



# Environmental Management Programme



Western Cape  
Government

## Environmental Management Programme

**Basic Assessment (BA) for the flood damage repairs to structures on  
MR309 in Seweweekspoort Pass, Western Cape**

Hatch project no.: H351019

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**HATCH**

## Acronyms and Abbreviations

BAR	Basic Assessment Report
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs & Development Planning
DWS	Department of Water & Sanitation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ESG	Environmental Services Group
GN	Government Notices
Hatch	Hatch Africa (Pty) Ltd.
I&APs	Interested & Affected Parties
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NWA	National Water Act (Act 36 of 1998)
WULA	A Water Use License Application

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**1. Introduction**

This Environmental Management Programme (EMPr) was prepared by Hatch Africa (Pty) Ltd. (Hatch) in terms Appendix 4 of Government Notice No. 982 of the Environmental Impact Assessment (EIA) Regulations, 2014, as amended.

The Seweweekspoort Pass, located on MR309 approximately between km 40.9 and km 58.1, is a gravel road linking the towns of Laingsburg in the north and Ladismith and Zoar in the south. The road meanders through the very narrow Seweweekspoort gorge crossing the Seweweekspoort River numerous times in a short distance of 18 km. Structures allowing vehicles to cross the river have been constructed over many years with the majority consisting of one or two pipes with some cement over the top. Because these structures are incapable of accommodating the river when it swells after rains, the crossings are frequently overtopped with damage occurring not only at the river crossings but also along the road since the road acts as a weir when the hydraulic capacity is exceeded. The frequent overtopping of the road requires repair work to be done by the Eden District Municipality and the Central Karoo District Municipality (the border between the two municipalities is half way through Seweweekspoort).

It is thus proposed to construct new structures that will be large enough to allow 1:2 year floods to pass easily beneath them, bearing in mind vegetation and other debris that might be carried in the stream. The 1:5 year floods may need to pass above the structures but the design would allow for minimal damage to the roadway in such events. In three places the river runs alongside the road and undercuts it during flood events. In these locations a retaining wall would be constructed between road and river to protect the road. See the figure below for the proposed points along the road at which these structures will be constructed or repaired:



The following general principles are proposed for the design of the new culverts:

- Routing of the water through a drainage opening is preferable to a drift structure where all water passes over the road
- The vertical clear height of drainage openings will be made as big as possible within the constraints of the river bed and the vertical alignment of the road
- The vertical opening of the drainage structure must have a minimum clear height of 1 m for ease of cleaning the structure by hand from siltation and debris
- The top level of the slab must be lower than the road on both sides to prevent the water creating a new river alignment if the openings are blocked. The vertical alignment of the road has been changed over the years very effectively to achieve this, but this principle may be developed further where it is not implemented yet
- Drop inlets may be used where required. In such cases the concrete of piers must be protected against abrasion of fast moving rock if present in the river bed.

In addition, alignment of the opening of the drainage structure to the direction of the river will be done as best as possible and clear spans with fewer piers will be favoured to reduce the risk of siltation build up and blockage forming.

A key element of the project is that short bypass routes will need to be created in order to allow construction vehicles to access both sides of each river crossing and to allow the road to remain in use by the public during the construction period. It should be noted that none of the specialists on the project supported the idea of the bypass routes at the outset but, after discussion with the client and engineers, it was found that there was no other way to implement the project as the construction crews needed to access both sides of each structure. The new structures would be constructed in batches rather than doing them simultaneously.

The project Alternatives assessed by the specialists are as follows:

- Alternative 1: “No-Go” alternative in which the status quo remains
- Alternative 2: Preferred alternative in which the structures are upgraded.

## 1.1 Expertise of the Environmental Assessment Practitioner

Hatch is an employee-owned, multi-disciplinary professional services firm. Hatch delivers a comprehensive array of technical and strategic services to three primary sectors: Mining & Metals; Energy; and Infrastructure. Our combination of a strong South African knowledge and skills base together with worldwide support and expertise allows us to focus the power of our global talent base on the specific needs of each project locally. In addition to our technical services, Hatch has offered a broad range of environmental services to clients for many years. The Environmental Services Group (ESG) within Hatch provides a focused delivery platform for a range of environmental, social and sustainability solutions to our clients.

ESG forms an integral part of our environmental services expertise required within Hatch's Project Life Cycle Process. A project delivery methodology which has been used successfully by Hatch for more than 50 years to provide clients with innovative technology solutions combined with rigorous safety, environmental, quality, cost and schedule performance that ensure projects are able to meet budgets and schedule constraints. This is done by ensuring that projects account for, and initiate environmental assessments and approvals at the right time.

Through the Project Life Cycle Process, Hatch applies focused environmental services at each phase of a project, ensuring that opportunities to incorporate social and environmental aspects into the engineering design are recognized and considered at the most opportune moment, thus improving a the overall sustainability of projects.

Hatch ESG offers the most comprehensive environmental and community interface solution by integrating the social, community and environmental aspects within a project with the engineering and overall project management functions. Knowledge of the customers' processes and business helps to turn these challenges into strategic opportunities and to mitigate project risks.

Evert Jacobs has worked at Hatch for nine years and has 15 years' experience in large, multi-disciplinary projects in Africa. He holds a Masters in Science Degree in Environmental Management and is fully registered with the South African Council for Natural Scientific Professions (see Appendix F of the Basic Assessment Report (BAR) for CV, Qualifications & Certification). He has experience in very large infrastructure, mining and energy projects specifically in guiding development from concept phase through to execution and construction. His experience includes Permitting Strategies for Mega Projects in various countries, EIAs, monitoring protocols for water and air quality, environmental management plans and construction management, environmental auditing, GIS, Water Use License Applications, Ecological Research and Ecological Processes which have been combined in his work related experience.

Evert has extensive experience in South African environmental legislation and how these are integrated into projects. This includes knowledge of the following acts and regulations: Constitution of the Republic of South Africa; National Development Plan; National Environmental Management Act; National Environmental Management: Biodiversity Act; National Environmental Management: Protected Areas Act; Marine and Living Resources Act; & World Heritage Convention Act.

## **1.2 Contents of the EMPr**

This EMPr specifies the management actions necessary to ensure minimal environmental impacts, as well as procedures for monitoring these impacts associated with the proposed activity.

Compliance with Appendix 4 of Government Notice No. 982 of the EIA Regulations, 2014, as amended is demonstrated as follows:

Requirements According to Appendix 4 of GNR 982 of 4 December 2014	Section
<p>1) An EMPr must comply with section 24N of the Act and include-</p> <p>a) details of-</p> <ul style="list-style-type: none"> <li>i. the EAP who prepared the EMPr; and</li> <li>ii. the expertise of that EAP to prepare an EMPr, including a curriculum vita;</li> </ul>	<p>Section 1.1 Appendix F of BAR</p>
<p>b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;</p>	<p>Chapter 1 Chapter 5</p>
<p>c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;</p>	<p>Appendix A of BAR</p>
<p>d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-</p> <ul style="list-style-type: none"> <li>i. planning and design;</li> <li>ii. pre-construction activities;</li> <li>iii. construction activities;</li> <li>iv. rehabilitation of the environment after construction and where applicable post closure; and</li> <li>v. where relevant, operation activities;</li> </ul>	<p>Chapter 6</p>
<p>f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraphs (d) will be achieved, and must, where applicable, include actions to-</p> <ul style="list-style-type: none"> <li>i. avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;</li> <li>ii. comply with any prescribed environmental management standards or practices;</li> <li>iii. comply with any applicable provisions of the Act regarding closure, where applicable; and</li> <li>iv. comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;</li> </ul>	<p>Chapter 6</p>
<p>g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);</p>	<p>Chapter 7</p>
<p>h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);</p>	<p>Chapter 7</p>

i) an indication of the persons who will be responsible for the implementation of the impact management actions;	Chapter 6 and 7
j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Chapter 7
k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Chapter 7
l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Chapter 7
m) an environmental awareness plan describing the manner in which- <ul style="list-style-type: none"> <li>i. the applicant intends to inform his or her employees of any environmental risk which may result from their work; and</li> <li>ii. risks must be dealt with in order to avoid pollution or the degradation of the environment; and</li> </ul>	Chapter 7
n) any specific information that may be required by the competent authority.	N/A
2) Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	N/A

## 2. Description of Applicable Legislation and Policies

### 2.1 National Environmental Management Act

The National Environmental Management Act (Act 107 of 1998 as amended) (NEMA) is the primary piece of environmental legislation in South Africa, and establishes principles for decision-making on matters affecting the environment. It establishes a framework for integrating good environmental management into all development activities. Section 2 of NEMA states the principles of environmental management that must be applied through the Republic of South Africa. The key principles relevant to the proposed project include:

- Environmental management must place people and their needs at the forefront, and serve their physical, psychological, developmental, cultural and social interests equitably
- Development must be socially, environmentally and economically sustainable
- Environmental management must be integrated and take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the best practical environmental option



- Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued
- The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage
- The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding. Skills and capacity necessary for achieving equitable and effective participation and participation by vulnerable and disadvantaged persons must be ensured
- The social, economic and environmental impacts of activities, including disadvantages and benefits must be considered, assessed and evaluated. Decisions must be appropriate in the light of such consideration and assessment
- The polluter must pay for the cost of remedying pollution, environmental degradation and adverse health effects
- Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

In terms of Section 28 of NEMA "Every person who causes, has caused, or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm cannot reasonably be avoided or stopped, to minimize and rectify such pollution or degradation of the environment."

The principles of environmental management and the Duty of Care as stated in NEMA must be observed on site, during all phases of the proposed project.

### **2.1.1 Environmental Impact Assessment Regulations**

The EIA Regulations of 2014 (Government Notice (GN) No. R982, 984 & 985 of December 2014, as amended), published under NEMA, list those activities that may have a potentially detrimental impact on the environment, and which require environmental authorisation before those listed activities can be undertaken. The proposed project will trigger the following listed activities:

**Table 2-1: Triggered Listed Activities in accordance with the EIA Regulations, 2014, as amended**

Listed Activities as Described in GN 983 & 985	Description of Project Activity
Activities in terms of GN R.983 (No. 327 of 7 April 2017 as amended)	
<p>19. <i>The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;</i></p> <p><i>but excluding where such infilling, depositing, dredging, excavation, removal or moving–</i> <i>(b) is for maintenance purposes undertaken in accordance with a maintenance management plan</i></p>	<p>The infilling and depositing of material of more than 10 cubic metres along the route is anticipated during the repair and development of river crossing structures within the watercourse as well as during temporary route diversions.</p>
<p>27. <i>The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for–</i> <i>(ii) maintenance purposes undertaken in accordance with a maintenance management plan.</i></p>	<p>The clearance of an area of 1 hectares or more of indigenous vegetation is anticipated during the repair and development of structures to accommodate the proposed route deviations for the traffic.</p> <p>It is recommended that a MMP should be submitted to the DEA for approval and implementation during proposed construction and for future maintenance work which may entail the clearance of vegetation.</p>
<p>30. <i>Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).</i></p>	<p>Most of the proposed areas requiring repairs are located within the formally protected Towerkop Nature Reserve, with the southern portion also forming part of a Mountain Catchment Area. The portions of the study area immediately north and south of the protected areas are mapped as Critical Biodiversity Areas that should be protected. The site is within a World Heritage Site.</p>
Activities in terms of GN R.985 (No. 324 of 7 April 2017 as amended)	
<p>12. <i>The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.</i></p>	<p>Most of the proposed areas requiring repairs are located within the formally protected Towerkop Nature Reserve, with the southern portion also forming part of a Mountain Catchment Area. The portions of the study area immediately north and south of the protected areas are mapped as Critical Biodiversity Areas that should be protected. The site is within a World Heritage Site.</p>

<p><b>Western Cape</b></p> <p><i>i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;</i></p> <p><i>ii. Within critical biodiversity areas identified in bioregional plans;</i></p> <p><i>iv. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning; or</i></p> <p><i>v. On land designated for protection or conservation purposes in an Environmental Management Framework adopted in the prescribed manner, or a Spatial Development Framework adopted by the MEC or Minister.</i></p>	<p>The clearance of an area of 300 square meters or more of indigenous vegetation is anticipated during the repair and development of structures to accommodate the proposed route deviations for the traffic.</p> <p>It is recommended that a MMP should be submitted to the DEA for approval and implementation during proposed construction and for future maintenance work which may entail the clearance of vegetation.</p>
<p>14. The development of– <i>(ii) infrastructure or structures with a physical footprint of 10 square metres or more;</i></p> <p>where such development occurs– <i>(a) within a watercourse;</i></p> <p><b>Western Cape</b></p> <p><i>i. Outside urban areas:</i></p> <p><i>(aa) A protected area identified in terms of NEMPAA, excluding conservancies;</i></p> <p><i>(bb) National Protected Area Expansion Strategy Focus areas;</i></p> <p><i>(cc) World Heritage Sites;</i></p> <p><i>(dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;</i></p> <p><i>(ee) Sites or areas listed in terms of an international convention;</i></p> <p><i>(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</i></p> <p><i>(gg) Core areas in biosphere reserves;</i></p>	<p>The proposed flood damage repairs occur on Main Road 309 in the Seweweekspoort Area, Western Cape, at 27 of the proposed construction sites along the route. The site is outside urban areas.</p> <p>The design width of the structures will be 6 m clear width between guide blocks and not materially wider than the gravel road which is narrower in many parts of the pass. Typical sizes for the structures will be 5 to 7 m long, perpendicular to the flow of the river, and structures will be aligned with the direction of the river.</p> <p>Most of the proposed areas requiring repairs are located within the formally protected Towerkop Nature Reserve, with the southern portion also forming part of a Mountain Catchment Area. The portions of the study area immediately north and south of the protected areas are mapped as Critical Biodiversity Areas that should be protected. The site is within a World Heritage Site.</p>

## **2.2 National Water Act (Act 36 of 1998)**

In terms of the National Water Act (Act 36 of 1998) (NWA), there are eleven types of “water use” that require authorisation from the Department of Water & Sanitation (DWS) before the water use activities commences. Given the nature of the project, the type of water uses in terms of Section 21 of the NWA relevant to the proposed project are:

- Section 21(c) – impeding or diverting the flow of water in a water course
- Section 21(i) – altering the beds, banks, course or characteristics of a watercourse.

Authorisation for a Water Use Licence Application (WULA) is required from the DWS in order to undertake the above activities. A WULA was lodged with the DWS in March 2017 (see Appendix I of the BAR).

## **2.3 Other Applicable Legislation and Policies**

Other legislation and guidelines applicable to the proposed project have been summarized in Table 2-2 below:

**Table 2-2: Policy and Legislative Context of Proposed Project**

<b>Legislation, Policy or Guideline</b>	<b>Applicability to Project</b>	<b>Administering Authority</b>	<b>Date</b>
NEMA EIA Regulations GN 982, 983, 984, 985)	For the project's potential to cause degradation to the environment. A number of listed activities are triggered by the proposed project under GN R983 & R985.	<ul style="list-style-type: none"> <li>National Department of Environmental Affairs</li> <li>Regional Department of Environmental Affairs &amp; Development Planning</li> </ul>	1998
Department of Environmental Affairs (DEA) Integrated Environmental Management Guideline Series, Guideline 5: Assessment of the EIA Regulations, 2012 (Government Gazette 805)	Environmental impacts will be generated primarily in the construction phase of this project with associated operational phase impacts. These will be assessed as part of the proposed project.		2012
Integrated Environmental Assessment Guideline Series 11, published by the DEA in 2004	An Environmental Assessment is required for the proposed project as activities are triggered under GN R983 & R985.		2004
DEA Integrated Environmental Management Guideline Series, Guideline 7: Public Participation in the Environmental Impact Assessment Process, 2012 (Government Gazette 807)	Public participation is a requirement of the Basic Assessment Process and will be conducted for the proposed project.		2012
National Water Act, 1998 (Act 36 of 1998)	For potential impact of project construction activities on watercourses defined as such under the Act. A Water Use License Application (WULA) for section 21(c)&(i) activities has been submitted to the Department of Water & Sanitation (DWS) (refer to Appendix I).	Department of Water & Sanitation	1998
National Heritage Resources Act, 1999 (Act 25 of 1999)	For the identification and preservation of items of heritage importance in Seweweekspoort	Heritage Western Cape	1999

Legislation, Policy or Guideline	Applicability to Project	Administering Authority	Date
	which were identified by the Heritage Specialist.		
National Environmental Management: Biodiversity, 2004 (Act 10 of 2004)	For the protection of biodiversity. The construction of temporary bypass roads as various points along the road will require clearance of vegetation.	<ul style="list-style-type: none"> <li>• Department of Agriculture</li> <li>• Department of Environmental Affairs &amp; Development Planning</li> <li>• CapeNature</li> </ul>	2004
Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)	For protection of agricultural resources and for control and removal of alien invasive plants, particularly during the operational phase of the project.	National Department of Agriculture	1983
Department of Environmental Affairs and Development Planning (DEA&DP) Guideline on Public Participation (March 2013)	Public participation is a requirement of the Basic Assessment Process and will be conducted for the proposed project.	<ul style="list-style-type: none"> <li>• National Department of Environmental Affairs</li> <li>• Regional Department of Environmental Affairs &amp; Development Planning</li> </ul>	2013
DEA&DP Guideline on Alternatives (March 2013)	An alternatives assessment is required as part of the Basic Assessment Process and will be conducted for the proposed project.		
DEA&DP Guideline on Need & Desirability (March 2013)	There is a need for the proposed project in that the road requires repair work in order to make it functional and safe.		
Eden Municipal By-Laws	The project spans over the Eden and Central Karoo Municipalities, thus all proposed construction and operational activities must comply with these municipal By-Laws.	Eden Municipality	Updated accordingly
Central Karoo By-Laws	The project spans over the Eden and Central Karoo Municipalities, thus all proposed construction and operational activities must comply with these municipal By-Laws.	Central Karoo Municipality	

### **3. Approach to the EMPr**

A typical EMPr takes the planning and design, construction and operational phases of a project into account. The EMPr is based largely on the findings and recommendations of the BA process. However, the EMPr is considered a “live” document and must be updated with additional information or actions during the lifetime of the project if and when needed (specifically with the conditions of the environmental authorization and Water Use Licence once these have been approved). The EMPr follows an approach of identifying an over-arching goal and objectives, accompanied by management actions that are aimed at achieving these objectives. The management actions are presented in a table format in order to show the links between the goal and associated objectives, actions, responsibilities, monitoring requirements and targets. The management plans for the Design and Layout, Construction and Operational phases consist of the following components:

- Description of the activity taking place
- The potential impacts associated with that activity
- The appropriate mitigation measures
- The responsible party
- Monitoring frequency.

### **4. Roles and Responsibilities**

For the purposes of the EMPr, the generic roles that need to be defined are those of the:

- Construction Manager
- Environmental Manager
- Environmental Control Officer
- Environmental Auditor.

Note: The specific titles for these functions will vary from project to project. The intent of this section is to give a generic outline of what these roles typically require.

#### **4.1 Construction Manager**

The Construction Manager has overall responsibility for environmental management on site which includes the implementation of the EMPr. The Construction Manager reports to the Engineering Project Manager. The Construction Manager is supported by the Environmental Manager. The specific tasks during the construction phase will include:

- Reviewing the monthly reports compiled by the Environmental Manager
- Identifying the need for remedial measures with regard to proposed works

- Communicating directly with the Contractors
- Issuing non-conformance notifications to the Contractors that do not comply with the requirements as set out in the EMPr.

## 4.2 Environmental Manager

The Environmental Manager will be responsible for ensuring that the requirements of the EMPr are complied with on the construction site. The Environmental Manager will report to the Engineering Project Manager and Construction Manager. The Environmental Manager will:

- Ensure that the Contractor is duly informed of the EMPr and associated responsibilities and implication of the EMPr prior to commencement of construction by ensuring that the necessary environmental documents are included in the tenders and the expression of interests
- Inform key onsite staff of their roles and responsibilities in terms of the EMPr through initial environmental awareness training (inductions)
- Monitor, review and verify compliance and recommend measures to rectify them in consultation with the Client and the Contractor as required
- Identify areas of non-compliance and recommend measures to rectify them
- Ensure that the Contractor remedies environmental problems timeously and to the satisfaction of the Project Engineer and authorities where necessary
- Request Environmental Method Statements from the Contractor prior to the start of relevant construction activities and approve these (as appropriate) without causing undue delay to the Contractor
- Ensure induction material includes project appropriate environmental issues
- Approve environmental training programmes and other awareness initiatives
- Provide feedback for continual improvement in environmental performance
- Respond to changes in project implementation or unanticipated site activities which are not addressed in the EMP, and which could potentially have environmental impacts, and advise the Client and the Contractor as required
- Assign an Environmental Control Officer who will be responsible for overseeing the day-to-day construction activities
- Undertake a site closure inspection, which may result in recommendations for additional clean-up and rehabilitation measures.

## 4.3 Environmental Control Officer

The Environmental Control Officer (ECO) reports to the Environmental Manager, who then reports to the Construction Manager. The ECO is responsible for conducting the



day-to-day tasks required to ensure that the EMPr is correctly implemented on the construction site. The ECO shall:

- Develop environmental awareness training for all new site personnel (e.g. posters, tool box talks, signage)
- Ensure that all activities on site are undertaken in accordance with the EMPr
- Undertake visual inspections of the activities of employees with regard to implementation of the requirements outlined in the EMPr
- Immediately notify the Construction Manager and the Environmental Manager of any non-compliance with the EMPr, or any other complaints or issues of environmental concern
- Review and submit Environmental Method Statements to the Environmental Manager for approval
- Ensure that all environmental monitoring programmes (sampling, measuring, recording etc.) are carried out according to protocols and schedules
- Keep site documentation related to environmental management on site (e.g. permits, EMPr, Environmental Method Statements, Environmental Authorisation, reports, audits, monitoring results, receipts for waste removal etc.)
- Keep a regular photographic record of all environmental incidents
- Compile and submit the following reports:
  - Monthly environmental compliance reports for submission to the Environmental Manager and the Construction Manager
  - Monthly environmental monitoring reports for submission to the Environmental Manager
  - Weekly environmental compliance checklist reports for submission to the Environmental Manager and the Construction Manager
  - Environmental Incident reports and an Environmental Incidents register
  - An environmental non-conformance register
  - A complaints register (if a register is required or appropriate)
  - An Environmental Method Statements register
  - A Site Closure Checklist.

#### **4.4 Environmental Auditor**

The appointed Independent Environmental Auditor conducts environmental audits to assess compliance during construction with the relevant requirements of the Environmental Authorisation, EMPr and other environmental permits and associated

documents. This appointment must be managed through the Client. The Environmental Auditor shall not be a person who works on the project being audited.

## 5. Project Description

The flood damage repairs included in this project occur on Major Road MR306 in the Seweweekspoort Area. There are 27 structures proposed for repair work or replacement. The design width of the structures are to be 6 m clear width between guideblocks and not materially wider than the gravel road which is narrower in many parts of the pass. Typical sizes for the structures will be 4 to 6 m wide perpendicular to the flow of the river and structures will be aligned with the direction of the river. Rectangular causeways with larger clear spans (few piers) are preferred to pipe causeways as the risk of blockage is much reduced. The sizing of openings will be to allow floods with a 2 year return period to pass through drainage openings under the deck slab. Concrete approach slabs are to be omitted as far as possible due to under scour risks and expensive repairs. The pass cannot be closed for traffic during construction. Temporary deviation roads would need to be used but will be revegetated. A site visit was attended between the environmental impact assessment team, the project engineers and the client to determine the bypass routing that would have the least environmental impact. Table 5-1 below provides a description of the structures on MR306 proposed for repair or replacement:

**Table 5-1: Structures Requiring Repair along the MR306**

Km Dist.	GPS Coordinates	Existing Structure	Proposed Structure
40.90	33°21'41.30"S	3x600 mm pipes with gabions upstream, ponding occurs at inlet and outlet	6 m wide causeway
	21°24'35.42"E		
44.10	33°22'51.38"S	2x600 mm encased pipes, large skew angle	4 m wide causeway
	21°24'31.32"E		
44.30	33°22'55.45"S	2x600 mm encased pipes, with wing walls, apron slabs, gabions downstream damaged	6 m wide causeway
	21°24'26.95"E		
44.50	33°23'1.12"S	2x600 mm encased pipes, grouted stone head walls, base scoured and water running under structure	4 m wide causeway
	21°24'21.51"E		
44.70	33°23'8.56"S	2x600 mm encased pipes, heavy siltation, low level	6 m wide causeway
	21°24'22.03"E		

45.05	33°23'11.26"S	2x600 mm encased pipes, grouted stone head walls, mostly damaged, slight siltation	4 m wide causeway
	21°24'31.42"E		
45.10	33°23'13.16"S	2x600 mm encased pipes, with stone and concrete head walls upstream	4 m wide causeway
	21°24'34.38"E		
45.50	33°23'24.84"S	1x600 mm pipe only for side stream	3 m wide causeway
	21°24'37.91"E		
45.97	33°23'27.84"S	2x600 mm encased pipes with concrete and stone head walls at inlet and outlet, heavy siltation, structure completely buried	4 m wide causeway
	21°24'22.06"E		
46.35	33°23'23.57"S	1x600 mm pipe with stone head wall	2 m wide causeway
	21°24'7.61"E		
46.50	33°23'26.04"S	2x600 mm pipes with concrete and stone head walls at inlet and outlet, stone pitching aprons, siltation, structure completely buried	6 m wide causeway
	21°24'5.27"E		
48.00	33°24'3.53"S	1x900 mm pipe, stone head and wing walls, damaged apron slabs both sides, river channel is deep	6 m wide causeway
	21°23'55.81"E		
50.10	33°24'42.25"S	3x600mm pipes with stone head walls up and down stream, stone pitching aprons severely damaged	8 m wide causeway
	21°24'31.50"E		
50.30	33°24'46.14"S	2x900 mm pipes with stone head and return wall downstream, severely damaged and siltation issue	5 m wide causeway
	21°24'29.91"E		
50.80	33°24'56.08"S	3x600 mm pipes with stone head and return walls up and down stream, severely damaged and siltation prevalent	6 m wide causeway
	21°24'14.54"E		
51.10	33°24'59.11"S	2x900 mm pipes with stone head wall up and down stream, severely damaged, large boulders abundant in river bed	6 m wide causeway
	21°24'7.50"E		
51.60	33°25'1.52"S		30 m concrete or gabion wall

	21°23'51.22"E	River blocked by fallen tree and erodes bank and under scours road when flood comes through	
52.00	33°25'16.31"S	2x900 mm pipes with stone head wall up and down stream, severely damaged, boulders abundant in river bed	6 m wide causeway
	21°23'50.59"E		
53.20	33°25'35.88"S	2x900 mm pipes with concrete protection works up and down stream, scouring severe	6 m wide causeway
	21°24'16.53"E		
53.40	33°25'39.94"S	2x600 mm pipes with stone head walls at and outlet, mostly buried, nearly completely destroyed	6 m wide causeway
	21°24'20.83"E		
53.50	33°25'43.76"S	2x900 mm pipes with concrete protection works up and down stream, scouring severe	6 m wide causeway
	21°24'23.71"E		
53.80	33°25'52.34"S	Road way gets flooded by river and washes material away completely during floods	100 m long concrete retaining wall
	21°24'31.94"E		
54.10	33°25'56.48"S	2x900 mm pipes with stone head wall up and down stream, mostly damaged, large boulders abundant in river	6 m wide causeway
	21°24'26.57"E		
54.30	33°26'0.20"S	2x900 mm pipes with stone head wall up and down stream, mostly damaged, large boulders abundant in river bed, siltation high	6 m wide causeway
	21°24'24.55"E		
54.40	33°26'3.00"S	Road way gets flooded by river and washes material away completely during floods	350 m long concrete retaining wall
	21°24'24.34"E		
57.10	33°27'14.40"S	57 m long causeway with 6x2.4m openings, 500mm thk slab, aprons and wing walls, 4 openings completely blocked with rocks only 2 openings clear	Drop inlet and river realignment
	21°25'15.08"E		
58.10	33°27'34.98"S	1x1.9 m W causeway with 750mm pipe down steam, broken apron slabs and downstream return walls	6 m wide causeway
	21°25'43.17"E		

## **5.1 Phases of the Project and Associated Activities**

Activities on site will include indigenous vegetation clearing, construction of temporary gravel sections to divert traffic, and construction of causeways of various widths.

These activities will be undertaken during three different phases as follows:

- Layout and Design Phase: The design and layout of the proposed structures.
- Construction Phase: Site preparation, construction of the proposed structures
- Operational Phase: General maintenance of the road and newly constructed proposed structures.

## **6. Management Plan for the Layout and Design, Construction and Operational Phase**

The Management Plan has been developed to facilitate the streamlining of environmental requirements during the various phases of the project. It describes the main requirements that must be adhered to, to ensure that the environment is considered, negative impacts avoided or minimised and positive impacts optimised. Most of the impacts will occur during the construction phase with minimal impacts occurring during the operational phase. Table 6-1 includes impacts associated with both the construction and operational phase, as well as the proposed mitigation measures. For the purposes of this EMPr, a responsible party has been assigned to ensure that each mitigation measure for the generated impact is applied however this may change once the environmental authorisation of the project has been granted.

**Table 6-1: Anticipated Impacts associated with Construction and Operational phase, and Proposed Mitigation Measures**

Activity / Potential Impact	Mitigation	Responsible Party	Monitoring Frequency
<b>Construction Phase</b>			
<p><b>Soil</b></p> <ul style="list-style-type: none"> <li>Erosion and potential soil loss due to clearance of vegetation for the construction of bypass roads.</li> <li>Insufficient stormwater control measures may result in localised high levels of soil erosion, possibly creating dongas or gullies, which may lead to decreased water quality in surrounding drainage lines.</li> <li>Increased erosion could result in increased sedimentation which could impact on ecological processes.</li> </ul>	<ul style="list-style-type: none"> <li>All fill material must be removed to expose the original soil surface and to preserve the soil integrity.</li> <li>Soil erosion prevention measures should be implemented such as gabions, sand bags etc.</li> <li>Impacted areas should be re-shaped post-construction to ensure natural flow of runoff and to prevent ponding.</li> <li>All exposed earth should be rehabilitated promptly with suitable vegetation to stabilize the soil.</li> <li>If erosion is evident, corrective action must be taken.</li> </ul>	ECO	<ul style="list-style-type: none"> <li>The sites should be monitored weekly for any signs of off-site siltation</li> <li>The area surrounding the drainage lines must be regularly checked for signs of erosion – monthly inspections</li> </ul>
<p><b>Botanical</b></p> <ul style="list-style-type: none"> <li>Loss of vegetation and ecological processes due to clearance of vegetation required for construction of bypass roads.</li> <li>Encroachment of alien invasive species due to the</li> </ul>	<ul style="list-style-type: none"> <li>An Environmental Control Officer (ECO) must visit the site once a month and agree with the Contractor what will be allowed at each construction location. This will include the pruning of trees, marking or plants which must be protected, plants which may be relocated permanently, the replanting of plants at the end of construction where they have been removed..</li> </ul>	ECO	<ul style="list-style-type: none"> <li>Inspections during vegetation clearing</li> <li>Regular inspections during rehabilitation of</li> </ul>

<p>disturbance of areas required for the bypass roads.</p> <ul style="list-style-type: none"> <li>Potential pollution as a result of accidental spillages of petrochemicals from construction machinery.</li> </ul>	<ul style="list-style-type: none"> <li>Sensitive patches of vegetation, including trees identified as sensitive and requiring protection, must be marked with danger tape to prevent them from being removed or damaged.</li> <li>Plant relocation of permitted species must be done through search and rescue activities prior to commencement of clearing</li> <li>Pruning of trees must be carried out with care to prevent unnecessary damage to the overall health of each tree.</li> <li>Topsoil must be kept aside at all locations to aid in rehabilitation of the disturbed areas</li> </ul> <p>All bypasses must be rehabilitated with the following in place:</p> <ul style="list-style-type: none"> <li>A detailed vegetation rehabilitation plan must be compiled along with an easy to follow method statement.</li> <li>All fill material must be removed to expose the original soil surface and to preserve the soil integrity.</li> <li>Seed must be collected from vegetation at each construction site prior to the construction phase by a qualified practitioner.</li> <li>Collected seed should be cleaned and stored until the rehabilitation phase.</li> <li>Areas must be irrigated regularly using a vehicle-based irrigation hose. Areas should be watered twice weekly for 2-months and weekly thereafter for 3 months.</li> <li>Monitoring of each site must be carried out to ensure that disturbed areas are successfully rehabilitated to an acceptable level.</li> </ul>		<p>construction areas</p>
<p><b>Air Quality</b> Potential dust generation from soil stripping, vehicle traffic on the access and bypass roads and motor vehicle fumes will have an impact on air quality.</p>	<ul style="list-style-type: none"> <li>All construction machinery and equipment must be regularly serviced and maintained to keep noise, dust and possible leaks to a minimum.</li> <li>Road dampening should be undertaken to prevent excess dust during construction.</li> </ul>	<p>Contractor &amp; ECO</p>	<p>Regular inspections</p>

<p><b>Waste</b> There is potential for the site and surrounding areas to become polluted if construction activities are not properly managed (e.g. oil / bitumen spills, litter from personnel on-site, sewage from ablutions etc.).</p> <p>Waste generation could be created by the following:</p> <ul style="list-style-type: none"> <li>• Solid waste – plastics, metal, wood, concrete, stone.</li> <li>• Chemical waste – petrochemicals, resins &amp; paints.</li> <li>• Sewage as may be generated by employees.</li> </ul>	<ul style="list-style-type: none"> <li>• All waste generated on-site during construction must be adequately managed. Separation and recycling of different waste materials is supported.</li> <li>• All solid wastes should be disposed of at a registered landfill site and records maintained to confirm safe disposal.</li> <li>• Adequate scavenger-proof refuse disposal containers should be supplied to control solid waste on-site.</li> <li>• It should be ensured that spoil areas are identified for the safe disposal on construction waste material.</li> <li>• Chemical waste should be stored in appropriate containers and disposed of at a licensed disposal facility.</li> <li>• Portable sanitation facilities should be erected for construction personnel. Use of these facilities should be enforced (these facilities should be kept clean so that they are a desired alternative to the surrounding vegetation). These facilities should also be monitored and serviced regularly so as to prevent contamination of the water resources.</li> <li>• Precautions should be taken to avoid litter from entering drainage lines.</li> </ul>	<p>ECO</p>	<p>The construction site should be inspected for waste associated impacts on a regular basis</p>
<p><b>Socio-Economic</b></p> <ul style="list-style-type: none"> <li>• Creation of job opportunities for skilled personnel (e.g. engineers, specialists etc.) and non-skilled personnel (e.g. labourers).</li> <li>• Skills development of the local community through employment opportunities.</li> <li>• Social anxiety may arise should the surrounding communities not be</li> </ul>	<ul style="list-style-type: none"> <li>• Inform the surrounding communities and general public of the proposed activity as soon as possible. This will serve to ease potential social anxiety. Such notification can be conducted through the Public Participation Process.</li> <li>• Local people should be employed where possible and a Community Liaison Officer could assist in raising any concerns / complaints noted by the affected community to the Construction Team.</li> </ul>	<p>Contractor</p>	<p>Ongoing</p>



<p>adequately notified of the proposed activity.</p> <ul style="list-style-type: none"> <li>Possible economic benefits to suppliers of building materials in the Eden and Central Karoo Municipalities as goods and services may be purchased from these entities during the construction phase.</li> </ul>			
<p><b>Noise</b> Disruption to residents through increased activity and noise in the area.</p>	<ul style="list-style-type: none"> <li>All construction machinery and equipment must be regularly serviced and maintained to keep noise, dust and possible leaks to a minimum).</li> <li>Operational Hours: No works shall be executed between sunset and sunrise and on the non-working and special non-working days as stated in the Contract Data unless otherwise agreed between the Engineer and Contractor.</li> <li>Construction personnel should be made aware of the need to prevent unnecessary noise such as hooting and shouting.</li> </ul>	ECO	Weekly
<p><b>Water Resources</b></p> <ul style="list-style-type: none"> <li>Aquatic habitat modification or loss.</li> <li>Impairment of the surface water quality.</li> <li>Potential for erosion.</li> <li>Flow modification.</li> </ul>	<ul style="list-style-type: none"> <li>Work within the river channel or wetland areas should be limited as far as possible and the disturbed areas rehabilitated immediately afterwards.</li> <li>Construction within the river channel should as far as possible take place during the drier months of the year.</li> <li>To minimise the impact of the temporary bypass, the bypass route should be selected to avoid larger riparian trees as far as possible. Larger plants should be trimmed back to leave their stems and roots intact rather than removing the entire trees unless absolutely necessary. Bidem should be placed over the existing topsoil and vegetation before placing the fill material in the channel, that the fill material can all be removed after completion of the road</li> </ul>	ECO	Weekly

	<p>crossing structure. Pipe culverts should be temporarily placed within the channel to ensure the low flow in the river is not impeded. Sandbags should be placed on the outer edge of the bypass to prevent the sashing of sediment into the channel.</p> <ul style="list-style-type: none"> <li>• Spoil material should be utilised within the construction works or removed to approved dumping / spoils sites.</li> <li>• Once construction is complete, the area should be rehabilitated to resemble that of the surrounding bed and banks and where necessary vegetated with suitable local indigenous plants as occur at the site.</li> <li>• Any invasive alien plants from the road reserve should be monitored and removed on an ongoing basis according to methods as provided by the Working for Water Programme.</li> <li>• Minimise the frequency of, or requirement for, maintenance activities.</li> <li>• All reasonable measures should be undertaken to ensure that river maintenance activities minimise erosion.</li> <li>• Contaminated runoff from the construction site(s) should be prevented from entering the river, its tributaries and associated wetland areas. The laydown area and main construction site for the road upgrade should be located outside of the pass and away from the river and its associated wetland areas.</li> <li>• If the construction site(s) need to be located near the rivers / streams, all materials on the construction site(s) should be properly stored and contained.</li> <li>• Disposal of waste from the site(s) should also be properly managed.</li> <li>• Construction workers should be given ablution facilities at the construction works that are located away from the river systems (at least 30 m) and regularly serviced.</li> </ul>		
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	<ul style="list-style-type: none"> <li>• Increased sedimentation or turbidity at each of the construction works should be mitigated as far as possible by making use of sandbags, settling ponds or screens to minimise the load of sediment being washed downstream of the sites.</li> <li>• The riparian vegetation cover should be disturbed as little as possible during the construction phase. Any disturbed areas should be rehabilitated as soon as possible after construction is completed and planted with suitable indigenous plants where necessary.</li> <li>• Where the tributary stream channels drop steeply at the crossings and the risk of erosion downstream of the crossings is high, erosion protection measures should be implemented or the structures stepped to accommodate the drop at the site in order to prevent the need to mitigate erosion in the future. Stormwater runoff from the road into the stream channel at these sites may also need to be mitigated to prevent erosion at the crossings.</li> <li>• Activities within the river channel during the construction phase should be limited as far as possible in terms of their spatial and temporal extent. Construction work within the river channel should preferably take place before the onset of the rainfall period to ensure minimal impact on flow. Flow in the river should be diverted around the construction works. In particular the low flow should not be impeded during construction.</li> <li>• Rubble and debris from existing structures and construction activities, as well as the temporary bypass structures, should be removed after construction is complete so as not to impede flow in the river.</li> <li>• In the longer term, the upgraded structures and the box culverts / pipes should not impede the flow and in particular the low flow in the river. In particular, the new culvert structures should not be placed higher than the base level of the river channels to ensure</li> </ul>		
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	<p>that low flows are not impeded. In addition, the culvert structures must be placed within the natural drainage line of the streams.</p> <ul style="list-style-type: none"> <li>• The structures should also not impede the migration of biota. The channel upstream of the river crossings should be kept free of debris, intrusive growth of invasive alien plants and sediment build-up, particularly at the culvert where it might impede flows.</li> <li>• Channelization or canalization associated with the proposed protection walls should be avoided as it tends to result in bigger problems than those it was intended to solve. The wall should be constructed within the road reserve and should not encroach into the riparian zone of the river. It should also not significantly confine or intensify the flood flows of the river but should only protect the road from flood damage.</li> </ul>		
<p><b>Heritage Resources</b> Damage to archaeological features located in close proximity to the river crossings or planned construction works.</p>	<p>General mitigation includes:</p> <ul style="list-style-type: none"> <li>• Ensure that archaeological features close to crossings are marked as no-go areas during maintenance work.</li> <li>• Keep disturbance footprint to a minimum.</li> </ul> <p>Specific mitigation includes:</p> <ul style="list-style-type: none"> <li>• Km 45.97: Construction of the temporary bypass is preferred on the downstream side of the road. However, if the upstream side is used then the bypass should be constructed within 8 m of the edge of the existing road in order to reduce the chances of impacts to archaeological artefacts and features related to the historic farm werf.</li> <li>• Km 46.35: Construction of the temporary bypass, if required<sup>1</sup>, must occur on the downstream side of the road to protect the historic retaining wall. During construction of the new structure impacts to the historic retaining wall must be minimised and, as far</li> </ul>	<p>ECO</p>	<p>Daily</p>

<sup>1</sup> This section of the road crosses a fairly steep slope and it is likely that no bypass will be possible and that construction will take place over half the road width at a time so as to allow the other half to remain open to traffic.

	<p>as possible, the new structure should be integrated with the old wall. Where required, the drystone retaining wall should be reconstructed in a manner that matches the existing walling.</p> <ul style="list-style-type: none"> <li>• Km 51.6: All work and related activities must be restricted to the downstream side of the road. No activity to be allowed on the upslope (northwest) side of the road at this point so as to protect the ruin that lies very close to the edge of the road.</li> <li>• Km 54.1: Construction of the temporary bypass is preferred on the upstream side of the road. However, if the downstream side is to be used then the bypass should be constructed so as to not be further than 15 m from the centre point of the present culvert in order to avoid impacts to possible archaeological features in the dense bush around the convict station.</li> <li>• Km 54.3: Construction of the temporary bypass is preferred on the downstream side of the road. However, if the upstream side is to be used then the bypass should be constructed within 8 m of the edge of the existing road and no further than 25 m north of the stream bed in order to avoid impacts to possible unknown archaeological features in the dense bush around the convict station.</li> </ul>		
<ul style="list-style-type: none"> <li>• Impacts to the built environment</li> </ul>	<ul style="list-style-type: none"> <li>• Minimise the damage to the drystone walling, integrating the new works with the base of the wall and rebuilding the wall where it was damaged. It would be important to use old, weathered and lichen-coated rocks so as to not create a high degree of contrast between old and new fabric.</li> <li>• Where new retaining walls are to be constructed between the road and the river there should not be bollards placed on the wall as this would be out of character with the pass. It is preferable that the finished product has a similar appearance to the status quo and that the wall be as unobtrusive as possible with plants able to</li> </ul>	<p>Contractor &amp; ECO</p>	<p>Weekly</p>

	grow along the edge. This will reduce the degree of 'modernisation' of the pass.		
<b>Operational Phase</b>			
<b>Soil</b> Pollution to soils from maintenance machinery.	<ul style="list-style-type: none"> <li>All maintenance machinery and equipment must be regularly serviced and maintained.</li> <li>In the event of any spills of fuel, oils, solvents, paints or other hazardous materials occurring during the maintenance activities, these spills need to be cleaned up in accordance with the approved Spill Response Method Statement.</li> </ul>	Client Maintenance Contractor	As and when maintenance occurs
<b>Botanical</b> <ul style="list-style-type: none"> <li>Encroachment of alien invasive species following rehabilitation of construction areas.</li> <li>Potential pollution as a result of accidental spillages of petrochemicals from maintenance machinery.</li> </ul>	<ul style="list-style-type: none"> <li>Pruning of trees must be carried out with care to prevent unnecessary damage to the overall health of each tree.</li> <li>Areas must be irrigated regularly using a vehicle-based irrigation hose. Areas should be watered twice weekly for 2-months and weekly thereafter for 3 months.</li> <li>Monitoring of each site must be carried out to ensure that disturbed areas are successfully rehabilitated to an acceptable level.</li> <li>All maintenance machinery and equipment must be regularly serviced and maintained.</li> <li>In the event of any spills of fuel, oils, solvents, paints or other hazardous materials occurring during the maintenance activities, these spills need to be cleaned up in accordance with the approved Spill Response Method Statement.</li> <li>Eradication and monitoring of alien plants must be done on an ongoing basis.</li> </ul>	Client Maintenance Contractor	<i>Ad hoc</i> monitoring to ensure that effective regrowth of vegetation is occurring on rehabilitated areas and no erosion is occurring
<b>Air Quality</b> Motor vehicle fumes from maintenance machinery will have a slight to negligible impact on air quality.	All machinery and equipment must be regularly serviced and maintained to keep noise, dust and possible leaks to a minimum.	Client Maintenance Contractor	N/A

<p><b>Waste</b> Litter from maintenance crew entering the drainage lines.</p>	<p>Precautions should be taken to avoid litter from maintenance crew from entering drainage lines.</p>	<p>Client Maintenance Contractor</p>	<p>As and when maintenance occurs</p>
<p><b>Noise</b> Disruption to residents through increased activity and noise in the area during maintenance activities. This impact will be marginal to negligible.</p>	<ul style="list-style-type: none"> <li>• All maintenance machinery and equipment must be regularly serviced and maintained to keep noise, dust and possible leaks to a minimum.</li> <li>• Maintenance personnel should be made aware of the need to prevent unnecessary noise such as hooting and shouting.</li> </ul>	<p>Client Maintenance Contractor</p>	<p>As and when maintenance occurs</p>
<p><b>Water Resources</b></p> <ul style="list-style-type: none"> <li>• Aquatic habitat modification or loss.</li> <li>• Impairment of the surface water quality.</li> <li>• Potential for erosion.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance work within the river channel or wetland areas should be limited as far as possible and the disturbed areas rehabilitated immediately afterwards.</li> <li>• Any invasive alien plants from the road reserve should be monitored and removed on an ongoing basis according to methods as provided by the Working for Water Programme.</li> <li>• Minimise the frequency of, or requirement for, maintenance activities.</li> <li>• All reasonable measures should be undertaken to ensure that river maintenance activities minimise erosion.</li> </ul>	<p>Client Maintenance Contractor &amp; Client</p>	<p>As and when maintenance occurs</p>
<p><b>Heritage Resources</b> Damage to archaeological features located in close proximity to the maintenance activities.</p>	<p>If any of the maintenance activities encroach in areas where archaeological resources have been identified, keep disturbance footprint to a minimum.</p>	<p>Client Maintenance Contractor &amp; Client</p>	<p>As and when maintenance occurs</p>

## 7. Environmental Monitoring and Auditing

Environmental inspections and audits are typically conducted using five basic techniques:

- Interviews with Contractors staff (including sub-contractors and suppliers)
- Document checks
- Observations
- Monitoring
- Measurement and verification.

This chapter defines the areas and aspects of the construction site that will be inspected or audited, the frequency of such audits, the auditor and auditee. It should be noted that these lists are not exhaustive and that each site will have specific issues that will need to be audited at an appropriate frequency. For each construction site along the length of the MR309, the auditor and auditee are as follows:

Place	Inspector / Auditor	Auditee	Inspection / Audit Frequency
Work places	ECO	Contractor's team (incl. sub-contractors)	Daily/regular Inspection
Construction site	ECO	Contractor's team	Monthly Audit
Operational phase*	Accredited EMS auditor	Client/Client Maintenance Contractor	Annual

\* Not covered in this documentation

### Work Places Inspection

The ECO will be required to conduct weekly inspections of all work places for which the Contractor is responsible, including but not limited to the following:

- Contractor's camp
- Material lay down areas
- Liquid and solid waste storage facilities (general, hazardous, recycling and scrap)
- Workshops
- Construction work area
- Bypass roads
- No-go areas
- Storm water drains.

At each of these sites, the ECO must on a daily basis check for the following, where relevant:



By observation:

- Litter
- Waste management
- Hydrocarbon spills
- Effectiveness of dust control measures
- Illegal washing out of containers in stormwater / sewer drains
- Correct usage of drip trays
- Water use and wastage
- Pollution of water bodies including wetlands
- Provision, use and security of toilet facilities
- Any other illegal activities that contravene the EMPr.

By document check:

- Removal of oil for recycling as per schedule if applicable
- Removal of packaging as per agreements with suppliers if applicable
- Removal of hazardous waste by specialist contractor as per schedule if applicable
- Correct placement of environmental signage and posters
- Document board listing emergency numbers, hazmat info sheets, etc.

### **Construction Site Audit**

The ECO must conduct monthly inspections of the entire construction site, which may involve more than one Contractor and may include, but not be limited to the following:

- Entire construction site
- Construction site fencing
- Environmentally sensitive areas
- Contractor's camp
- Material laydown areas
- Liquid and solid waste storage facilities (general, hazardous, recycling, scrap)
- Spoil dumping areas
- Concrete batching plant if applicable
- Bypass roads
- No-go areas

- Storm water diversion drains
- And any other construction areas not listed.

At each of these sites the ECO will be required to check for the following, where relevant:

By observation:

- Litter
- Separation of solid waste as per system (general, hazardous, recycling, scrap)
- Hydrocarbon spills
- Illegal dumping
- Effectiveness of dust control measures
- Illegal washing out of containers in storm water / sewer drains
- Correct usage of drip trays
- Illegal use of tracks and off-road driving in no-go areas
- Correct procedures are followed for topsoil removal and stockpiling
- Effectiveness of erosion protection measures
- Excess noise and vibration
- Water use and wastage
- Pollution of water resources
- Any other illegal activities that contravene the EMPr.

By document check:

- Correct placement of environmental signage and posters
- Document board listing emergency numbers, hazmat info sheets, etc.
- Complete and accurate records of the Environmental Management File.

By measurement:

- Amount of water used by each Contractor (where practical)
- Amount of topsoil removed and stockpiled
- Amount of land stabilisation completed
- Area revegetated
- Amount of waste recycled, sent to scrap yard or disposed of to municipal waste handling site.

By monitoring:

- Effectiveness of dust control systems
- Effectiveness of pollution control systems
- Effectiveness of rehabilitation and revegetation programmes
- Effectiveness of erosion control methods
- Effectiveness of noise control barriers.

A site-specific inspection checklist will be provided to the ECO prior to site establishment.

### **Construction Site and Documentation Compliance Audit**

The Project Environmental Manager and / or an independent environmental auditor and / or the ECO will conduct quarterly audits of the entire construction site and documentation system (Contractor and Project), which may include, but not be limited to the following:

- Site entrance/s
- Entire construction works area
- No-go areas
- Environmentally sensitive areas
- Liquid and solid waste storage facilities (general, hazardous, recycling, scrap) if applicable
- Refueling depots if applicable
- Contractor's camp area and laydown place
- Any other place which needs to be audited within the construction site.

By observation:

- Litter
- Liquid and Solid waste storage facilities (general, hazardous, recycling, scrap)
- Hydrocarbon spills
- Use of bunding, hard standing and other protection measures if applicable
- Illegal dumping
- Effectiveness of dust control measures
- Illegal washing out of containers in storm water / sewer drains
- Correct usage of drip trays
- Illegal use of tracks and off-road driving in no-go areas
- Correct procedures are followed for topsoil removal and stockpiling

- Effectiveness of erosion protection measures
- Excess noise and vibration
- Water use and wastage
- Pollution of water resources
- Provision and use of toilet facilities
- Any other illegal activities that contravenes the EMPr.

By document check:

- Complaints register is available and up to date
- Environmental Method Statements are signed off and filed correctly and up to date
- All environmental permits are available
- Copy of the Environmental Authorisation is available on site
- Copies of the Construction Environmental Management Plan are available on site
- Copies of all daily, weekly inspections and audits, minutes, incident reports and corrective action reports are filed correctly
- Copies of close-out reports are available
- The monitoring programme (where relevant) is being adhered to and the monitoring results are no more than one month late
- Chains of custody for samples can be provided on request
- Sampling protocols are followed
- Emergency numbers and procedures are clearly displayed
- Photographic record
- Records of environmental awareness training of Contractors and Staff
- Any other documentation necessary to ensure effective environmental management of the site.

By verification (if necessary):

- Spot samples to check water quality (e.g. storm water runoff)
- Map/plan measurements to check areas disturbed / revegetated
- Any other aspect which gives cause for concern.

By interview:

- The Environmental Officer

- Contractor's staff at random.

A specific site audit protocol will be formulated prior to the first audit and sent to the Contractor and ECO two weeks in advance of the quarterly audit.

## **8. Environmental Education / Environmental Awareness Plan**

### **8.1 Introduction**

An Environmental Awareness Plan must be developed as part of the EMPr to describe the manner in which the Applicant intends to inform his or her employees of any environmental risks which may result from their work and the manner in which the risks must be dealt with in order to avoid pollution or the degradation of the environment. This should not only be fulfilled as it is a legal requirement but also as duty of care to the environment.

The material / source of information for the EAP will be the approved EMPs, as well as other relevant specialist reports. These documents will be utilised to compile a database, which will contain all medium to high significant environmental aspects and issues. The environmental issues and aspects will be entered into the database with associated mitigation measures and responses, along with the specific legislation that governs such an impact or aspect. The environmental awareness plan is detailed in the sections below.

### **8.2 Induction**

All Contractor's Personnel shall undergo induction before commencement of work at the various project sites along the MR309 (or on other places, if any, as may be specified under the Contract as forming part of the site). Part of the induction will include general environmental awareness.

All environmental impacts and aspects and their mitigating measures will be discussed, explained and communicated to employees. The induction sessions will be modified according to the level of employee attending the induction session, so that all employees gain a suitable understanding of environmental issues and pollution.

### **8.3 Environmental Meetings**

Environmental meetings can be held with the Contractor. This will take the form of an open discussion. The meetings will aid in environmental awareness being generated at all levels, as well as assisting in identifying new environmental issues, concerns and pollution sources.

### **8.4 On the Job Training**

On the job training is an essential tool in environmental awareness. Employees will be given details of the expected environmental issues and concerns specifically related to their occupation. Employees will be trained on how to respond if an environmental problem or source of environmental pollution arises. The training will be ongoing, and all new employees will be provided with the same standard of training as existing employees.

## 8.5 Environmental Communication Strategy

Environmental communication can be divided into two categories, namely internal communication and external communication.

The Client shall establish and maintain procedures for the internal communication between the various levels and functions of the organisation, and receiving, documenting and responding to relevant communication from external Interested & Affected Parties (I&APs). The organisation shall consider processes for external communication on its significant environmental aspects and record its decisions.

## 8.6 Incident Reporting

Employees are required to report any and all environmentally related problems, incidents and pollution, so that the appropriate mitigating action can be implemented timeously.

The table below is an example of an environmental incident reporting procedure:

Environmental Incident Reporting Structure	Action Required
Responsible person in relevant area of responsibility where the incident occurred	<ul style="list-style-type: none"> <li>• Shall investigate the incident and record the following information:               <ol style="list-style-type: none"> <li>1) How the incident happened</li> <li>2) The reasons the incident happened</li> <li>3) How rehabilitation or clean up needs to take place</li> <li>4) The nature of the impact that occurred</li> <li>5) The type of work, process or equipment involved</li> <li>6) Recommendations to avoid future such incidents and/or occurrences.</li> </ol> </li> <li>• Shall inform the Environmental Manager on a daily basis of all incidents that were reported in the area/section.</li> <li>• Shall consult with the relevant department / person for recommendations on actions to be taken or implemented, where appropriate (e.g. clean-ups).</li> <li>• Shall assist the Environmental Manager with applicable data in order to accurately capture the incident into the reporting database.</li> </ul>
Environmental Manager	<ul style="list-style-type: none"> <li>• Shall complete an incident assessment form to assess what level of incident occurred.</li> <li>• Shall make recommendations for clean-up and / or appropriate alternate actions.</li> <li>• Shall enter actions necessary to remediate environmental impacts into the database in conjunction with the contractor.</li> <li>• Shall enter the incident onto the database in order to monitor the root causes of incidents.</li> <li>• Shall include the reported incidents in an appropriate monthly / quarterly report.</li> <li>• Shall highlight all incidents for discussion at meetings.</li> </ul>