table 1: Impact Assessment Criteria

Criteria	Description
Aspect and Nature	<p>An aspect is an element of an organisation's activities, products and services which can interact with the environment which may result in an impact.</p> <p>The nature of the impact is described and the significance thereof determined.</p>
Status	<p>This describes whether the impact is positive (a benefit) or negative (a cost) and is deemed to be direct, indirect or cumulative in impact.</p> <p>Direct impact is caused by the action and occurs at the same time and place.</p> <p>Indirect impact is caused by the action and occurs later in time or is further removed in distance.</p> <p>Cumulative impact is the sum of existing conditions and the direct/indirect impacts resulting from the project. Cumulative impacts refer to the combined effect of changes to the environment caused by multiple human activities over space and time.</p>
Extent	<p>The physical and spatial scale of the impact. Whether the impact will occur on a scale limited to the immediate areas, footprint or site of the development activity or will the impact occur on a sub-regional (local), regional or national scale.</p>
Duration	<p>The lifetime of the impact is measured in relation to the lifetime of the proposed development.</p> <p>Whether the lifetime of the impact will be of a short duration (0-5 years); medium term (5-15 years); long-term (15 years, with the impact ceasing after the operational life of the development); or considered permanent where mitigation either 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 (i.e. impact will remain after the operational lifetime of the project).</p>
Intensity / Magnitude	<p>Whether the intensity (magnitude / size) of the impact is high, medium, low or negligible (no impact). This will be a relative evaluation within the context of all the activities and the other impacts within the framework of the project.</p>
Probability	<p>This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the lifecycle of the activity, and not at any given time.</p> <p>The probability of the impact actually occurring as either improbable (low likelihood); probable (distinct possibility); highly probable (most likely) or definite (impact will occur regardless of preventative measures).</p>

Criteria	Description
Significance	A distinction will be made for the significance rating without the implementation of mitigation measures and with the implementation of mitigation measures. The purpose of mitigation measures is to reduce the significance level of the anticipated impact. Refer to Table 2 for further description.
Confidence	This is the level of knowledge/information that the environmental impact practitioner or a specialist had in his/her judgement. The degree of confidence in the predictions, based on the availability of information and/or specialist knowledge.
Reversibility	Reversibility is the ability of the affected environment to recover from the impact. Examining whether the impacted environment can be returned to its pre-impacted state once the cause of the impact has been removed. The degree to which the impact and risk can be reversed: Yes: Affected environment is able to recover from the impact. No: Affected environment is unable to recover from the impact, i.e. permanently modified.
Replaceability	Examining if an irreplaceable resource is impacted upon. Replaceability is an indication of the scarcity of the specific set of parameters that make up the affected environment. That is, if lost can the affected environment be (a) recreated, or (b) is it a common set of characteristics and thus if lost is not considered a significant loss. The degree to which the impact and risk may cause irreplaceable loss of resources. Yes: Affected environment is replaceable, i.e. an irreplaceable resource is not damaged or the resource is not irreplaceable / scarce. No: Affected environment is irreplaceable.

Table 2: The significance of the identified impacts on the components of the affected environment:

Description	Explanation
No Impact	Where the project action will not cause any adverse or beneficial changes to the natural (biophysical), and/or socio-economic environment.
Impact of Low Significance	Where the project actions will result in minor short-term changes to the biophysical and/or socio-economic environment. The impacts will usually be restricted to the immediate area of the project action. The affected system should return to its natural or almost natural state in a short period of time (0 - 5 years). The impacts on human populations will be of a short duration and will not have any lasting consequences.
Impact of Moderate Significance	Where the project actions will result in moderate short-term or medium term changes to the biophysical and/or socio-economic environment. The effects of the impact could be experienced outside of the project action area and may be evident at a sub-regional or even a regional level. Minor indirect impacts may arise from the project action. The system should recover but it is unlikely that it will return to its natural state. Recovery would only take place in the medium term (5-15 years). Impacts on the human population will be felt after the project action is completed but are not severe and/or disruptive to their quality of life or economic well-being.

Description	Explanation
Impacts of High Significance	Where the project actions will result in major long-term changes to the biophysical and/or socio-economic environment. The effects of the impact will be experienced outside of the project action area and may be evident at a regional, national and even at the international level. Secondary or indirect impacts may arise from the project action. The system may recover over the long-term (>15 years) but will not revert to its natural state. Impacts on human populations will be felt after the project action is completed. The impacts are of a long-term nature and are disruptive to the previous life style of the affected population.

2. ASSESSMENT OF IMPACTS

Environmental issues (or impacts) that were identified during the basic assessment process (including impacts or issues identified by Interested and Affected Parties) have been considered, including an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures.

Mitigation measures proposed have been included in the assessment and Environmental Management Programme (EMPr).

2.1 ECOLOGICAL IMPACTS

2.1.1. LOSS OF VEGETATION

The footprint size of the activity is approximately 10ha in extent, including the linear routes for the pipelines. The construction phase would have the greatest impact on the vegetation. Clearance of vegetation will be required for the construction of the penstock pools, the hydropower house, the penstock pipelines, the intake channel, and the expansion of the access roads. The operational phase of the project would have a limited impact on vegetation regrowth within the footprint area of the hydropower system.

A total of 67 plant species were identified on site, of which one i.e. *Opuntia ficus-indica*, is listed as a declared weed i.e. Category 1 under the Conservation of Agricultural Resources Act No. 43 of 1983, and Category 1b under the National Environmental Management: Biodiversity Act 10 of 2004 – National Invasive Terrestrial and Fresh-water Plant Species List (published July 2016). Nine species of protected plants listed under the Eastern Province Nature and Environmental Conservation Ordinance of 1974 and the Draft Eastern Cape Environmental Conservation Act of 2003 were identified on site. No species listed as threatened on the Red List of South African Plants (version 2015.1) was identified on site. No protected tree species listed under the National Forests Act No. 43 of 1983 were identified on site (Louw, 2016; Appendix D-1).

According to Mucina and Rutherford (2006) the Little Fish Embedded Small Hydro site is located within three vegetation types. The Bedford Dry Grassland, within the Grassland Biome, is assigned a conservation status of Least Threatened, and a protection status of Not Protected [Conservation target: 23%; Protected: 0% (+1.1%); Remaining habitat: 96.8%]. The Southern Karoo Riviere vegetation, an Azonal vegetation biome, is assigned a conservation status of Least Threatened, and a protection status of Hardly Protected [Conservation target: 24%; Protected: 1.4% (+1.6%); Remaining habitat: 88.2%]. The south-eastern portion of the project site is mapped as Great Fish Thicket vegetation (Albany Thicket Biome) though, if at all present on site, only small patches of Great Fish Thicket vegetation occur near the Little Fish River, and not in the southern section of the project site, as mapped. Great Fish Thicket vegetation is assigned a conservation status of Least Threatened, and a

protection status of Poorly Protected [Conservation target: 19%; Protected: 6.1% (+4.5%); Remaining habitat: 96%] (Louw, 2016; Appendix D-1).

Vegetation of the Little Fish small hydro project footprint appears largely intact, given the arid climate, gravelly soils, north-facing hillslopes, and often sparsely-vegetated nature of the site. However, the past grazing and fire management history of the project site is unknown. There is also a very low presence of exotic and alien invasive plant species on site. Given that vegetation appears to be largely intact, except in disturbed areas i.e. along gravel roads and embankments of the Little Fish irrigation canal, vegetation can be considered to be of a moderate to high conservation value (Louw, 2016; Appendix D-1).

Though Bedford Dry Grassland vegetation enjoys very little formal protection / conservation, and is listed as Not Protected, but Least Threatened – vegetation clearing along the relatively small development footprint of the Little Fish small hydro project is not anticipated to result in a significant negative impact on conservation targets for this vegetation type, or result in significant negative impacts on biodiversity and ecosystem functioning in this area (Louw, 2016; Appendix D-1).

The project site is mapped as occurring in areas with an Ecosystem Status of Least Threatened.

Mitigation Measures: Construction Phase:

1. Where feasible, development of power lines, pipelines and associated structures should be restricted to existing cleared areas and gravel roads / pathways.
2. The power line and pipeline footprints should be kept to a minimal width and length.
3. Topsoil and subsoil should be conserved and returned once development is complete, to encourage recruitment from the soil-stored seed bank.
4. Reseeding of disturbed soil with grass species i.e. *Cynodon dactylon* (Quick Grass), or any other indigenous grass species suitable to the soil and climate of the area, will likely be required as part of rehabilitation efforts in order to restrict soil erosion, and encourage succession in areas that will not be actively replanted or landscaped as part of the development.
5. The site camp to be located in an already disturbed area with existing access, to minimise additional disturbance and clearing of vegetation.
6. Work areas must be clearly demarcated, e.g. with droppers and/or orange netting but not with danger tape, so that construction workers limit their impact to these areas alone.
7. All construction vehicles must stay on single demarcated access tracks to avoid compaction of soil and roots.
8. Limit any disturbance to the vegetation only to that which is essential for the development. All remaining indigenous vegetation to be left intact.
9. Rehabilitation should be undertaken in a progressive manner. Re-vegetation of the disturbed areas with indigenous material should be undertaken as soon as construction activities at an individual site have been completed.

Mitigation Measures: Operational Phase:

1. Vegetation regrowth within the access roads, penstock pipelines and transmission lines to be controlled, i.e. removed physically or through chemical means by operational contractor.

With the mitigation measures in place, the impact on the loss of vegetation would remain localised resulting in a low impact.

No-Go Alternative: No indigenous vegetation will be cleared, and impact remains at a moderate positive significance.

Theme	Ecological			
Impact	Loss of Vegetation			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Aspect and Nature	None	Clearing of vegetation for construction activities	Clearing of vegetation for operational activities	No clearing of vegetation
Status		Direct, Negative	Direct, Negative	Direct, Positive
Extent		Limited to site/ footprint area	Limited to site/ footprint area	Limited to site/ footprint area
Duration		Long-term	Long-term	Long-term
Intensity		Medium	Medium	Low
Probability		Definite	Definite	Definite
Confidence		High		
Reversibility	None	Yes	Yes	Yes
Replaceability		Yes	Yes	Yes
Level of Significance before mitigation	None	Moderate (-)	Moderate (-)	Moderate (+)
Level of Significance after Mitigation	None	Low (-)	Low (-)	Moderate (+)

2.1.2. LOSS OF HABITAT CONTAINING SPECIES OF SPECIAL CONCERN

The Eastern Cape Biodiversity Conservation Plan (ECBCP) (2007) indicates that the footprint of the Little Fish small hydro project falls entirely within a Terrestrial Critical Biodiversity Area (CBA) 2. Terrestrial CBA 2 areas are included under Biodiversity Land Management Class (BLMC) 2: Near-natural landscapes. The recommended land use objectives for BLMC 2 areas are to 'maintain biodiversity in near natural state with minimal loss of ecosystem integrity. No transformation of natural habitat should be permitted'.

According to the Biodiversity Sector Plan (BSP) for the Blue Crane Route Municipality (2012) the proposed hydropower system falls within a CBA, Ecological Support Area (ESA) and Other Natural Area (ONA). The management objective for the CBA and ESA is to 'maintain natural land, rehabilitate degraded to natural or near natural and manage for no further degradation'. The land use activity for infrastructure installations has a 'Restricted' classification, where land use is possible under strict controls in order to avoid impacts on biodiversity.

Nine species of protected plants listed under the Eastern Province Nature and Environmental Conservation Ordinance of 1974 and the Draft Eastern Cape Environmental Conservation Act of 2003 were identified on site. Protected plants require permits from the relevant authorities i.e. DEDEAT, prior to their disturbance, removal, and / or transplantation. No species listed as threatened on the Red List of South African Plants (version 2015.1) was identified on site. No protected tree species listed under the National Forests Act No. 43 of 1983 were identified on site (Louw, 2016; Appendix D-1).

Mitigation Measures: Planning & Design Phase:

1. SCCs and Protected Plants identified on site should be removed from the pipeline footprint, once surveyed and pegged, and replanted in the same general area, but outside the pipeline footprint, as part of search and rescue efforts.
2. Permits must be obtained from the DEDEAT prior to the removal of protected and SSCs.

- Where feasible, development of linear structures should be restricted to existing cleared/transformed areas and gravel roads / pathways. The power line and pipeline footprints should be kept to a minimal width and length.

Mitigation Measures: Construction Phase:

- Topsoil and subsoil should be conserved and returned once development is complete, to encourage recruitment from the soil-stored seed bank.
- The site camp to be located in an already disturbed / transformed area with existing access, to minimise additional disturbance to habitat and SSCs.
- Only shrubs are to be removed for the construction camp area and laydown areas. Grass is to be left in place.
- Work areas must be clearly demarcated, e.g. with droppers and/or orange netting but not with danger tape, so that construction workers limit their impact to these areas alone.
- All construction vehicles must stay on single demarcated access tracks to avoid creep into surrounding areas.
- Limit any disturbance to the vegetation only to that which is essential for the development. All remaining indigenous vegetation to be left intact.
- Rehabilitation should be undertaken in a progressive manner. Re-vegetation of the disturbed areas with indigenous material should be undertaken as soon as construction activities at an individual site have been completed.
- Reseeding of disturbed soil with grass species i.e. *Cynodon dactylon* (Quick Grass), or any other indigenous grass species suitable to the soil and climate of the area, will likely be required as part of rehabilitation efforts in order to restrict soil erosion, and encourage succession in areas that will not be actively replanted or landscaped as part of the development.

Mitigation Measures: Operational Phase

- Shrubs and trees located on the boundary of the site should be left intact and not removed.
- DEDEAT Permits to be obtained for any removal of SCCs and Protected Plants within the hydropower system due to maintenance requirements.

With the mitigation measures in place, the impact on the loss of habitat would remain localised resulting in a medium impact.

No-Go Alternative: No protected or endangered species will be physically removed; however a risk remains that these species will be lost to animals as a food source. Impact remains at a medium negative significance.

Theme	Ecological			
Impact	Loss of habitat containing species of special concern			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Aspect and Nature	Removal of SCCs within footprint area	Removal of SCCs within footprint area	Loss of protected species and SSC from operational activities	Loss of protected species and SSC from grazing
Status	Direct, Negative	Direct, Negative	Direct, Negative	Direct, Negative
Extent	Regional	Regional	Regional	Regional
Duration	Permanent	Permanent	Permanent	Long Term
Intensity	Medium	Medium	Medium	Medium
Probability	Definite	Definite	Definite	Likely
Confidence	High			

Theme	Ecological			
Impact	Loss of habitat containing species of special concern			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Reversibility	Yes	Yes	Yes	Yes
Replaceability	Yes	Yes	Yes	Yes
Level of Significance before mitigation	Moderate (-)	Moderate (-)	Moderate (-)	Moderate (-)
Level of Significance after Mitigation	Low (-)	Low (-)	Low (-)	Moderate (-)

2.1.3. POTENTIAL SPREAD OF ALIEN VEGETATION

A low level of alien plant invasion is scattered across the site. One plant species (*Opuntia ficus-indica*) identified on site are listed as declared weeds i.e. Category 1 under the Conservation of Agricultural Resources Act (CARA) (No. 43 of 1983), and Category 1b under the National Environmental Management: Biodiversity Act (No. 10 of 2004) – National Invasive Terrestrial and Fresh-water Plant Species List.

The potential of alien plants spreading is likely if not managed during the site establishment, construction and operational phases.

Mitigation Measures: Construction Phase

1. Disturbed areas should be kept to a minimum, keeping the width and length of the earth works to a minimum.
2. Rehabilitation should be undertaken in a progressive manner. Re-vegetation of the disturbed areas with indigenous material should be undertaken as soon as construction activities at an individual site have been completed.
3. The shallow topsoil layer to be stockpiled separately from the subsoil layers, should the excavation exceed 0.5m. When the construction has been completed, then the topsoil layers, which contain seed and vegetative material, should be reinstated last thus allowing plants to rapidly re-colonise the bare soil areas.
4. Alien plant regrowth is to be monitored during construction on-site by the Contractor's Environmental Officer and any such species to be removed either by physical (preferable) or chemical means by the Contractor.

Mitigation Measures: Operational Phase

1. Alien plant growth to be monitored and area to be kept free of alien invasive plants and declared weeds by the operational contractor.

With the mitigation measures in place, the impact on the indigenous vegetation would remain localised, with natural re-vegetation happening within a short time period, resulting in a low risk and low impact significance.

No-Go Alternative: The risk remains that the current alien vegetation may spread into surrounding areas, if not controlled. Impact can be reduced to a low negative significance with the implementation of an alien plant monitoring and control programme by the landowner.

Theme	Ecological			
Impact	Potential Spread of Alien Vegetation			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Aspect and Nature	None	Spread of Alien Vegetation	Spread of Alien Vegetation	Spread of Alien Vegetation
Status		Direct, Negative	Direct, Negative	Direct, Negative
Extent		Local	Local	Local
Duration		Permanent	Permanent	Permanent
Intensity		Medium	Medium	Medium
Probability		Likely	Likely	Likely
Confidence		High		
Reversibility	None	Yes	Yes	Yes
Replaceability		Yes	Yes	Yes
Level of Significance before mitigation		Moderate (-)	Moderate (-)	Moderate (-)
Level of Significance after Mitigation	None	Low (-)	Low (-)	Low (-)

2.1.4 POTENTIAL LOSS OF AQUATIC HEALTH

This impact focuses on increased sediment input and turbidity levels in the watercourse.

A non-perennial drainage line is located to the east of the proposed hydropower system. The drainage line starts at the end of the Orange – Fish – Sundays Water Transfer Canal and flows in a north-easterly direction to flow into the Little Fish River. The drainage line section is known as the Cascades section. The Little Fish River is located to the north of the proposed hydropower system.

The Little Fish River in the affected reach, has been moderately transformed and modified by the almost constant inflow of the relatively large volume (8 cumecs) of water from the Fish – Sundays Canal. In addition, the introduction of fish alien to this system via the Orange – Fish – Sundays Canal has also modified and degraded the ecological functioning of the river to the detriment of endemic species (Bok, 2016; Appendix D-2).

In terms of the National Freshwater Ecosystem Priority Areas (NFEPA) study, this reach of the Little Fish River is considered to have very limited value in terms of fish biodiversity or freshwater ecosystem conservation. This reach of the Little Fish River has a C- Category Present Ecological Status (PES), and Moderate Ecological Importance (EI) and Moderate Ecological Sensitivity (ES) (Bok, 2016; Appendix D-2).

Increased sediment input and raised turbidity levels in the river during construction due to disturbance and erosion of riparian zones, river banks and adjacent areas could have serious negative impacts on aquatic habitats and biota.

The negative impacts of elevated turbidity on fish and other aquatic biota, include:

- The whole food web can be disrupted due to reduced light penetration and photosynthesis, resulting in reduced primary production and a reduction in submerged plant life.
- Reduced number of benthic organisms (e.g. benthic algae, crabs, small aquatic invertebrates) due to altered substrate composition and smothering.

- Clogging, abrading and damage to fish gills, leading to reduced oxygen absorption, damage to gill filaments, resulting in increased stress, disease and even death.
- Smothering of newly fertilized fish eggs and larval fish.
- Reduced feeding efficiency and slower growth rates, even starvation of fish – this can have a major impact on visual predators as they are unable to see and find enough food in the turbid water and filter feeders are unable to cope with a high proportion of non-food items.

Clearing of top-soil and vegetation cover in preparation for construction of infrastructure on steep slopes adjacent to the river, particularly in the riparian zone, could increase soil erosion and sediment input into the adjacent river channel. This has particularly relevance to the removal of riparian trees and other stabilising vegetation for construction of the hydro powerhouse and return slipway. Poorly-planned design and construction of the powerhouse in the riparian zone and the discharge slipway over the river bank could cause serious bank erosion or slumping during high floods, resulting in sediment input and elevated turbidity and filling in pools within the watercourse. Run-off from newly-cleared areas and earth-moving activities on steep gradients during construction of the penstock pools and penstock pipes may increase soil erosion during heavy rains resulting in sediment input to the river, increasing the turbidity levels.

During operations, unless all disturbed areas on the banks and riparian zones of the Little Fish River are adequately stabilized post construction it is possible that erosion and bank slumping may occur during floods.

Mitigation Measures: Construction Phase

1. The design of the powerhouse and return slipway should ensure that high flows are not impeded, ensuring that scouring and flood damage does not occur;
2. Appropriate (best practice) gabion or other erosion and flood protection works should be constructed for the powerhouse and slipway;
3. Appropriate erosion-protection works to be constructed and suitable indigenous vegetation re-established on all disturbed areas along the new water channel, penstock pipes and penstock pools.
4. Silt fences to be installed.

Mitigation Measures: Operational Phase

1. Maintenance of the erosion protection works and ensure areas remain stabilised.
2. Sedimentation must be minimised through the effective stabilisation (e.g. gabions and Reno mattresses) and the re-vegetation of cleared areas.
3. An effective long-term operational and management plan should be drawn up and submitted by the Applicant

The Little Fish River already has a moderately modified present ecological status (PES of a C Category) due to the impact of the farming activities and the constant canal discharges into a previously non-perennial or seasonal river stream. The significance of the possible impact of elevated erosion and turbidity due to this project is thus considered to be moderate. With appropriate mitigation this should be reduced to a low impact.

No-Go Alternative: No change in status.

Theme	Ecological			
Impact	Potential Loss of Aquatic Health			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Nature	None	Increased sediment input and turbidity during construction.	Increased sediment input and turbidity during operations	No change in status
Status		Direct, Negative	Direct, Negative	
Extent		Footprint / Site	Footprint / Site	
Duration		Medium term	Medium term	
Intensity		High	Medium	
Probability		Likely	Likely	
Confidence	High			
Reversibility	None	Yes	Yes	No change in status
Replaceability		Yes	Yes	
Level of Significance	None	Moderate (-)	Moderate (-)	No change in status
Level of Significance after Mitigation	None	Low (-)	Low (-)	No change in status

3.1.5 SOIL, SURFACE AND GROUNDWATER POLLUTION (WATER QUALITY)

The water quality in the river has been seriously impacted by the discharge of poor-quality sewage effluent from upstream Somerset East and irrigation return flows contaminated with chemicals from large-scale pivot irrigation in the catchment.

Soil and water pollution impacts relate to spillages from construction materials, such as diesel, oils and cement, if dispersed via surface run-off, or are allowed to permeate into the soils and groundwater.

Toxic chemicals associated with the construction activities and machinery used during construction can be very harmful to aquatic biota. During rainfall events or after accidental spillages, these chemical could be washed into the adjacent watercourse and then downstream, posing a risk to downstream aquatic biota. Chemical pollutants (hydrocarbons, drilling and cleaning fluids) associated with site-clearing and earth-moving machinery could wash into the river. Hazardous materials & chemical pollutants stored on site and used in construction could accidentally spill or be washed into the river channel. Uncured concrete and dry cement powder could contaminate the watercourse – e.g. due to heavy rains during construction. It is important to note that uncured cement is highly alkaline and could significantly raise the pH of any water in contact with it to levels lethal to fish life.

During construction there will be a short-term risk of chemical pollution associated with construction activities and machinery, which could potentially result in pollution impacts of moderate significance in the Study Area and downstream. However, with appropriate mitigation this potential impact could readily be reduced to low significance.

Malfunction or breakdown of machinery (e.g. turbines and associated equipment) during the operational phase resulting in hydrocarbon contamination of the water discharged into the river. Pollution risks should be minimal during operation provided due maintenance and repairs are carried out, as well as having a sound operation and maintenance plan is drawn up and implemented.

Mitigation Measures: Construction Phase

1. Strict use and management of all hazardous materials used on site.
2. Strict management of potential sources of pollution (hydrocarbons from vehicles & machinery, cement during construction, etc.).
3. Containment of all contaminated water before it can enter the adjacent watercourse.
4. Chemicals must be stored safely on site, on an impermeable lined surface and surrounded by lined bunds. Chemical storage containers must be regularly inspected so that any leaks are detected early. MSDS for hazardous materials must be kept on site.
5. Littering and contamination of water sources during construction must be prevented by effective construction camp and site management.
6. Emergency plans must be in place in case of spillages onto road surfaces and drainage lines.
7. All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised. Stormwater must be directed around the stockpiles.
8. The topsoil layer (300mm of the top surface layer, including organic matter) must be stockpiled separately from the subsoil layers and used during reinstatement thus allowing plants to rapidly re-colonise the bare soil areas.
9. Spill kits for small spills to be kept on site.

Mitigation Measures: Operational Phase

1. Broken, or damaged or equipment are to be replaced/ repaired immediately.
2. A strict operation and maintenance programme for the hydro power facility should be implemented.

The impact can be mitigated to a low negative impact significance, from a medium negative impact.

No-Go Alternative: No change in status.

Theme	Ecological			
Impact	Soil, surface and groundwater pollution			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Nature	None	Potential pollution of soils, surface and groundwater from construction activities. Accidental spillage of chemical pollutants, hazardous materials, cement and construction activities	Potential pollution of soils, surface and groundwater from operational activities. Malfunction / Breakdown of machinery resulting in hydrocarbon contamination	No change in status
Status		Direct, Negative	Direct, negative	
Extent		Regional	Regional	
Duration		Short term	Medium term	
Intensity		High	Medium	
Probability		Likely	Unlikely	
Confidence	High			
Reversibility	None	Yes	Yes	No change in status
Replaceability		Yes	Yes	
Level of Significance before mitigation	None	Moderate (-)	Moderate (-)	No change in status

Theme	Ecological			
Impact	Soil, surface and groundwater pollution			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Level of Significance after Mitigation	None	Low (-)	Low (-)	No change in status

3.1.6 IMPACTS TO FAUNA AND AVIFAUNA

The site does not fall within an Important Bird Area (BGIS).

Construction activities may disturb any fauna located within the immediate location; however this will be limited to the construction phase. Fauna will need to remain out of the construction area; as a result the construction site will need to be fenced.

Overhead transmissions lines may present a potential collision risk or electrocution to avifauna during the operational phase. No fauna impacts are anticipated during the operational phase.

Increased sediment input and raised turbidity levels in the river due to disturbance and erosion of riparian zones and adjacent areas, as well as river bed and banks, could have serious negative impacts on aquatic habitats and biota; during the construction and operational phases.

Mitigation Measures: Construction Phase

1. Work areas must be clearly demarcated, so that construction workers limit their impact to these areas alone.
2. All construction vehicles must stay on single demarcated access tracks to avoid small fauna.
3. The site camp to be located in an already disturbed area with existing access.
4. Fires are to be prohibited on and adjacent to the site.
5. Vegetation that was cleared may provide useful fauna habitat. Logs, limbs and stumps should be cleared and stockpiled separately to the topsoil stripping operation.
6. Gabion protection works and rehabilitation of all disturbed areas, including the pipeline trench with appropriate indigenous vegetation will be necessary.
7. Sedimentation must be minimised through the effective stabilisation (e.g. gabions and Reno mattresses) and the re-vegetation of cleared areas.

Mitigation Measures: Operational Phase

1. All overhead power lines to include bird deflectors
2. To prevent scouring and erosion during heavy rains via surface run-off, appropriate gabion protection works and rehabilitation of all disturbed areas, including the pipeline trench with appropriate indigenous vegetation will be necessary
3. Maintenance of the erosion protection works and ensure areas remain stabilised

With appropriate mitigation this should be reduced to a low or insignificant impact.

No-Go Alternative: No change in status.

Theme	Ecological			
Impact	Impacts to Fauna and Avifauna			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Aspect and Nature	None	Disturbance to fauna and avifauna from construction activities; Run-off from newly-cleared areas and earth-moving activities increasing sediment and turbidity affecting aquatic biota	Flood damage and bank erosion could occur resulting in elevated sediment input into the river thereby affecting aquatic biota. Overhead transmissions lines may present a potential collision risk or electrocution to avifauna.	No change in status
Status		Direct, Negative	Direct, Negative	
Extent		Immediate footprint/ site	Regional	
Duration		Short	Long	
Intensity		Medium	Medium	
Probability		Probable	Unlikely	
Confidence	High			
Reversibility	None	Yes	Yes	No change in status
Replaceability		Yes	Yes	
Level of Significance	None	Moderate (-)	Moderate (-)	No change in status
Level of Significance after Mitigation	None	Low (-)	Low (-)	No change in status

2.2 AIR QUALITY IMPACTS

Dust and air pollution impacts relate to the generation of dust during construction related activities, poorly maintained construction vehicles and burning materials for warmth during winter by contraction staff.

In relation to operational phase activities, the impact relates mainly to dust from cleared areas, e.g. the gravel access. The operation of Hydropower system does not produce any emissions.

Mitigation Measures: Construction Phase:

1. Prompt rehabilitation and wetting down of recently cleared areas to minimize dust creation.
2. Until vegetation used in rehabilitation efforts has established, temporary stabilization methods must be used (e.g. protecting exposed soils with coarse granular materials, mulches, or straw).
3. Construction should be undertaken in a phased manner, so as to limit the size of the area to be exposed at any one time.
4. Dust levels are not to exceed 1200mg/m²/day (30 day average) for rural areas.
5. Dust suppression techniques (e.g. wetting of areas) to be used on all dust generating surfaces. Potable and contaminated water not to be used as a dust-suppressing agent.
6. All work must stop during high wind conditions (i.e. when wind speeds exceed 35km/h).
7. Construction vehicles must adhere to speed limits.

8. No materials shall be burnt.
9. Trucks transporting any form of soil or waste should be covered with a tarpaulin.
10. Vehicles and machinery will be maintained in good running condition.
11. No waste may be buried.
12. Contact details (e.g. telephone number) should be located at the entrance of the site for reporting of excessive dust after hours.

Mitigation Measures: Operational Phase:

1. Vehicles must adhere to speed limits on gravel roads.
2. No waste materials shall be burnt.
3. Maintaining re-vegetated areas to limit exposed soils.
4. No waste may be buried.

The impact can be mitigated to a low negative impact significance, from a medium negative impact.

No-Go Alternative: No change in status.

Theme	Air quality impacts			
Impact	Dust and Air Pollution			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Nature	None	Dust and emissions from construction works	Dust from cleared areas and gravel roads	No change in status
Status		Direct, negative	Direct, Negative	
Extent		Local	Local	
Duration		Short term	Long term	
Intensity		Medium	Low	
Probability		Definite	Likely	
Confidence		High		
Reversibility	None	Yes	Yes	No change in status
Replaceability		Yes	Yes	
Level of Significance before mitigation	None	Moderate (-)	Low (-)	No change in status
Level of Significance after Mitigation	None	Low (-)	Low (-)	No change in status

2.3 HERITAGE RESOURCE IMPACTS

The loss of heritage resources relates to the possible loss of cultural heritage resources, including archaeological artefacts.

The area is of low cultural sensitivity and it is highly unlikely that any archaeological remains of any significance will be found *in situ* or exposed during the development.

There are no known graves or historical buildings older than 60 years on the site.

Impact on heritage resources would occur only in the construction phase, with no impact anticipated in the operational phase.

Mitigation Measures: Construction Phase:

1. Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the find brought to the immediate attention of the Resident Engineer or his representative who will report it to the Eastern Cape Provincial Heritage Resources Authority (043 6422811). The area will be fenced off with a radius of 20m around the unearthed item, demarcated as a no-go area and access will be prohibited.
2. Human remains confirmed younger than 60 years (to be confirmed by the police forensic unit or archaeologist) are to be reported directly to the nearest police station.
3. Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the National Heritage Resources Act (Act No. 25 of 1999), Section 51.(1).

The impact can be mitigated to a very low negative impact significance, from a low negative impact.

No-Go Alternative: No change in status.

Theme	Heritage Resources			
Impact	Loss of heritage resources			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Aspect & Nature	None	Loss/damage to heritage / archaeological artefacts during construction	None	No change in status
Status		Direct, Negative		
Extent		Limited to site / footprint area		
Duration		Permanent		
Intensity		Medium		
Probability		Unlikely		
Confidence		High		
Reversibility	None	No	No	No change in status
Replaceability		No	No	
Level of Significance before mitigation	None	Low (-)	None	No change in status
Level of Significance after Mitigation	None	Very Low (-)	None	No change in status

2.4 LAND USE IMPACTS

2.4.1 LOSS OF AGRICULTURAL LAND

Agricultural potential of the site is low as it is classified as non-arable agricultural land (CDM SDF, 2013). As such, the site is not suitable for cultivation purposes. The site is currently utilised partially as a grazing area for game / livestock, and historically has been utilised as a grazing area for livestock.

The proposed hydro power site is currently zoned as Agriculture.

Mitigation Measures: Construction Phase

1. Where feasible, development of power lines, pipelines and associated structures should be restricted to existing cleared areas and gravel roads / pathways.
2. The power line and pipeline footprints should be kept to a minimal width and length.
3. Work areas must be clearly demarcated, e.g. with droppers and/or orange netting but not with danger tape, so that construction workers limit their impact to these areas alone.

The construction related impact can be mitigated to a low negative impact, from a moderate negative impact.

No mitigation measures are identified for the operational phase.

No-Go Alternative: The site would be continued to be used for grazing. The significance remains at a moderate positive impact.

Theme	Land Use			
Impact	Loss of Agricultural Land			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Aspect and Nature	None	Construction areas leading to additional loss of agricultural land	Hydro power house, penstock pools and penstock pipelines leading to the loss of agricultural land	Area will be continued to be used for grazing
Status		Direct, Negative	Direct, Negative	Direct, Positive
Extent		Limited to footprint / site	Limited to footprint / site	Limited to footprint / site
Duration		Short term	Long term	Long term
Intensity		Medium	Medium	Medium
Probability		Definite	Definite	Highly probable
Confidence		High		
Reversibility	None	Yes	Yes	Yes
Replaceability		Yes	Yes	Yes
Level of Significance before mitigation	None	Moderate (-)	Moderate (-)	Moderate (+)
Level of Significance after Mitigation	None	Low (-)	Moderate (-)	Moderate (+)

2.4.1 SOIL EROSION

The general description for soils in the northern and southern sections of the Little Fish small hydro project site is 'soils with minimal development, usually shallow, on hard or weathering rock, with or without intermittent diverse soils. Lime generally present in part or most of the landscape'. The general description for soils in the middle section of the project site is 'soils with a marked clay accumulation, strongly structured and a non-reddish colour. They may occur associated with one or more of vertic, melanic and plinthic soils (BGIS).

The clay component is less than 15% (ENPAT 2001).

Soil exposed by the clearing of vegetation during construction will have substantially elevated erosion levels. The risk of soil erosion increases in areas where vegetation and rocks are removed in order to cater for linear infrastructure and access roads.

Areas that may require clearing include the hydro power house, penstock pools, penstock pipelines, and construction and laydown areas in order to undertake the required construction. Some of these areas may not be required for operational phase.

Mitigation Measures: Construction Phase

1. It is important that adequate soil conservation measures are in place during both construction and operational phases.
2. Compaction of clayey soil should be kept to a minimum during the construction phase, particularly in wet areas, in order to optimise the successful rehabilitation of disturbed soil.
3. Topsoil and subsoil should be conserved and returned once development is complete, to encourage recruitment from the soil-stored seed bank. This is particularly important for the project site, as the soil layer is likely extremely limited due to the presence of gravel, and shallow bedrock.
4. Soil level / landscape contours should be restored to its original state (where feasible), in order to encourage encroachment of neighbouring vegetation into disturbed areas, and allow wind-blown seed establishment i.e. all topsoil, subsoil and gravel stockpiles should be levelled to blend into the landscape upon completion.
5. Anti-erosion measures to be included to disperse run-off so as to reduce the volume and velocity of surface water flow and vulnerable areas to be stabilised.

Mitigation Measures: Operational Phase

1. Maintenance of erosion control structures.

The impact can be mitigated to a low negative impact significance, from a moderate negative impact.

No-Go Alternative: No change in status.

Theme	Land Use			
Impact	Soil Erosion			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Aspect and Nature	None	Construction activities and vegetation clearance leading to soil erosion	Soil erosion from increased run off due to cleared areas	No change in status
Status		Indirect, Negative	Indirect, Negative	
Extent		Limited to footprint / site	Limited to footprint / site	
Duration		Short term	Long term	
Intensity		Medium	Medium	
Probability		Most likely	Most likely	
Confidence	High			
Reversibility	None	Yes	Yes	No change in status
Replaceability		Yes	Yes	
Level of Significance before mitigation	None	Moderate (-)	Moderate (-)	No change in status

Theme	Land Use			
Impact	Soil Erosion			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Level of Significance after Mitigation	None	Low (-)	Low (-)	No change in status

2.5 WASTE MANAGEMENT IMPACTS

Hydropower technology generates electricity by utilising the flow of water. Renewable energy technology produces zero greenhouse gas emissions, air pollutants and waste.

Impacts relating to ineffective waste management procedures may lead to the dumping of building rubble, littering and pollution of the surrounding areas as well as unsanitary (toilet) conditions and an increase in vermin.

Construction waste will be removed from site by the appointed contractor to a registered waste disposal site. Where possible, excavated material and inert construction waste material will be used as fill material or in site levelling. Domestic and construction waste will increase the amount of waste disposed to landfill, including cleared vegetation.

No vermin will be attracted during the operational phase. Debris (vegetation and animal carcasses) in the canal would need to be collected prior to the canal water flowing through the hydropower system. Maintenance procedures may result in the disposal of equipment. This waste will be removed from site by the operational contractor and disposed of at a registered landfill site during the operational phase, unless it is able to be recycled or reused.

During the construction phase chemical toilet facilities will be provided at construction areas and secured to the ground, and cleaned at least weekly. During the operational phase, the operational contractor will not be on site full time, and toilet facilities will not be required.

Mitigation Measures: Construction Phase

1. Cleared vegetation to be mulched or disposed of at the Somerset East licensed landfill site. Stockpiles of vegetation not to be left on site due to fire hazard.
2. Good housekeeping to be undertaken at all times.
3. No illegal dumping or burning of waste allowed. Waste is not to be buried.
4. Where possible, the contractor must register with the local waste exchange programme for re-use and recycling of construction rubble.
5. Awareness training to be undertaken with the construction workers regarding health and environmental impacts from illegal dumping.
6. Any excavated material not reused on site, to be disposed of at the Somerset East licenced landfill site.
7. Waste bins are to be located at the construction camp and construction site. Bins are to have secured lids to prevent waste from being blown into the surrounding area and to prevent animals scavenging in the bins.
8. Domestic and general construction waste to be disposed of at the Somerset East licensed landfill site. The Contractor may not utilise the municipal waste collection services. Proof of disposal must be kept at the site office by the Contractor.
9. Chemical toilet facilities to be provided at construction areas and secured to the ground, cleaned at least weekly. Water should be provided for washing and sanitary bins for women. Waste to be disposed of at a wastewater treatment works.

10. No hazardous waste material to be disposed of as general waste. Hazardous waste (e.g. old oil) to be stored separately in impermeable (i.e. leak proof) containers, and sent for recycling.
11. Proof of waste disposal must be kept on site.
12. A Waste Management Method Statement must be submitted by the appropriate contractor to the Resident Engineer or his representative for approval.

Mitigation measures: Operational Phase

1. Decommissioned, faulty or broken equipment is to be taken off site and recycled. If items are unable to be recycled, to be disposed of at an appropriate landfill site.
2. No illegal dumping, burying or burning of waste allowed. Waste is not to be buried.
3. No hazardous waste material to be disposed of as general waste.
4. Proof of waste disposal must be kept.

The impact can be mitigated to a low negative impact significance, from a moderate negative impact.

No-Go Alternative: Debris (vegetation and animal carcasses) in the canal is removed and discarded prior to the canal water flowing through the weirs and Little Fish River. The impact significance remains at moderate negative.

Theme	Waste Management			
Impact	Liquid and solid waste			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Nature	None	Liquid and solid waste generated by construction activities	Solid waste generated during operational phase	Debris (vegetation and animal carcasses) in the canal is removed and discarded
Status		Direct, Negative	Direct, Negative	Indirect, Negative
Extent		Regional	Regional	Regional
Duration		Short term	Medium Term	Long Term
Intensity		Medium	Low	Low
Probability		Highly probable	Likely	Likely
Confidence	High			
Reversibility	None	Yes	Yes	Yes
Replaceability		Yes	Yes	Yes
Level of Significance before mitigation	None	Moderate (-)	Moderate (-)	Moderate (-)
Level of Significance after Mitigation	None	Low (-)	Low (-)	Moderate (-)

2.6 SOCIAL IMPACTS

2.6.1 NOISE POLLUTION

Noise creation from construction workers and vehicles may impact on surrounding landowners during the construction phase. This includes noise emanating from construction machinery, power tools and compressors, construction vehicles and general construction activity.

Noise activities during the operational phase would be limited to periods when maintenance activities are being undertaken.

Given that the proposed site is located outside an urban area, no sensitive receptors in close proximity and provided that mitigation measures are implemented, a negligible impact from noise generation is anticipated during construction. During the operational phase, the noise impact will be low as there are no sensitive receptors within 500m of the site.

Mitigation Measures: Construction Phase

1. Limit intrusive construction activity to daylight hours and normal working days; i.e. weekdays between 07:00 and 17:00; and Saturdays until 13:00.
2. No construction staff to be housed on site.
3. All construction vehicles must be in sound working order with the prescribed mufflers and silencers.

No-Go Alternative: No change in status

Theme	Social			
Impact	Noise Pollution			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Aspect and Nature	None	Noise from construction activities and works	Noise from operation and maintenance activities	No change in status
Status		Direct, Negative	Direct, Negative	
Extent		Limited to footprint / site	Limited to footprint / site	
Duration		Short term	Long Term	
Intensity		Medium	Low	
Probability		Definite	Likely	
Confidence		High		
Reversibility	None	Yes	Yes	No change in status
Replaceability		Yes	Yes	
Level of Significance before mitigation	None	Moderate (-)	Low (-)	No change in status
Level of Significance after Mitigation	None	Low (-)	Low (-)	No change in status

2.6.2 HEALTH, SAFETY & SECURITY

This impact refers to public health, safety and security concerns including linkages to fire management.

Health and Safety:

General safety of persons is a concern due to construction activities, e.g. open excavations and machinery, resulting in potential injury to construction staff; health and safety aspects relate to the potential spread of HIV and STDs. Strict adherence to health and safety regulations during construction is vital.

Security:

Security aspects relate to potential theft of construction materials and theft of neighbouring farmers livestock or equipment. The presence of workers on the site for construction related activities, irrespective of whether or not they are local, may create an increased safety and security risk to local

households in the area. In addition, any changes in the local crime rates are likely to be attributed to the influx of construction workers, whether such changes can be attributed to their presence or not.

The security risks would be higher during the construction phase. The contractor would have security on-site full time during the construction phase. During the operational phase the operational contractor would check the site periodically and it is anticipated that some security checks will be made on a regular basis.

Fire:

Fire is a potential risk with any electrical system. Veld fires are a potential risk considering the vegetation types occurring within and adjacent to the site. During construction the risk may be attributed to inappropriate construction activities (e.g. hot work, welding) on dry, windy days. During the operational phase, fire risks may be associated with incorrect or loose wiring within the powerhouse or transmission lines, or when wiring is inadequate and cannot withstand electricity generation.

Mitigation Measures: Construction Phase

Health and Safety:

1. A general STD and HIV/AIDS awareness programme should be provided to all workers prior to the commencement of the construction phase.
2. Construction vehicles must adhere to speed limits and must be made aware of the possibility of people walking and living in close proximity to the site.
3. Signage is to be displayed regarding construction activities.
4. General risks associated with the construction activities should be addressed through compliance with the relevant health and safety procedures and regulations.
5. Installation of hydropower equipment to be undertaken by a trained professional.

Security:

1. No construction workers, apart from security personnel, should be allowed to overnight at the construction site.
2. Access to and from the construction site(s) should be closely monitored and contractors should be required to make the necessary arrangements for the transport of workers to and from the site on a daily basis.
3. The construction area must be demarcated and access controlled for the duration of the construction period.
4. Visitors to report to the Site Office, and appropriate Protective Personal Equipment to be worn by visitors.
5. Discuss the safety and security issues, as well as construction schedule with the local community policing forum and local SAPS.
6. Adjacent landowners are to be notified 14 days prior to construction commencement.

Fire:

1. Fire-fighting equipment in proportion to the fire risk that is presented by the type of construction and other on-site activities and materials used on site is to be available and kept in good operating order at all times.
2. Any welding or other sources of heating of materials must be done in a controlled environment, under appropriate supervision, in such a manner as to minimise the risk of fires and/or injury to staff. No "hot work" is to be undertaken on days where the Fire Danger Index is "orange" or "red".
3. Smoking will not be permitted in those areas where there is a fire hazard. These areas include the fuel storage areas and any area where the vegetation or other material may support the rapid spread of an initial flame. Where possible, these areas (e.g. at the chemical and hazardous substances storage area) are to be demarcated with no-smoking signs.

Mitigation Measures: Operational Phase

Health and Safety:

1. Maintenance to be undertaken by trained personnel only.
2. Trained personnel shall wear appropriate electrically insulating Personal Protective Equipment (PPE) during inspection operations.

Security:

1. Adjacent landowners are to be notified 14 days prior to operational commencement.

Fire:

2. Fire-fighting equipment in proportion to the fire risk that is presented by the type of materials used on site is to be available and kept in good operating order at all times.
3. Maintenance procedures to include regular inspection of electrical connections.
4. Faulty wiring to be replaced immediately.
5. Proper grounding of the electrical system to reduce the risk of fire.
6. Maintenance to be undertaken in accordance with the manufacturer's guide.

The impact can be mitigated to a low negative impact significance, from a moderate negative impact.

No-Go Alternative: No change in status.

Theme	Social			
Impact	Health, Safety & Security			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Aspect and Nature	None	Health & Safety, and Security	Health & Safety, and Security	No change in status
Status		Indirect, Negative	Indirect, Negative	
Extent		Regional	Regional	
Duration		Short term	Long term	
Intensity		Medium	Medium	
Probability		Likely	Likely	
Confidence		High		
Reversibility	None	Yes	Yes	No change in status
Replaceability		Yes	Yes	
Level of Significance before mitigation	None	Moderate (-)	Moderate (-)	No change in status
Level of Significance after Mitigation	None	Low (-)	Low (-)	No change in status

2.6.3 EMPLOYMENT OPPORTUNITIES

Approximately 65 and 8 employment opportunities will be created during the construction and operational phases respectively. An adverse effect on this impact may occur in that high expectations are formed regarding construction employment opportunities and that these expectations cannot be sustained.

Mitigation Measures: Construction Phase

1. Local labour from the surrounding community to be used for unskilled positions

Mitigation Measures: Operational Phase

1. Up skilling of local labour to skilled positions

The impact can be mitigated to a medium positive impact.

No-Go Alternative: Employment opportunities will not be created during the construction and operational phases. The significance is a moderate negative impact.

Theme	Social			
Impact	Employment opportunities			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Nature	None	Skilled and unskilled employment opportunities	Skilled employment opportunities	Employment opportunities will not be created during the construction and operational phases
Status		Indirect, Positive	Indirect, Positive	Indirect, Negative
Extent		Regional	Regional	Regional
Duration		Short Term	Long Term	Long Term
Intensity		Medium	Medium	Medium
Probability		Definite	Highly Likely	Likely
Confidence	High			
Reversibility	None	Yes	Yes	Yes
Replaceability		Yes	Yes	Yes
Level of Significance before mitigation	None	Moderate (+)	Moderate (+)	Moderate (-)
Level of Significance after Mitigation	None	Moderate (+)	Moderate (+)	Moderate (-)

2.6.4 EXISTING SERVICES & INFRASTRUCTURE

A transmission line of 22kV, i.e. power line, of approximately 11km would need to be constructed in order to feed electricity produced into the electricity distribution network of the BCRM. The transmission line would join the Somerset-East Main Substation, and is located to the north of the hydro power site. The transmission line's design will conform to Eskom standards.

A step-up transformer would be required at the powerhouse along with a grid voltage stabiliser in order to maintain a constant voltage level.

The impact relates to disruption of or damage to existing services and infrastructure, e.g. Eskom transmission line.

Mitigation Measures: Planning & Design, Construction and Operational Phases

1. Eskom approval per requirements for work in or near Eskom servitudes or infrastructure.
2. Implementation of the DEA's Generic Environmental Management Programme Overhead Powerline Construction.

The impact can be mitigated to a low negative impact.

No-Go Alternative: No change in status.

Theme	Social			
Impact	Existing services & infrastructure			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Aspect and Nature	Disruption of or damage to existing services and infrastructure, e.g. Eskom transmission line	Disruption of or damage to existing services and infrastructure, e.g. Eskom transmission line	Disruption of or damage to existing services and infrastructure, e.g. Eskom transmission line	No Change in status
Status	Direct, Negative	Direct, Negative	Direct, Negative	
Extent	Regional	Regional	Regional	
Duration	Long term	Short term	Long term	
Intensity	Medium	Medium	Low	
Probability	Likely	Likely	Likely	
Confidence	High			
Reversibility	Yes	Yes	Yes	None
Replaceability	Yes	Yes	Yes	
Level of Significance before mitigation	Moderate (-)	Moderate (-)	Moderate (-)	No change in status
Level of Significance after Mitigation	Low (-)	Low (-)	Low (-)	None

2.6.5 TRAFFIC IMPACT

Traffic impacts relate simply to potential increases in traffic within the area, with resultant potential congestion, road damage, noise, etc. issues.

The Bloemhof Road presently carries low traffic volumes related to the farms situated along the road. During the construction phase, the additional daily traffic will increase with construction vehicles. During the operational phase, the additional daily traffic is anticipated to be low.

Safety aspects relate to a lack of advanced construction warning road signage, possible deterioration of the road due to a lack of maintenance and heavy vehicles travelling through sections with limited sight distance albeit that truck drivers will have better visibility due to their higher seat position.

Mitigation Measures: Construction Phase

1. Flagmen to be posted when construction works are being undertaken adjacent to roads.
2. Signage is to be displayed regarding construction activities at the intersection with the Bloemhof Road.
3. Construction vehicles are to keep to the speed limits.
4. Regular maintenance of road during construction phase.

Mitigation Measures: Operational Phase

1. Vehicles are to keep to the speed limits.
2. Maintenance of road immediately after construction period.

The impact can be mitigated to a low negative impact.

No-Go Alternative: No change in status.

Theme	Social			
Impact	Traffic			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Nature	None	Increase in traffic and traffic safety from construction vehicles	Increase in traffic and traffic safety from operational vehicles	No change in status
Status		Indirect, Negative	Indirect, Negative	
Extent		Regional	Regional	
Duration		Short term	Long term	
Intensity		Medium	Medium	
Probability		Likely	Likely	
Confidence		High		
Reversibility	None	Yes	Yes	No change in status
Replaceability		Yes	Yes	
Level of Significance before mitigation	None	Moderate (-)	Moderate (-)	No change in status
Level of Significance after Mitigation	None	Low (-)	Low (-)	No change in status

2.7 RENEWABLE ENERGY INFRASTRUCTURE

Renewable energy infrastructure relates to the production of cleaner energy from renewable sources, and moving to a less carbon-intensive electricity production (i.e. reducing carbon emissions associated with coal power stations). The impact relates to the operational phase only.

The Eastern Cape Province is reliant on electricity imports from other provinces yet houses significant industrial and rural development potential. Power from the national grid is largely generated from coal power stations, and transmitted considerable distances to the Eastern Cape. This leads to significant transmission losses and local grid instabilities. Electricity supply to the Eastern Cape Province is further constrained by transmission infrastructure. The Eastern Cape Province will need to import more power from the national grid, as well as increase local generation capacity. Although only 3.1MW will be fed into the electrical grid, the proposed project forms a source of zero carbon electricity generation and contribution to the renewable energy targets.

Mitigation Measures: Operational Phase

1. Implementation of identified mitigation measures and EMPr.

The impact remains at a high positive impact significance.

No-Go Alternative: Other renewable energy sources will need to be sourced to contribute to the renewable energy targets, and reduction of carbon-intensive electricity production. The impact remains at a high negative significance.

Theme	Renewable Energy			
Impact	Production of cleaner energy			
Phase	Planning & Design Phase	Construction Phase	Operational Phase	No Go
Aspect and Nature	None	None	Production of cleaner energy from renewable sources	Production of energy reliant on coal power stations
Status			Direct, Positive	Indirect, Negative
Extent			National	National
Duration			Long term	Long term
Intensity			Medium	Medium
Probability			Highly probable	Highly Probable
Confidence			High	
Reversibility	None	None	Yes	Yes
Replaceability			Yes	No
Level of Significance before mitigation	None	None	High (+)	High (-)
Level of Significance after Mitigation	None	None	High (+)	High (-)