APPENDIX C: DWS RISK ASSESSMENT MATRICES

RISK MATRIX (Based on DWS 2015 publication: Section 21 c and I water use Risk Assessment Protocol)

NAME and REGISTRATION No of SACNASP Professional member: ……Dr Brian Colloty…… Reg no. ……Ecologist 400268/07……

Risk to be scored for construction and operational phases of the project. MUST BE COMPLETED BY SACNASP PROFESSIONAL MEMBER REGISTERED IN AN APPROPRIATE FIELD OF EXPERTISE.

Upgrade of existing district roads to widening / strengthen current crossings for some of the road options but not all of the projects

					Severity																	
No.	**Phases**	**Activity**	**Aspect**	**Impact**	**Flow Regime**	**Physico & Chemical (Water Quality)**	**Habitat (Geomorph + Vegetation)**	**Biota**	**Severity**	**Spatial scale**	**Duration**	**Consequence**	**Frequency of activity**	**Frequency of impact**	**Legal Issues**	**Detection**	**Likelihood**	**Significance**	**Risk Rating**	**Confidence level**	**Control Measures**	**Borderline LOW MODERATE Rating Classes**	**PES AND EIS OF WATERCOURSE**
1	Construction	**Upgrade of existing district roads to widening / strengthen current crossings**	Disturbance and clearing of vegetation within the bed and banks of watercourses to access the bridge crossing site to increase widths and heights of the existing culverts as required. Plant and associated machinery will be used to remove / install additional bridge infrastructure e.g. increase culvert sizes, reshape approach roads, rebuild wing walls and erosion protection and energy dissipation structures, which will result in vegetation clearing and or disturbance (e.g. soil erosion, and or soil compaction).	Loss of riparian and or instream aquatic vegetation through the disturbance, which could result in unstable soils that has the potential to create erosion and or sedimentation. This will also result in the disturbance of aquatic biota as well as create habitat fragmentation if any such vegetation is present as the activities will occur within an area with pre-existing disturbance.	1	1	2	1	1,25	1	1	3,25	2	3	5	1	11	35,75	LOW	90-100	Rehabilitate areas where active erosion is identified to re-instate natural topography and hydrological conditions; Monitor for erosion and incision within affected aquatic resources, and where it persists interventions to stimulate revegetation must be installed which can include the packing of loss rock, geotextiles such as soil savers; and Implement alien vegetation control program & ensure establishment of indigenous species within areas where alien vegetation was identified		PES = C & D EIS = Moderate to Low
2	Construction		Localised potential changes to the flow regime, by the impedance created by the culverts if existing or upgraded structures are placed higher than the natural riverbed levels	Surface water flow may be impeded within the natural channels when a structure is placed within the bed of the watercourse during the construction phase, i.e. any raised structures higher than the current natural river levels may create impedance while construction takes place. This is especially true when considering that a number of these existing structures were not installed with due consideration of the natural riverbed levels and do already create a small degree of impendence.	2	1	1	1	1,25	1	2	4,25	2	2	5	1	10	42,5	LOW	90-100	•The final design should take cognisance of typical baseflows and should not create any impedance of flows •Natural river levels upstream and downstream of the site should be maintained, thus allowing for continuity within the riverbed, i.e. not create any obstruction limiting any fauna from moving up or downstream. •Vehicle movement within the watercourse should be limited to the works area to prevent undue any compaction of soils •Bed and bank erosion protection should be included in the designs to prevent bank instability and sedimentation.		PES = C & D EIS = Moderate to Low
3	Construction		Water quality may be affected by various construction activities which include oil and fuel spills, spill of construction chemicals such as concrete or dry cement etc.	During construction various materials, such as sediments, diesel, oils and cement/concrete, could pose a threat to the continued functioning of downstream areas, if by chance it is dispersed via surface run-off, or are allowed to permeate into the groundwater.	1	3	1	2	1,75	1	1	3,75	1	1	5	1	8	30	LOW	90-100	•Chemicals used for construction must be stored safely on site and surrounded by bunds. Chemical storage containers must be regularly inspected so that any leaks are detected early. •Littering and contamination of water sources during construction must be prevented by effective construction camp management. •Emergency plans must be in place in case of spillages onto road surfaces and water courses. •No stockpiling should take place within a water course. •All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds. •Stockpiles must be located away from river channels. •Erosion and sedimentation into channels must be minimised through the effective stabilisation (gabions and Reno mattresses) and the re-vegetation of any disturbed riverbanks. •The construction camp and necessary ablution facilities meant for construction workers must be beyond the proposed buffers shown in Figure 6 as shown in the Aquatic Assessment Attached		PES = C & D EIS = Moderate to Low
4	Construction		Destruction of habitat that may contain listed and / or protected aquatic biota (fauna and flora) or fragmentation of critical biodiversity / ecological support area	Loss of any species of special concern and habitat continuity / habitat fragmentation as a result works within the bed or banks	2	2	2	1	1,75	2	1	4,75	2	2	5	1	10	47,5	LOW	90-100	•The final design should take cognisance of typical baseflows and should not create any impedance of flows •Natural river levels upstream and downstream of the site should be maintained, thus allowing for continuity within the riverbed, i.e. not create any obstruction limiting any fauna from moving up or downstream. •Once construction has been completed, all disturbed areas should be monitored with regard revegetation which should occur naturally, thus preventing unstable soils. Seeding should only occur if soils are not stable within 6 months post construction. •Vehicle movement within the watercourse should be limited to the works area to prevent undue any compaction of soils •Bed and bank erosion protection should be included in the designs to prevent bank instability and sedimentation.		PES = C & D EIS = Moderate to Low

5	Operations		Operational activities will be limited to vehicles using the bridge crossings, with the only anticipated activities within the watercourses being the occasional repair and maintenance of the crossing infrastructure (culverts, guard rails and erosion protection/stormwater management features).	Limited disturbance of the beds and banks while maintenance and repairs are conducted, but would be limited to the existing crossing footprinted which includes the stormwater and erosion protection measures	1	1	1	1	1	1	1	3	1	1	5	1	8	24	LOW	90-100	Rehabilitate areas where active erosion is identified to re-instate natural topography and hydrological conditions; Monitor for erosion and incision within affected aquatic resources, and where it persists interventions to stimulate revegetation must be installed which can include the packing of loss rock, geotextiles such as soil savers; and Implement alien vegetation control program & ensure establishment of indigenous species within areas where alien vegetation was identified		PES = C & D EIS = Moderate to Low
6	Operations		Stormwater runoff in the operations phase	Increased velocity of surface water flows generated by hardened surfaces and through improper stormwater management increase the potential for erosion and then sedimentation downstream.	1	2	2	1	1,5	1	1	3,5	1	1	5	1	8	28	LOW	90-100	A stormwater management plan must be developed in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks. The effectiveness of the stormwater / energy dissipation structures must be inspected on an annual basis and maintained / improved as required during this the operational phase, especially where any erosion or sedimentation has become evident in the operational phase. No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes, i.e. stormwater detention pond.		PES = C & D EIS = Moderate to Low

NEW INTERNAL ACCESS ROADS AND UNDERGROUND CABLES - MINOR WATERCOURSE CROSSINGS ONLY AS SUPPORTING INFRASTRUCTURE OF THE WIND FARMS (TURBINES, SUBSTATIONS AND LAYDOWN AREAS HAVE AVOIDED WATERCOURSES). ALL PANS AND WETLANDS INCL OF BUFFER HAVE ALSO BEEN AVOIDED BY THE PROPOSED LAYOUTS

					Severity																		
No.	**Phases**	**Activity**	**Aspect**	**Impact**	**Flow Regime**	**Physico & Chemical (Water Quality)**	**Habitat (Geomorph + Vegetation)**	**Biota**	**Severity**	**Spatial scale**	**Duration**	**Consequence**	**Frequency of activity**	**Frequency of impact**	**Legal Issues**	**Detection**	**Likelihood**	**Significance**	**Risk Rating**	**Confidence level**	**Control Measures**	**Borderline LOW MODERATE Rating Classes**	**PES AND EIS OF WATERCOURSE**
1	Construction	**NEW INTERNAL ACCESS ROADS AND UNDERGROUND CABLES - MINOR WATERCOURSE CROSSINGS ONLY AS SUPPORTING INFRASTRUCTURE OF THE WIND FARMS (TURBINES, SUBSTATIONS AND LAYDOWN AREAS HAVE AVOIDED WATERCOURSES). ALL PANS AND WETLANDS INCL OF BUFFER HAVE ALSO BEEN AVOIDED BY THE PROPOSED LAYOUTS I.E. New watercourse crossings within minor watercourses and or associated buffer, but not any wetlands (Pans and Valley Bottom systems)**	Disturbance and clearing of vegetation within the bed and banks of watercourses to access the bridge crossing site to install culverts as required. Plant and associated machinery will be used to the crossing bridge infrastructure e.g. culvert, shape approach roads, build wing walls and erosion protection and energy dissipation structures, which will result in vegetation clearing and or disturbance (e.g. soil erosion, and or soil compaction).	Loss of riparian and or instream aquatic vegetation through the disturbance, which could result in unstable soils that has the potential to create erosion and or sedimentation. This will also result in the disturbance of aquatic biota as well as create habitat fragmentation if any such vegetation is present .	1	2	2	2	1,75	1	2	4,75	2	3	5	1	11	52,25	LOW	90-100	Rehabilitate areas where active erosion is identified to re-instate natural topography and hydrological conditions; Monitor for erosion and incision within affected aquatic resources, and where it persists interventions to stimulate revegetation must be installed which can include the packing of loss rock, geotextiles such as soil savers; and Implement alien vegetation control program & ensure establishment of indigenous species within areas where alien vegetation was identified		PES = C & D EIS = Moderate to Low
2	Construction		Localised potential changes to the flow regime, by the impedance created by the culverts when structures are placed higher than the natural riverbed levels	Surface water flow may be impeded within the natural channels when a structure is placed within the bed of the watercourse during the construction phase, i.e. any raised structures higher than the current natural river levels may create impedance while construction takes place.	2	1	1	2	1,5	1	2	4,5	2	2	5	1	10	45	LOW	90-100	•The final design should take cognisance of typical baseflows and should not create any impedance of flows •Natural river levels upstream and downstream of the site should be maintained, thus allowing for continuity within the riverbed, i.e. not create any obstruction limiting any fauna from moving up or downstream. •Vehicle movement within the watercourse should be limited to the works area to prevent undue any compaction of soils •Bed and bank erosion protection should be included in the designs to prevent bank instability and sedimentation.		PES = C & D EIS = Moderate to Low

3	Construction		Water quality may be affected by various construction activities which include oil and fuel spills, spill of construction chemicals such as concrete or dry cement etc.	During construction various materials, such as sediments, diesel, oils and cement/concrete, could pose a threat to the continued functioning of downstream areas, if by chance it is dispersed via surface run-off, or are allowed to permeate into the groundwater.	1	2	1	2	1,5	1	1	3,5	1	1	5	1	8	28	LOW	90-100	•Chemicals used for construction must be stored safely on site and surrounded by bunds. Chemical storage containers must be regularly inspected so that any leaks are detected early. •Littering and contamination of water sources during construction must be prevented by effective construction camp management. •Emergency plans must be in place in case of spillages onto road surfaces and water courses. •No stockpiling should take place within a water course. •All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds. •Stockpiles must be located away from river channels. •Erosion and sedimentation into channels must be minimised through the effective stabilisation (gabions and Reno mattresses) and the re-vegetation of any disturbed riverbanks. •The construction camp and necessary ablution facilities meant for construction workers must be beyond the proposed buffers shown in Figure 6 as shown in the Aquatic Assessment Attached		PES = C & D EIS = Moderate to Low
4	Construction		Destruction of habitat that may contain listed and / or protected aquatic biota (fauna and flora) or fragmentation of critical biodiversity / ecological support area	Loss of any species of special concern and habitat continuity / habitat fragmentation created by the works within the bed or banks	1	1	1	3	1,5	2	1	4,5	2	2	5	1	10	45	LOW	90-100	•The final design should take cognisance of typical baseflows and should not create any impedance of flows •Natural river levels upstream and downstream of the site should be maintained, thus allowing for continuity within the riverbed, i.e. not create any obstruction limiting any fauna from moving up or downstream. •Once construction has been completed, all disturbed areas should be monitored with regard revegetation which should occur naturally, thus preventing unstable soils. Seeding should only occur if soils are not stable within 6 months post construction. •Vehicle movement within the watercourse should be limited to the works area to prevent undue any compaction of soils •Bed and bank erosion protection should be included in the designs to prevent bank instability and sedimentation.		PES = C & D EIS = Moderate to Low
5	Operations		Operational activities will be limited to vehicles using the bridge crossings, with the only anticipated activities within the watercourses being the occasional repair and maintenance of the crossing infrastructure (culverts, guard rails and erosion protection/stormwater management features).	Limited disturbance of the beds and banks while maintenance and repairs are conducted, but would be limited to the existing crossing footprinted which includes the stormwater and erosion protection measures	1	1	1	1	1	1	1	3	1	1	5	1	8	24	LOW	90-100	Rehabilitate areas where active erosion is identified to re-instate natural topography and hydrological conditions; Monitor for erosion and incision within affected aquatic resources, and where it persists interventions to stimulate revegetation must be installed which can include the packing of loss rock, geotextiles such as soil savers; and Implement alien vegetation control program & ensure establishment of indigenous species within areas where alien vegetation was identified		PES = C & D EIS = Moderate to Low
6	Operations		Stormwater runoff in the operations phase	Increased velocity of surface water flows generated by hardened surfaces and through improper stormwater management increase the potential for erosion and then sedimentation downstream.	2	2	2	1	1,75	1	1	3,75	1	1	5	1	8	30	LOW	90-100	A stormwater management plan must be developed in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks. The effectiveness of the stormwater / energy dissipation structures must be inspected on an annual basis and maintained / improved as required during this the operational phase, especially where any erosion or sedimentation has become evident in the operational phase. No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes, i.e. stormwater detention pond.		PES = C & D EIS = Moderate to Low

NEW INTERNAL ACCESS ROADS AND UNDERGROUND CABLES - WITHIN 500m OF A WETLAND BOUNDARY. ALL PANS AND WETLANDS INCL OF BUFFER HAVE ALSO BEEN AVOIDED BY THE PROPOSED LAYOUTS.

					Severity																	
No.	**Phases**	**Activity**	**Aspect**	**Impact**	**Flow Regime**	**Physico & Chemical (Water Quality)**	**Habitat (Geomorph + Vegetation)**	**Biota**	**Severity**	**Spatial scale**	**Duration**	**Consequence**	**Frequency of activity**	**Frequency of impact**	**Legal issues**	**Detection**	**Likelihood**	**Significance**	**Risk Rating**	**Confidence level**	**Control Measures**	**Borderline LOW MODERATE Rating Classes**	**PES AND EIS OF WATERCOURSE**

1	Construction	**NEW INTERNAL ACCESS ROADS AND UNDERGROUND CABLES - WITHIN 500m OF A WETLAND BOUNDARY. ALL PANS AND WETLANDS INCL OF BUFFER HAVE ALSO BEEN AVOIDED BY THE PROPOSED LAYOUTS I.E. New watercourse crossings within 500m of Pans and Valley Bottom systems but not within these systems as they have been avoided**	Disturbance and clearing of vegetation within the bed and banks of watercourses to access the bridge crossing site to install culverts as required. Plant and associated machinery will be used to the crossing bridge infrastructure e.g. culvert, shape approach roads, build wing walls and erosion protection and energy dissipation structures, which will result in vegetation clearing and or disturbance (e.g. soil erosion, and or soil compaction).	Loss of riparian and or instream aquatic vegetation through the disturbance, which could result in unstable soils that has the potential to create erosion and or sedimentation. This will also result in the disturbance of aquatic biota as well as create habitat fragmentation if any such vegetation is present .	1	2	2	2	1,75	1	2	4,75	2	3	5	1	11	52,25	LOW	90-100	Rehabilitate areas where active erosion is identified to re-instate natural topography and hydrological conditions; Monitor for erosion and incision within affected aquatic resources, and where it persists interventions to stimulate revegetation must be installed which can include the packing of loss rock, geotextiles such as soil savers; and Implement alien vegetation control program & ensure establishment of indigenous species within areas where alien vegetation was identified		PES = C & D EIS = Moderate to Low
2	Construction		Localised potential changes to the flow regime, by the impedance created by the culverts when structures are placed higher than the natural riverbed levels	Surface water flow may be impeded within the natural channels when a structure is placed within the bed of the watercourse during the construction phase, i.e. any raised structures higher than the current natural river levels may create impedance while construction takes place.	2	1	1	2	1,5	1	2	4,5	2	2	5	1	10	45	LOW	90-100	•The final design should take cognisance of typical baseflows and should not create any impedance of flows •Natural river levels upstream and downstream of the site should be maintained, thus allowing for continuity within the riverbed, i.e. not create any obstruction limiting any fauna from moving up or downstream. •Vehicle movement within the watercourse should be limited to the works area to prevent undue any compaction of soils •Bed and bank erosion protection should be included in the designs to prevent bank instability and sedimentation.		PES = C & D EIS = Moderate to Low
3	Construction		Water quality may be affected by various construction activities which include oil and fuel spills, spill of construction chemicals such as concrete or dry cement etc.	During construction various materials, such as sediments, diesel, oils and cement/concrete, could pose a threat to the continued functioning of downstream areas, if by chance it is dispersed via surface run-off, or are allowed to permeate into the groundwater.	1	2	1	2	1,5	1	1	3,5	1	1	5	1	8	28	LOW	90-100	•Chemicals used for construction must be stored safely on site and surrounded by bunds. Chemical storage containers must be regularly inspected so that any leaks are detected early. •Littering and contamination of water sources during construction must be prevented by effective construction camp management. •Emergency plans must be in place in case of spillages onto road surfaces and water courses. •No stockpiling should take place within a water course. •All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds. •Stockpiles must be located away from river channels. •Erosion and sedimentation into channels must be minimised through the effective stabilisation (gabions and Reno mattresses) and the re-vegetation of any disturbed riverbanks. •The construction camp and necessary ablution facilities meant for construction workers must be beyond the proposed buffers shown in Figure 6 as shown in the Aquatic Assessment Attached		PES = C & D EIS = Moderate to Low
4	Construction		Destruction of habitat that may contain listed and / or protected aquatic biota (fauna and flora) or fragmentation of critical biodiversity / ecological support area	Loss of any species of special concern and habitat continuity / habitat fragmentation created by the works within the bed or banks	1	1	1	3	1,5	2	1	4,5	2	2	5	1	10	45	LOW	90-100	•The final design should take cognisance of typical baseflows and should not create any impedance of flows •Natural river levels upstream and downstream of the site should be maintained, thus allowing for continuity within the riverbed, i.e. not create any obstruction limiting any fauna from moving up or downstream. •Once construction has been completed, all disturbed areas should be monitored with regard revegetation which should occur naturally, thus preventing unstable soils. Seeding should only occur if soils are not stable within 6 months post construction. •Vehicle movement within the watercourse should be limited to the works area to prevent undue any compaction of soils •Bed and bank erosion protection should be included in the designs to prevent bank instability and sedimentation.		PES = C & D EIS = Moderate to Low
5	Operations		Operational activities will be limited to vehicles using the bridge crossings, with the only anticipated activities within the watercourses being the occasional repair and maintenance of the crossing infrastructure (culverts, guard rails and erosion protection/stormwater management features).	Limited disturbance of the beds and banks while maintenance and repairs are conducted, but would be limited to the existing crossing footprinted which includes the stormwater and erosion protection measures	1	1	1	1	1	1	1	3	1	1	5	1	8	24	LOW	90-100	Rehabilitate areas where active erosion is identified to re-instate natural topography and hydrological conditions; Monitor for erosion and incision within affected aquatic resources, and where it persists interventions to stimulate revegetation must be installed which can include the packing of loss rock, geotextiles such as soil savers; and Implement alien vegetation control program & ensure establishment of indigenous species within areas where alien vegetation was identified		PES = C & D EIS = Moderate to Low

6	Operations		Stormwater runoff in the operations phase	Increased velocity of surface water flows generated by hardened surfaces and through improper stormwater management increase the potential for erosion and then sedimentation downstream.	2	2	2	1	1,75	1	1	3,75	1	1	5	1	8	30	LOW	90-100	A stormwater management plan must be developed in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks. The effectiveness of the stormwater / energy dissipation structures must be inspected on an annual basis and maintained / improved as required during this the operational phase, especially where any erosion or sedimentation has become evident in the operational phase. No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes, i.e. stormwater detention pond.		PES = C & D EIS = Moderate to Low

TURBINES, HARDSTAND AREAS AND BLADE LAYDOWNS WITHIN 500M OF A WETLAND BOUNDARY - ALTHOUGH ALL PANS AND WETLANDS HAVE BEEN AVOIDED INCL OF BUFFER THEREFORE NO DIRECT IMPACTS

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No.	**Phases**	**Activity**	**Aspect**	**Impact**	**Flow Regime**	**Physico & Chemical (Water Quality)**	**Habitat (Geomorph + Vegetation)**	**Biota**	**Severity**	**Spatial scale**	**Duration**	**Consequence**	**Frequency of activity**	**Frequency of impact**	**Legal Issues**	**Detection**	**Likelihood**	**Significance**	**Risk Rating**	**Confidence level**	**Control Measures**	**Borderline LOW MODERATE Rating Classes**	**PES AND EIS OF WATERCOURSE**
1	Construction	**Turbines, hardstands and laydown areas only within 500m of wetland boundary, but not within any wetland areas or the associated buffers**	Disturbance and clearing of vegetation within 500m of a wetland boundary	All wetlands (pans and valley bottom areas) have been avoided by the proposed layouts thus no direct disturbance of any vegetation or soils associated with these systems are anticipated	1	1	1	1	1	1	1	3	1	1	5	1	8	24	LOW	90-100	Approval of the current layout is provided in which wetland areas will be avoided		PES = C & D EIS = Moderate to Low
2	Construction		Water quality may be affected by various construction activities which include oil and fuel spills, spill of construction chemicals such as concrete or dry cement etc.	All wetlands (pans and valley bottom areas) have been avoided by the proposed layouts thus no direct disturbance of these systems are anticipated	1	1	1	2	1,25	1	1	3,25	1	1	5	1	8	26	LOW	90-100	•Chemicals used for construction must be stored safely on site and surrounded by bunds. Chemical storage containers must be regularly inspected so that any leaks are detected early. •Littering and contamination of water sources during construction must be prevented by effective construction camp management. •Emergency plans must be in place in case of spillages onto road surfaces and water courses. •No stockpiling should take place within a water course. •All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds. •Stockpiles must be located away from river channels. •Erosion and sedimentation into channels must be minimised through the effective stabilisation (gabions and Reno mattresses) and the re-vegetation of any disturbed riverbanks. •The construction camp and necessary ablution facilities meant for construction workers must be beyond the proposed buffers shown in Figure 6 as shown in the Aquatic Assessment Attached		PES = C & D EIS = Moderate to Low
3	Construction		Destruction of habitat that may contain listed and / or protected aquatic biota (fauna and flora) or fragmentation of critical biodiversity / ecological support area	Loss of any species of special concern and habitat continuity / habitat fragmentation created by the works however, wetlands (pans and valley bottom areas) have been avoided by the proposed layouts thus no direct disturbance of any vegetation or soils associated with these systems are anticipated	1	1	1	1	1	1	1	3	1	1	5	1	8	24	LOW	90-100	•The final design should take cognisance of typical baseflows and should not create any impedance of flows •Natural river levels upstream and downstream of the site should be maintained, thus allowing for continuity within the riverbed, i.e. not create any obstruction limiting any fauna from moving up or downstream. •Once construction has been completed, all disturbed areas should be monitored with regard revegetation which should occur naturally, thus preventing unstable soils. Seeding should only occur if soils are not stable within 6 months post construction. •Vehicle movement within the watercourse should be limited to the works area to prevent undue any compaction of soils •Bed and bank erosion protection should be included in the designs to prevent bank instability and sedimentation.		PES = C & D EIS = Moderate to Low

4	Construction		Placement of elevate structures	Localised potential changes to the flow regime, by the impedance created when structures are placed higher than the natural levels	1		1		1		1		1	1		3		1	1	5	1		8	24	LOW	90-100	•The final design should take cognisance of typical baseflows and should not create any impedance of flows •Natural river levels upstream and downstream of the site should be maintained, thus allowing for continuity within the riverbed, i.e. not create any obstruction limiting any fauna from moving up or downstream. •Vehicle movement within the watercourse should be limited to the works area to prevent undue any compaction of soils •Bed and bank erosion protection should be included in the designs to prevent bank instability and sedimentation.		
5	Operations		Stormwater runoff in the operations phase due to placement of hard surfaces	Increased velocity of surface water flows generated by hardened surfaces and through improper stormwater management increase the potential for erosion and then sedimentation downstream.	1		1		1		1		1	1		3		1	1	5	1		8	24	LOW	90-100	A stormwater management plan must be developed in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks. The effectiveness of the stormwater / energy dissipation structures must be inspected on an annual basis and maintained / improved as required during this the operational phase, especially where any erosion or sedimentation has become evident in the operational phase. No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes, i.e. stormwater detention pond.		PES = C & D EIS = Moderate to Low