



Lower Sundays River Canal

Environmental Maintenance Management Plan

Lower Sundays River Water User Association

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Executive summary

The Lower Sundays River Water User Association (LSRWUA) is responsible for the management, operation, and maintenance of the canal infrastructure that supplies water to agricultural users in the Lower Sundays River Valley. This infrastructure is critical to the region's agricultural economy, supporting irrigation for citrus and other crops that contribute significantly to local socio-economic development.

Currently, the canal infrastructure is aging and increasingly vulnerable to damage from factors such as sedimentation, structural wear, and extreme weather events. Failures within the system can lead to interrupted water supply to farmers, directly impacting crop production, livelihoods, and the broader socio-economic stability of the region. Given the dependency of local farmers on a reliable water supply, urgent and ongoing maintenance is essential to sustain agricultural productivity and economic growth.

In order to address this type of issues, the LSRWUA must engage in on-going repair and maintenance activities; sometimes of an emergency nature. These activities may trigger the need to apply in terms of the EIA regulations, which would necessitate the need to make an application for environmental authorisation every time maintenance or emergency repairs needs to be carried out. The regulations however allow for an Environmental Maintenance Management Plan (eMMP) to be approved under which these activities could be carried out, thus assisting to “fast track” repairs whilst alleviating the administrative burden on the Authorities to authorise an EIA Process, after each occurrence or to prevent these increasing potential impacts.

This document sets out to review the various potential maintenance activities that may be required from time to time and to assess the risks and proposed methodologies to address the impacts of these activities. Emphasis is placed on managing the accumulation of sediment in the canals and repairs across the canal infrastructure system. The document includes a generic methodology for infrastructure maintenance work in general. This document should not be seen as an exhaustive document that include all activities or solutions, but rather a living document that will facilitate implementation of maintenance projects. It should therefore be revised on a regular basis to include new developments and new issues arising, especially in light of expected pressures due to climate change and aging infrastructure. This will assist in the support of an important contributor to the local economy viz agriculture, which is dependent on working and well-maintained infrastructure.

Details of applicant

The details of applicant for the eMMP and the appointed environmental consultants are tabulated below.

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1 Introduction

The Lower Sundays River Water User Association (LSRWUA) is a Water User Association (WUA) that oversees the management and distribution of water resources in the Sundays River Valley and surrounds. The component supporting the economy in the area is the LSRWUA canals and associated infrastructure. This extensive canal system ensures a consistent and reliable supply of water to the region and thus supporting the region's agricultural and economic activities. One of its key functions undertaken by LSRWUA, is to maintain the canal system to ensure efficient water supply, essential for sustaining productivity, employment, and economic growth in the region. To facilitate these maintenance activities in compliance with environmental regulations, an environmental Maintenance Management Plan (eMMP) is proposed to identify maintenance requirements, assess potential environmental impacts, and integrate statutory and contractual obligations for sustainable infrastructure management.

1.1 Scheme background and supply

The initial irrigation scheme for the Lower Sundays River Valley started in 1913 with the construction of the Korhaansdrift Weir, developed to support commercial agriculture by regulating water flow from the Sundays River. The irrigation infrastructure expanded over time, with the construction of the Darlington Dam (formerly Lake Mentz) in 1917 to provide water for farmers. Further improvements came in the 1970s with the addition of the Gariep Dam on the Orange River, enabling a more extensive water distribution network.

In line with the National Water Act No. 36 of 1998, the management structure of the irrigation system evolved, requiring the transformation of the Sundays River Irrigation Board into a Water User Association (WUA). This transition was formalized on 20 August 2004, and operations under the newly established Lower Sundays River Water User Association (LSRWUA) commenced on 1 April 2005.

Currently, the Department of Water and Sanitation (DWS) manages the inter-basin transfer scheme which delivers untreated water from the Orange River system some 300 kilometres away, via a series of tunnels, pipelines, canals and interconnecting rivers (Figure 1). Downstream of the Darlington Dam, the LSRWUA manages the bulk water supply system, which delivers untreated water to a range of users (Figure 2). Water is released from Darlington Dam, flows down the Sundays River, and is abstracted into the LSRWUA's canal system at Korhaansdrift Weir. The water is then diverted through a network of canals that spans the length of the irrigated farming region in the Sundays River Valley Municipality (SRVM), with over 1000 delivery points in the form of sluices delivering to users in the Valley (d'Hont, et al., 2013).

The SRVM receives untreated water from the WUA to three supply systems (Enon, Addo and Greater Nqweba). The water source for the fourth system (Paterson) has historically been groundwater, but a new pipeline will connect Paterson to the Addo water treatment works in the near future. This will make all four urban settlements in the SRVM increasingly reliant on the LSRWUA for the supply of untreated water. The LSRWUA also acts as the bulk water service provider to two municipalities, the SRVM and the Nelson Mandela Bay Municipality (NMBM).

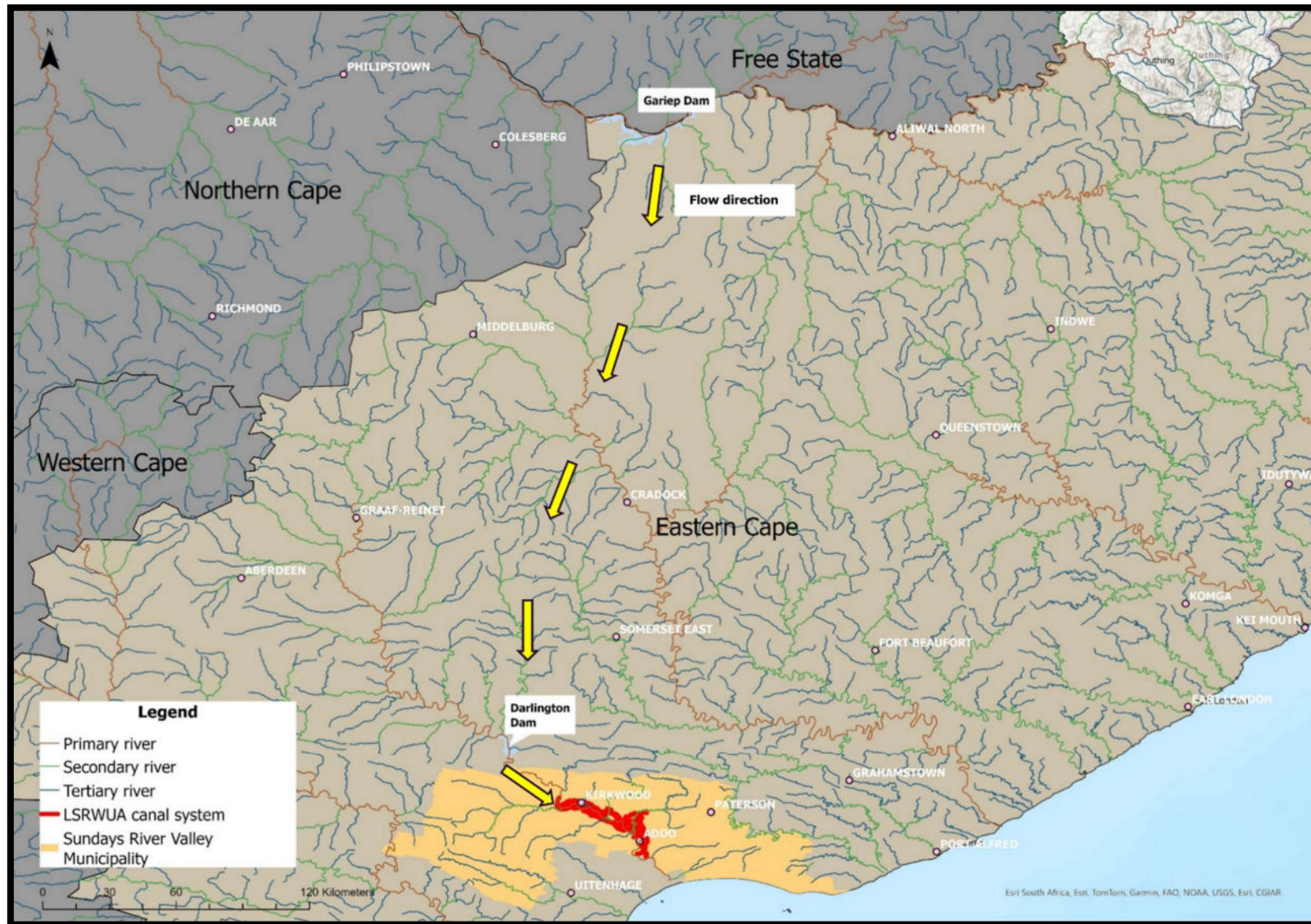


Figure 1. Overview of the water supply route from Gariep Dam to Darlington Dam, leading into the LSRWUA canal system.

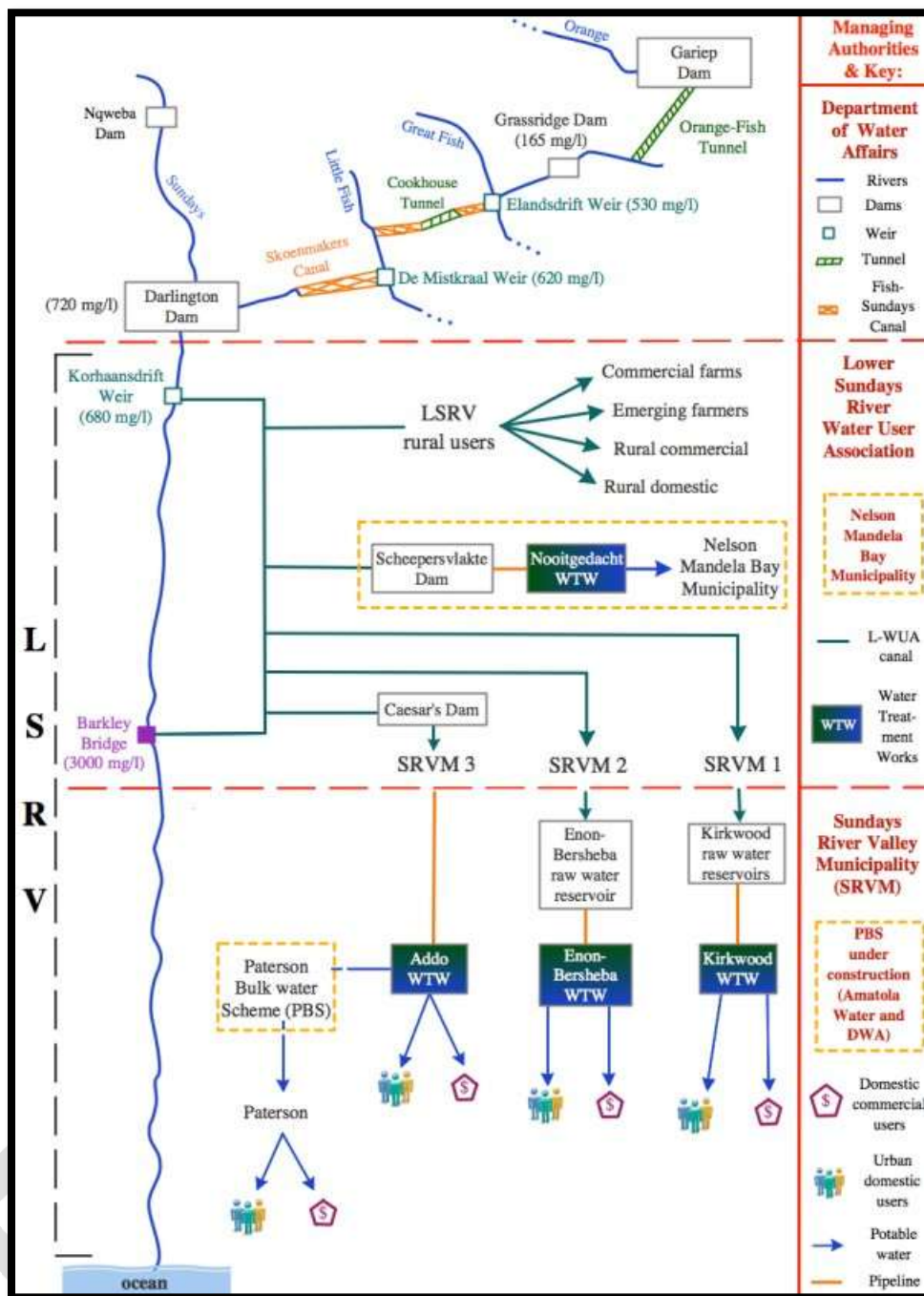


Figure 2. Conceptual diagram of overall water supply system from the Gariep Dam to the Lower Sundays River Valley (source Clifford-Holmes, 2015)

1.2 Mandate of the LSRWUA and the need for an environmental Maintenance Management Plan (eMMP)

The Lower Sundays River Water User Association (LSRWUA) is primarily focused on the efficient management and distribution of water resources in the Sundays River Valley in the Eastern Cape, South Africa. This area is known for its rich citrus farming and supports a large number of agricultural activities that rely on a sustainable water supply. The LSRWUA serves

both agricultural and domestic users, ensuring that water resources are used efficiently to support the economic growth of the region¹.

Agriculture is one of the key economic drivers in the Sundays River Valley Local Municipality (SRVM), and the LSRWUA is committed to facilitating sustainable water management practices that contribute to long-term agricultural productivity. According to the National Water Act (NWA) 36 of 1998, a water user association (WUA) is a statutory body formed by the Minister. It consists of a group of water users with a shared interest, working collaboratively to carry out water-related activities at the local level for their collective benefit². In this context, the mutual benefit involves supplying water to farmers through a canal irrigation system to support agricultural practices within the Valley.

LSRWUA mandate:

- Flow control
- ***Canal maintenance***
- Community awareness

To comply with the mandate of a WUA, the LSRWUA places importance on conducting regular maintenance on the existing services infrastructure. Water canal maintenance is a crucial aspect of preserving the functionality and longevity of canal systems. Over time, neglect of these infrastructures can result in clogged canals, damaged sluice gates, and weakened embankments, leading to disruptions in water distribution and increased costs for emergency repairs. Without regular maintenance, the canal system risks inefficiencies that can lead to reduced water supply for farmers, potentially threatening crops and agricultural livelihoods.

Maintenance and emergency repair activities may trigger the need to apply for authorisation in terms of the National Environmental Management Act (NEMA) EIA 2014 regulations. The NEMA 2014 regulations (as amended) allow an Applicant to compile an environmental Maintenance Management Plan (eMMP) to cover some of these activities so that authorisation does not have to be applied for every time maintenance takes place. Therefore, this document will set out to identify the likely maintenance activities, assess their potential impacts and give a methodical approach to manage maintenance work in the identified areas, by integrating both Contractual and Statutory law requirements. The objective is to limit potential impacts on the receiving environment, whilst regulating role players and the maintenance activities identified in the Sundays River Valley.

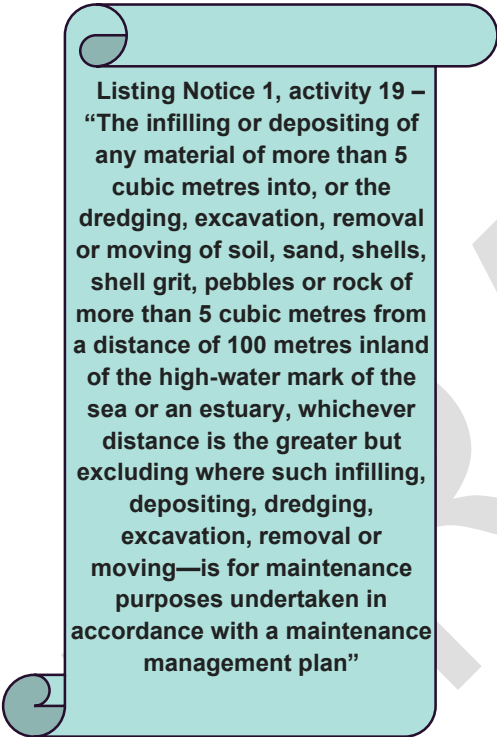
¹ Lower Sundays River Water User Association (<https://sundayswater.co.za/>)

² National Water Act (NWA) no. 36 of 1998 (92)

2 Overview Scope

2.1 Conceptual background of an Environmental Maintenance Management Plan (eMMP)

The concept of a ‘maintenance plan’ was first included in the NEMA EIA 2010 Regulations and then re-iterated in the NEMA 2014 Regulations. The intent was to reduce the administrative burden of having to process repeated applications for authorisation for routine maintenance as the holder of such a plan, could in agreement with the relevant environmental authority³, undertake certain listed activities, for the purpose of maintenance, without having to first obtain environmental authorisation to do so. The listed activity most relevant for this particular eMMP is the excavation or removal of more than 10 cubic metres of material from a watercourse (listed activity 19 of Listing Notice 1).



Listing Notice 1, activity 19 –
“The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater but excluding where such infilling, depositing, dredging, excavation, removal or moving—is for maintenance purposes undertaken in accordance with a maintenance management plan”

This provision for a maintenance plan in the EIA regulations created the impression that the submission of a management plan for the purposes of “maintenance” in terms of Activity 19⁴ did not constitute an application for environmental authorisation, which created significant problems with the implementation (DeVilliers et al, 2017). Some provinces did implement the approach of approving maintenance work without an authorisation, however from the onset, DEDEAT expressed concern as to how the provisions of NEMA section 23 (the objectives of integrated environmental management) and section 24 (e.g. the minimum mandatory procedures for environmental assessment and reporting, and the content of environmental management programmes) would apply to the formulation of a management plan for maintenance purposes. After extensive deliberations it was therefore agreed with DEDEAT⁵, that the need for application for authorisation in terms of NEMA 2014 Regulations is required for an eMMP. Therefore, this

document is a hybrid that deals with the Maintenance Management Plan and a Basic Assessment application process.

The environmental Maintenance Management Plan (eMMP) is a deviation from the Environmental Management Programme (EMPr) required as part of the EIA application process. Although the eMMP and the EMPr both aim to provide contextual information pertaining to the structures undergoing maintenance as well as the environment in which the infrastructure and associated maintenance work is to be undertaken, the EMPr only identifies potential environmental impacts associated with the work and proposes environmental management measures to be implemented. Whilst the EMPr advocates measures to mitigate impact significance this seldom materialises during Construction.

This shortcoming in an EMPr, can be ascribed to the lack of integration of proposed measures in Contractual Documentation that governs the Construction process. In the seminal work of

³ The Provincial Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) will be the relevant Authority

⁴ Previously Activity 18 in NEMA 2010 regulations, extended to include 5 cubic meters described in Activity 19A in NEMA 2014 regulations

⁵ See section on Public Participation

Fuggle & Rabie (1992. p752) the authors state “An Environmental contract may be required as a condition of approval. It is a contractual control over development where the penalties for not complying with stated conditions are stipulated”. They further continue to explain that the contract stipulates mitigatory measures and penalties associated with non-compliance which are negotiated at the onset. For this reason, this document also explores the management of proposed mitigation measures not only from a statutory perspective⁶ but also from a contractual aspect⁷.

2.2 Aims

This document aims to be relevant to a range of maintenance activities, whilst being applicable to different biophysical, social, economic and governance contexts. This document should be seen as a best practice guideline, taking the following into consideration:

- Defining the environmental management objectives to be realized (viz. pre-construction, construction, operation and/or decommissioning phases) in order to augment benefits and minimise potential environmental impacts
- Describing detailed actions needed to achieve these objectives, including how they will be achieved, by whom, by when, with what resources, with what monitoring/verification, and to what target or performance level. This will include mechanisms to address changes in the implementation, emergencies or unexpected events, and the associated approval processes
- Clarification of institutional structures, roles, communication and reporting processes required as part of the implementation of the eMMP
- Describing the link between the eMMP and associated legislated requirements
- Describing the requirements for record keeping, reporting, review, auditing and updating of the eMMP.

2.3 Structure of the eMMP

The Document is a hybrid between a BAR and EMPr. In order to comply with Section 24N(2) of the NEMA the format for Environmental Management Programmes (EMPrs) [R326(App4)] was mainly used in the document with some amendments.

Table 1. Requirements of the 2014 EIA Regulations, R326, as amended.

Appendix 4	Description	Section in eMMP
1 (a)	Details of- (i) the EAP who prepared the eMMP and (ii) the expertise of that EAP to prepare an eMMP, including a curriculum vitae	Section 3
1 (b)	A detailed description of the aspects of the activity that are covered by the eMMP as identified by the project description	Section 5
1 (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	Appendix A
1 (d)	A description of the impact management outcomes, including management statements, identifying the impacts and risks that need	5 & 8

⁶ Various Environmental Legislation (common law)

⁷ Private law

	to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including- (i) planning and design (ii) pre-construction activities (iii) construction activities (iv) rehabilitation of the environment after construction and where applicable post closure and (v) where relevant, operation activities	Appendix G
1 (f)	A description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation (ii) comply with any prescribed environmental management standards or practices (iii) comply with any applicable provisions of the Act regarding closure, where applicable and (iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable	8 & 10
1 (g)	The method of monitoring the implementation of the impact management actions contemplated in paragraph (f)	10
1 (h)	The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f)	10
1 (i)	An indication of the persons who will be responsible for the implementation of the impact management actions	10
1 (j)	The time periods within which the impact management actions contemplated in paragraph (f) must be implemented	10
1 (k)	The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f)	10 Appendix G
1 (l)	A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations	10 Appendix G
1 (m)	An environmental awareness plan describing the manner in which- (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment and	10 Appendix G
1 (n)	Any specific information that may be required by the competent authority.	8
2	Where a government notice gazetted by the Minister provides for a generic EMP. Such generic EMP as indicated in such notice will apply.	N/A

2.4 Extent of the eMMP Study Area

The eMMP is applicable to the approximately 290km of existing canal infrastructure operated and managed by LSRWUA within the Sundays River Valley. The canal infrastructure starts from Korhaansdrift Weir and runs east through Nqweba (formerly Kirkwood) towards the Addo Elephant National Park. At the R335 it veers south through the town of Addo and ends downstream of the Barkley Bridge, where it discharges the remaining water back into the Sundays River (Figure 3). The canal infrastructure runs through numerous private and state-owned properties.

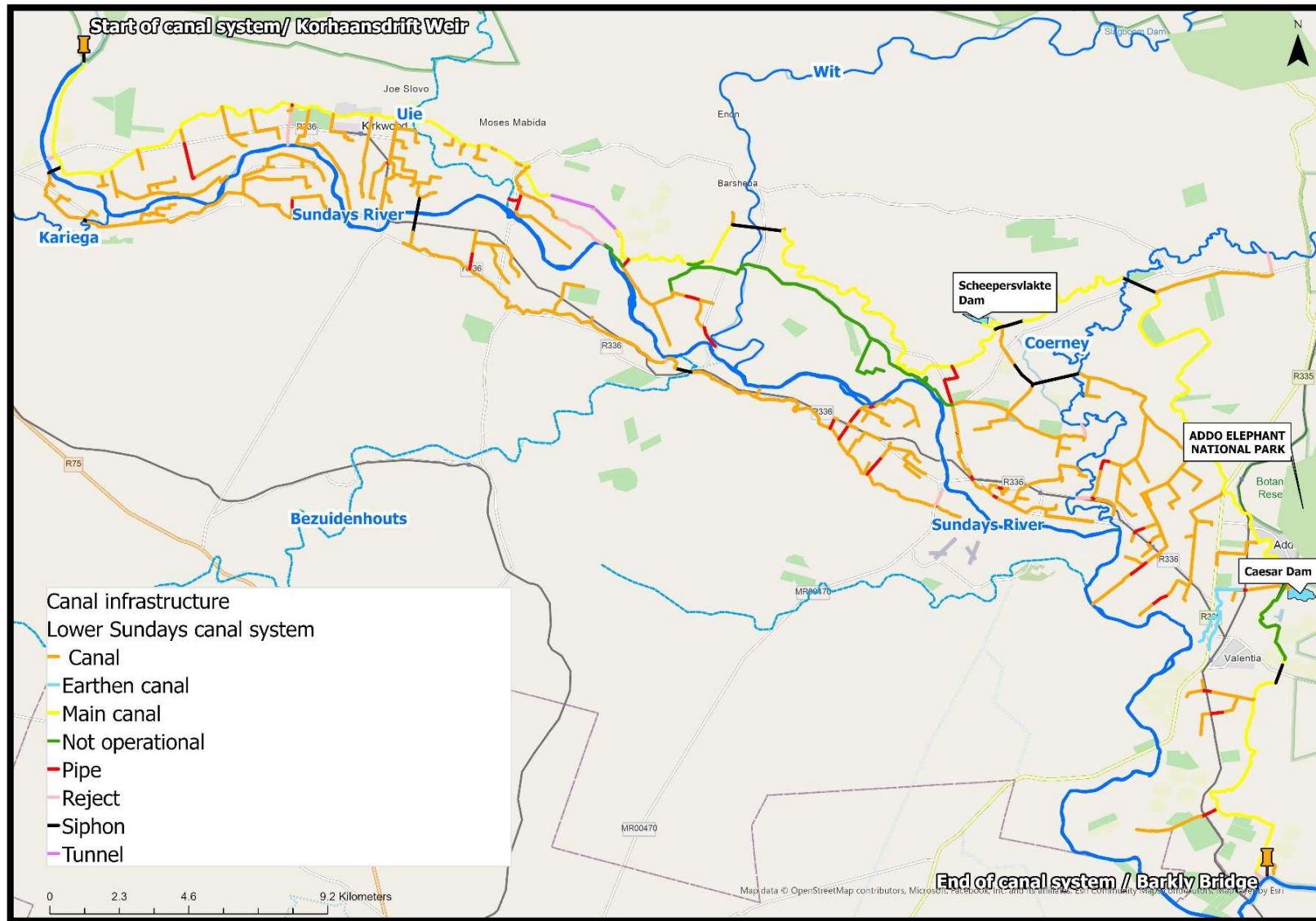


Figure 3. Extent of LSRWUA canal system

2.5 Maintenance activities covered by the eMMP

The eMMP will cover the following general maintenance activities. These are discussed in more detail in section 5.

Table 2. Summary of maintenance activities covered by the eMMP

Canals	Weirs and Infrastructure	Other	Reject discharge points
• Canals and reticulation infrastructure repairs • Canal sealing • Refurbish/Upgrade • Replacement ○ Existing canal is excavated ○ Existing panels are removed ○ Ready mix concrete used • Culvert repair / replacement • Vegetation clearing • Erosion protection measures	• Dredging in dams/weirs to desilt abstraction points and remove debris • Sluice repair and replacement • Demolish/Removal of old structures • Tunnel, pipe & syphons sealing/repair • Bypass pumping • Tunnel, pipe & syphons replacement • Tunnel, pipe & syphons clearing/dredging • Repair, replace and construction of valves, chambers and manholes • Vegetation clearing • Erosion protection measures	• Demolition of structures • Vegetation clearing • Excavation • Backfill and compaction • Import of concrete and/ or gabion baskets • Erosion protection measures	

2.6 Assumptions & Limitations

2.6.1 Assumptions

In the compilation of this eMMP it has been necessary to make the following assumptions

- The Applicant is the Lower Sundays River Water User Association (LSRWUA)⁸ and application is for the identified infrastructure and working area of 30m from the centreline of the canal⁹.
- It is further important to note that areas/properties belonging to Government entities or parastatals viz DWS, SANRAL, ESKOM, SANParks are excluded from this application, as these would require an application to be submitted to National Department of Environmental Affairs (DEFF).

⁸ As promulgated in Government Gazette GN 26663 of 20 August 2004

⁹ The existing infrastructure is not in a dedicated reserve

- This application is based on the activity of “maintenance”¹⁰ as mostly defined in National Environmental Management Act (107 of 1998); however for purpose of practicality, the definition needs to be expanded to “*the work needed to keep something in a good condition*”¹¹. This might entail expansion or upgrading of existing infrastructure. Therefore, the application not only deals with NEMA 2014 Regulation activities that are relevant to eMMPs but also includes a suite of other potential Activities that may be triggered as discussed in Section 4.
- Work will allow for maintenance, including sections of replacement of badly damaged infrastructure, related to infrastructure as described in this eMMP.
- The application is for work on existing infrastructure, therefore impacts would have occurred in the working footprint during original construction. The working and operational footprint, including existing corridors and servitudes, needs to be utilized as far as feasible.
- It is standard practice to accommodate municipal services in dedicated servitudes. The services within such a servitude (both existing and proposed) are afforded protection under law. Based on this, it is our understanding that the “servitude” enforced through Sundays River bylaws would thus constitute a recognized footprint as defined in the NEMA definition. For this reason, application is for areas zoned as Public Open Space or municipal infrastructure servitudes and therefore no private properties are included in this application.
- The information provided by the client, I&APs, surveyors, engineers, and other professionals is accurate and unbiased.
- It is assumed that when infrastructure was constructed, all necessary Authorisations, Licenses and permits were applied for and are in place.
- Various GIS layers were used in compiling maps and infrastructure positions. Data were sourced from reputable sources and it was assumed that correctness was within acceptable parameters. Due to budget constraints data could not all be groundtruthed, but necessary adaptations were made as below:
 - Rivers = NEFPA (data represented as single line and thus representative of the actual river, as courses vary in width over the length of the river basin)
 - Wetlands = National Biodiversity Assessment 2018 National Wetland Map 5
 - Infrastructure = Lower Sundays River Water User Association GIS data
 - Vegetation = National Vegetation Map (VEGMAP2018)
 - GIS software was used to auto generate the intersects and to do analysis

“Maintenance means actions performed to keep a structure or system functioning or in service on the same location, capacity and footprint.”

¹⁰ NEMA 2014

¹¹ Cambridge Academic Content Dictionary© Cambridge University Press

- The next step of the process was to verify that all identified intersects are on similar horizontal planes, by overlaying contours and satellite photos. At this point an informed professional judgement was applied
- The environmental data is mainly desktop with expert inputs and use of peer reviewed documents. The study did not set out to question any available information or methodologies applied in other studies (viz, Lower Sundays River Water User Association documents).
- As this is a first order assessment done on a large scale, allowance was made for some deviations, for this reason a 20m buffer was used to define potential working areas.
- Emergency interventions cannot be predicted and therefore all identified infrastructure in the potentially affected areas is applied for. This approach will also allow maintenance teams to plan and do proactive maintenance work to prevent future emergency situations.
- Due to size of the Sundays River Valley area the applications are limited to identified areas as discussed in Section 2.4.
- The GCC format was used for compilation of the construction specifications as that is the most widely used construction contract. The specifications were compiled in such a format that it can easily be converted to NEC, COLTO, FIDIC, JBCC formats.
- The process to be followed for eMMPs is not defined in the NEMA (2014)¹² Regulations, thus in consultation and in agreement with DEDEAT, the format for Environmental Management Programmes (EMPrs) [R326(App4)] was mainly used, but reference was also made to Environmental Management Frameworks (EMFs) and Strategic Environmental Assessments (SEAs).
- This eMMP provides the means of integrating the concept of sustainability into planning. In the eMMP, limits of acceptable change are defined, which indicate the ability of the environment to sustain development. These limits may therefore be used as a guide in planning, to ensure that construction does not degrade or deplete environmental resources. The purpose of the eMMP is therefore to complement the planning process, by providing the information necessary to ensure that development maintains and enhances environmental resources.

2.6.2 Gaps in knowledge

- Sundays River: The establishment of the canal network has modified the natural course of the Sundays River. A desktop study may not fully account for the impact of this infrastructure on the river, the effectiveness of water allocation, or the operational challenges faced by local water authorities.
- This is a desktop assessment with specialist opinions only.

¹² Neither was it defined in NEMA 2010 Regulations

3 EAP Details and Independence

This eMMP was compiled by the following Environmental Assessment Practitioners (EAPs):

Mr Theuns Duvenhage (EAPASA) – lead EAP

Theuns holds a Master of Science in Geography and Environmental Management, as well as a Bachelor's in Landscape Architecture. He is registered with the South African Council for Landscape Architectural Professionals (SACLAP Reg. No. 20138), and with the Green Buildings Council of South Africa (GBCSA) as a Green Star SA Accredited Professional. Theuns has over 27 years' experience in multi-disciplinary project management, environmental planning, landscape architecture, environmental education, community project management, training and organisational development. His experience in the civil engineering industry and the combination of landscape planning, design and environmental management enables him to provide valuable input into environmental impact assessment (EIA) processes and environmental management plans (EMPs)

Theuns is registered with the Environmental Assessment Practitioners Association of South Africa (EAPASA – registration number 2019/787). Theuns is responsible for internal review.

Ms Tanushri Govender (EAPASA)

Tanushri is a registered candidate EAP (reg no. 2024/8429) with the Environmental Assessment Practitioners Association of South Africa (EAPASA). She is also registered as a Candidate with the South African Council for Natural Scientific Professions (SACNASP Reg No. 155500). She holds a Master of Science in Environmental and Water Science and has three years' experience in the environmental management field.

Independence:

In order to reduce the potential for bias, the environmental process calls for independence of the environmental consultant/ practitioner. Any potential conflict of interest, whether business, financial, personal, or otherwise must be disclosed in the application for Environmental Authorisation. It should therefore be noted that besides the appointed environmental consultants, civil engineers from Zutari have also been contracted to oversee and manage various projects for LSRWUA the WSA. Furthermore, the EAPs did not receive any payment or gratification from any Individual or Organisation other than the Applicant, Lower Sundays River Water User Association, as per the scope of works defined in the Service Level agreement.

4 Legal Requirements

This chapter provides a brief overview of the legislative requirements which drives the environmental process and thus the submission of an eMMP. The legislation detailed here is by no means exhaustive and is provided as an overview in relation to the eMMP.

4.1 The Constitution of South Africa

Section 24 of the Constitution of South Africa (No. 108 of 1996) states that “...everyone has the right - (a) to an environment that is not harmful to their health or well-being and (b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that ... (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.” This protection encompasses preventing pollution and promoting conservation and environmentally sustainable development. These principles are embraced in the National Environmental Management Act (No 108 of 1998) and given further expression.

4.2 National Environmental Management Act

The National Environmental Management Act (NEMA) (Act 107 of 1998 as amended) was promulgated as a result of Section 24 of the Constitution of the Republic of South Africa (Act 108 of 1996) which ensures that everyone has a right to “an environment that is not harmful to their health or well-being”. The Environmental Impact Assessment (EIA) Regulations (R326) and the three Listing notices (R327, R325 and R324)¹³ were promulgated in terms of Section 24(2) and 24D of NEMA to regulate the “submission, processing and consideration of, and decision on, applications for environmental authorisations for the commencement of listed activities” (Section 2, R326). Whereas the Listing Notices R327, R325 and R324 provide a list of activities for which an Environmental Authorisation is required, Notice R326 legislates and regulates the EIA process itself.

Activities which potentially do not pose a significant risk to the receiving environment or where such activities may result in reasonably predictable impacts are contained in Listing Notice 1 (GNR. 327). These activities require a Basic Assessment (BA) process to be undertaken for Environmental Authorisation from the relevant authority. Larger and more complex activities with less predictable environmental impacts are included in Listing Notice 2 (GNR. 325). These activities require an EIA to be completed for Environmental Authorisation. Activities in Listing Notice 3 (GNR. 324) tend to be reasonably predictable but may vary from one geographical area to another. As a result, this notice contains geographically specific thresholds, principally related to biodiversity management, which require a Basic Assessment process to be followed for Environmental Authorisation.

4.2.1 Combination of applications

This submission in effect is a combination of a number of activities taking place in various localities, in which case NEMA 2014 (as amended) regulations make allowance in Regulation 11 for an applicant to undertake one or more activity of the same type at different locations within the area of jurisdiction of a competent authority, a single application must be submitted for such development and the assessment of impacts, including cumulative impacts, where

¹³ As amended by GN R 324-327 - 7 April 2017

applicable, and consideration of the application, undertaken in terms of these Regulations, will include an assessment of all such activities forming part of the development.

Should a planned activity trigger any of the activities listed in GNR. 327, GNR. 325 or GNR. 324, the appropriate environmental process, as prescribed by the Regulation, will need to be undertaken. Although the requirements for an eMMP are primarily described for work within a watercourse, they also apply to vegetation clearance and maintenance-related activities, which may trigger additional listed activities under the NEMA regulations. The process will therefore consider all relevant triggers, each of which is discussed below:

4.2.2 No. 327 Listing Notice 1 Activity 12

The proposed maintenance activities would typically trigger Activity 12 of Listing Notice 1 (GNR. 327). Activity 12 states that the development of infrastructure or structures with a physical footprint of 100m² or more where it occurs within a watercourse will not trigger this listed activity (and therefore not require the preparation of a basic assessment) provided that such maintenance is undertaken in accordance with a management plan agreed to by the relevant environmental authority.

4.2.3 No. 327 Listing Notice 1 Activity 19

Maintenance projects¹⁴ would typically trigger Activity 19 of Listing Notice 1 (GNR. 327). Activity 19 states that the removal or infilling of more than 10 m³ of material from a watercourse will not trigger this listed activity (and therefore not require the preparation of a basic assessment) provided that such maintenance is undertaken in accordance with a management plan agreed to by the relevant environmental authority.

4.2.4 No. 327 Listing Notice 1 Activity 27

Proposed maintenance projects typically trigger Activity 27 of Listing Notice 1 (GNR. 327). Activity 27 states that the clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation will not trigger this listed activity (and therefore not require the preparation of a basic assessment) provided that such maintenance is undertaken in accordance with a management plan agreed to by the relevant environmental authority.

4.2.5 No. 324 Listing Notice 3 Activity 12

Proposed maintenance projects typically trigger Activity 12 of Listing Notice 3 (GNR. 324). Activity 12 states that the clearance of an area of 300 square meters of indigenous vegetation will not trigger this listed activity (and therefore not require the preparation of a basic assessment) provided that such maintenance is undertaken in accordance with a management plan agreed to by the relevant environmental authority.

4.2.6 Other Listed Activities

For the purpose of completeness and to allow the authorities to issue an authorisation the previously discussed activities and additional activities are tabled below, and comment given on each.

¹⁴ See Section 5

LSRWUA Canal Infrastructure maintenance			
Activity	No.	Trigger	Comment
CONSTRUCTION			
The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water— (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where— (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area.	1(9)	Possible	Replacement of syphons
The expansion of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water— (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where— (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area.	1(45)	Possible	Replacement or upgrades to syphons and tunnels
The expansion of- (vi) infrastructure or structures with a physical footprint of 100 square metres or more where such development occurs- (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse	1(48)	Possible	Similar to 1(12) including repairs on dam infrastructure
The expansion of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, where the combined capacity will be increased by 50 000 cubic metres or more.	1(50)	Possible	Various activities on Scheepersvlakte , Ceasars dam, Korhaans Drift may trigger this activity

The expansion of facilities or infrastructure for the transfer of water from and to or between any combination of the following— (i) water catchments; (ii) water treatment works; or (iii) impoundments; where the capacity will be increased by 50 000 cubic metres or more per day	1(63)	Unlikely	Future developments
The expansion of a dam where— (i) the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, was originally 5 metres or higher and where the height of the wall is increased by 2,5 metres or more; or (ii) where the high-water mark of the dam will be increased with 10 hectares or more.	1(66)	Unlikely	Future developments at Scheepersvlakte , Ceasars dam and Korhaans Drift may trigger this activity
The development of- (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.	3(14)	Possibly	Similar to 1(12)
The expansion of- (i) dams or weirs where the dam or weir is expanded by 10 square metres or more; or (ii) infrastructure or structures with a physical footprint of <u>10 square metres</u> or more where such development occurs - (a) within a watercourse (c) if no development setback has been adopted, within <i>32 metres of a watercourse, measured from the edge of a watercourse</i>	3(23)	Likely	To repair gabions and revetments additional baskets may be required. Future work at Scheepersvlakte , Ceasars dam and Korhaans Drift may trigger this activity
TRANSFORMATION OF LAND			
The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous	1 (27)	Possible	Accessing tunnels , syphons and canals

vegetation, except where such clearance of indigenous vegetation is required for			may require removal of vegetation
The transformation of land bigger than 1000 square metres in size, to residential, retail, commercial, industrial or institutional use, where, such land was zoned open space, conservation or had an equivalent zoning, on or after 02 August 2010 i. Outside urban areas, in: (ff) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans ii. Inside urban areas: (aa) Areas zoned for use as public open space	3(15)	Unlikely	Definition of transformation not defined, but areas worked in has already been transformed during original construction

4.2.7 Environmental Management Programmes

The EIA Regulations and the associated Listing Notices make no mention of the required content of an eMMP. As such, this eMMP has been compiled in line with the **environmental management principles** required for the **Environmental Management Programmes** (EMPrs). An EMPr can be defined as

“an environmental management tool used to ensure that undue or unreasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented and that positive benefits of the projects are enhanced.”

EMPrs are legislated both in NEMA as well as in the EIA Regulations (R326). Section 24N(2) of the NEMA prescribes the content of an EMPr as follows.

Section 24N(2) The environmental management programme must contain –

- 1) Information on any proposed management, mitigation, protection or remedial measures that will be undertaken to address the environmental impacts that have been identified in a report contemplated in subsection 24(1A), including environmental impacts or objectives in respect of –
 - a) Planning & design;
 - b) Pre-construction & construction activities;
 - c) The operation or undertaking of the activity in question;
 - d) The rehabilitation of the environment; and
 - e) Closure, if applicable;
- 2) Details of –
 - a) The person who prepared the environmental management programme; and
 - b) The expertise of that person to prepare an environmental management programme
- 3) A detailed description of the aspects of the activity that are covered by the environmental management programme
- 4) Information identifying the persons who will be responsible for the implementation of the measures contemplated in paragraph
- 5) Information in respect of the mechanisms proposed for the monitoring compliance with the environmental management programme and for reporting on the compliance
- 6) As far as reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specific activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and
- 7) A description of the manner in which intends to –
 - a) Modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
 - b) Remedy the cause of pollution or degradation and mitigation of pollutants; and
 - c) Comply with any prescribed environmental management standards or practices.

In addition to the above, the EIA Regulation (R326) Section 34 further requires:

- Proposed mechanisms for compliance and performance monitoring and assessment
- Time periods in which management measures can be implemented
- Management of environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation and
- And environmental awareness plan in which environmental risks are communicated and dealt with to avoid pollution and environmental degradation.

The inclusion of the legislated EMP requirements in this eMMP aims to ensure that the primary principles of environmental management are applied to the maintenance cycle of the identified structure.

4.2.8 Duty of Care and Remediation of Environmental Damage Section 28

The developer has a general duty to care for the environment and to institute such measures as may be needed to demonstrate such care.

The maintenance work done by Lower Sundays River Water User Association is crucial for the prevention of environmental and economic damage¹⁵. This eMMP sets out to create a procedural approach to fast-track maintenance activities, as well as recommending remediation activities during and after the construction process.

4.2.9 Sustainable development

NEMA sets out a National Environmental Management Principle that development must be socially, economically and environmentally sustainable. This includes

- Avoiding pollution and degradation of the environment.
- Managing waste.
- Responsibly using and exploiting non-renewable natural resources.

Authorisations granted under this Act are subject to this principle.

4.3 Other Applicable Environmental Legislation

4.3.1 National Environmental Management Biodiversity Act (NEMBA 10 of 2004)

National Environmental Management Biodiversity Act (10 of 2004), including

- Critically Endangered, Endangered, Vulnerable and Protected Species List (GNR 151)
- Amendment of Critically Endangered, Endangered, Vulnerable and Protected Species (GNR 1187).
- Draft National List of Threatened Ecosystems (GNR 1477)
- Sundays River Local WSA Final Bioregional Plan (Provincial Gazette Extraordinary No 9962 (30 March 2015)).
- In terms of the Alien Invasive Species regulations – Lower Sundays River Water User Association has responsibility to remove/manage alien invasive species on land they own/that is under their control.

In the face of escalating water needs and global climate change, it is vital that landscape corridors are safeguarded against the loss of intact habitat and that the natural landscape is not fragmented into disconnected portions. (Vromans, et al., 2012)

4.3.2 National Environmental Management Protected Areas Act (NEMPAA 57 of 2003)

The Act provides for the declaration of Protected Areas (PAs) in three forms (Chapter 3), namely Special Nature Reserves (Part 2), Nature Reserves (Part 3) and Protected Environments (Part 4). National Parks are the equivalent of National Protected Areas. Section 10 states that a Protected Area, declared in terms of provincial legislation, is either a nature

¹⁵ Loss of irrigation water may have significant impact on citrus export market and water users in NMBM

reserve or protected environment. There are no protected areas found within the extent of the canal system.

4.3.3 The National Water Act (NWA 36 of 1998)

Water uses require a Water Use License (WUL) from the Department of Water and Sanitation (DWS). Some of the proposed activities are likely to trigger water uses in terms of Section 21 of the National Water Act (36 of 1998 (NWA)) specifically, 21(c) impeding or diverting the flow in a watercourse and 21(i) altering the bed, banks, course or characteristics of a watercourse. However, the structures are existing and maintenance are unlikely to impact on water courses and the responsible authority may dispense with the requirement for water use licence if it is satisfied that the purpose of this Act will be met by a licence, permit or other Authorization granted under any other law. Further WUA's are exempt from applying for a WUL as described in Chapter 8 of the NWA. The purpose and functions of Water User Associations will be discussed below.

4.3.3.1 Water User Associations

Water User Associations (WUAs) are cooperative institutions formed by individual water users to address localized water-related activities for mutual benefit. Unlike Catchment Management Agencies, their primary role is not broad water management but managing specific needs at a restricted, local level. The Minister of Water Affairs is responsible for establishing or disestablishing WUA's, either in response to proposals from interested parties or on the Minister's initiative. A WUA's powers and functions are limited to those delegated or assigned to it and are defined in its approved constitution, which is generally based on the model constitution provided in Schedule 5. This schedule also outlines detailed provisions for the management and operation of WUA's.

Although WUA's operate within the framework of national policies and standards, including the national water resource strategy, they remain under the Minister's oversight. The Minister may issue directives or temporarily assume their functions under certain circumstances. These associations enable collaboration among water users while aligning their activities with broader national strategies and regulations.

WUAs perform a variety of functions, such as

- preventing water wastage
- protecting water resources
- supporting water services institutions and rural communities.

They also supervise water distribution, monitor water flow, and maintain infrastructure. While these roles support broader water resource management goals, WUAs must ensure their primary responsibilities to members are not compromised, particularly regarding financial viability and equitable water use.

4.3.3.1.1 Powers of a Water User Association

(1) A water user association is a body corporate and has the powers of a natural person of full capacity, except those powers which –

Prepared by in partnership with

- (a) by nature can only attach to natural persons; or
- (b) are inconsistent with this Act.

(2) Schedule 4 (excluding item 4(3) of Part 1 of that Schedule) applies to a water user association as if-

(a) the water user association were an institution; and

(b) a member of that management committee was a director, within the meaning of that Schedule, except to the extent that the Minister may otherwise direct

4.3.3.1.2 Water User Associations within this Context

The Lower Sundays River Water User Association (LSRWUA), officially established as a WUA in 2004, operates under this framework. It manages water use for its members, focusing on irrigation, infrastructure maintenance, and resource distribution. The LSRWUA also supports inclusivity and redress by integrating all water users, including those historically marginalized. While the association may take on additional functions like rural water provision and catchment management, these responsibilities are contingent on its capacity to uphold its core duties effectively. Ownership and maintenance of infrastructure are vital considerations, with localized infrastructure typically transferred to the WUA and larger, regional assets remaining under DWS control to ensure public interest and funding.

An eMMP is essential for the LSRWUA to align its operations with national water resource policies and ensure the sustainable use of water resources. This plan enables the association to prevent water wastage, mitigate flood risks and manage unlawful water use, all while safeguarding natural ecosystems. Additionally, it ensures that infrastructure is maintained and operated sustainably to address the needs of diverse user groups while balancing environmental considerations. By implementing such a plan, the LSRWUA can fulfil its obligations as a water management institution and uphold its role as a steward of local water resources.

4.3.3.2 ***Dam Safety Regulations***

Chapter 12 of NWA prescribe the dam safety requirements for new and existing dams to prevent potential for harm to the public, damage to property or to resource quality. The owner is required to submit a report on the safety of a dam, to repair or alter a dam, or to appoint an approved professional person to undertake these tasks. These measures are in addition to the owners' common law responsibility to ensure the safety of their dams. Not all dams are subject to regulations and the Minister may exempt certain persons from these requirements. Only dams of a defined size, dams which have been declared to be dams with a safety risk, or dams falling into a prescribed category are affected. All dams with a safety risk must be registered.

Dam and Spillway maintenance requires regular inspections, maintenance work, and adherence to the regulations. The owner or designated person must inspect the dam regularly (at least weekly) and perform necessary maintenance. Regulations dictate that formal dam safety inspections occur every five years or more frequently if directed by the Director General, and outcome reported to the Authority. This is regulated by the Dam Safety Office located in the Department of Water and Sanitation.

4.3.4 **The National Heritage Resources Act (NHRA 25 of 1999)**

Section 34 of the National Heritage Act (NHRA 25 of 1999) protects buildings and structures older than 60 years.

Section 38 (1) of the NHRA identified activities that would require a heritage authorization.

- i. the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length*

With one exception the structures are less than 60 years of age As this is not construction¹⁶ but maintenance and the areas were previously disturbed it is unlikely that a heritage authorization will be required, however Eastern Cape Provincial Heritage Resources Authority (ECPHRA), would determine whether a Heritage Impact Assessment is required.

4.3.5 National Forest Act (84 of 1998)

The National Forest Act (84 of 1998) Section 15(1) prohibits the cutting, damaging, disturbing, destruction or removal of any protected tree, except under a licence granted by the Minister'. Government Notice 1042 lists protected tree species (amended GN 1012). In terms of the National Forest Act (84 of 1998) some protected trees are found in the area but unlikely to occur on existing disturbed areas.

4.3.6 The Conservation of Agricultural Resources Act, (CARA 43 of 1927)

The Conservation of Agricultural Resources Act (CARA) was promulgated to control the utilization of the natural agricultural resources of South Africa. The focus is to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants. The primary aim of the Act is to address soil conservation but also regulates water pollution from farming operations

Sec 29 (1) gives the Minister the power to make regulations as to any matter which in terms of this Act is required or permitted to be prescribed or done by regulation.

4.3.7 Mineral and Petroleum Resources Development Act (MPRDA 28 of 2002)¹⁷

Mineral and Petroleum Resources Development Act (MPRDA) governs the acquisition, use, and disposal of mineral rights in South Africa. It aims to ensure equitable access to and sustainable development of the mineral and petroleum resources.

Section 106 of the MPRDA allows exemptions from certain provisions in the Act. The Minister, may exempt any organ of state from the provisions of sections 16, 20, 22 and 27 (Authorisation of mining activities). This is done by a notice in the Gazette to allow activities to remove any mineral for road construction, building of dams or other purpose as identified is exempted from an authorisation process, but requires submission an environmental management programme for approval in as described in section 39(4).

The section also allows a landowner or lawful occupier of land who lawfully, takes sand, stone, rock, gravel or clay for farming or for effecting improvements in connection with such land or community development purposes, is exempted from applying for authorisations as long as the sand, stone, rock, gravel or clay is not sold or disposed of.

4.3.8 National Environmental Management: Waste Act (NEM:WA 59 of 2009)

National Environmental Management: Waste Act (NEM:WA)) regulates waste management. Its aim is to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable

¹⁶ NHRA does not define construction but development (means any physical intervention which may result in a change to the nature, appearance or physical nature of a place)

¹⁷ As amended by Act 49 of 2008

development, to provide for institutional arrangements and planning matters, to provide for national norms and standards for regulating the management of waste by all spheres of government, to provide for specific waste management measures, to provide for the licensing and control of waste management activities, to provide for the remediation of contaminated land, to provide for the national waste information system and ensure compliance and enforcement.

Waste is considered to be any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in the Act. Schedule 3 of the Act does not list sediment as waste especially as this is not a mining operation and as such sediment management would not be seen as triggering NEM:WA.

4.3.9 Nature and Environmental Conservation Ordinance (19 of 1974)

The EO will need to submit the necessary applications for the removal of indigenous flora and fauna in terms of Nature and Environmental Conservation Ordinance (19 of 1974) if required.

4.3.10 Municipal by-laws & planning documents

Adherence to these will be required, particularly those relating to servitude guidelines. It is assumed that Sundays River Valley Municipality will be responsible for identifying and obtaining the required permissions. Systematic conservation plans/maps that have been produced for the region in which the study site is located include, namely

- The Addo Biodiversity Sector Plan (2012) which also covers the Sundays River Valley, Blue Crane Route, Ikwezi, and Ndlambe local municipalities.
- The Eastern Cape Biodiversity Conservation Plan's (ECBCP) Critical Biodiversity Area (CBA) Map (2019).

4.4 Construction Regulations

All construction work in South Africa is governed in terms of Section 217 of the Constitution. Section 217(1) provides that organs of state in the national, provincial or local sphere of government or any other institutions identified in national legislation when contracting for goods or services must do so in accordance with a system which is fair, equitable, transparent, competitive and cost-effective. Organs of state are not prevented from implementing procurement policies which provide for categories of preference in the allocation of contracts and the protection or advancement of persons, or categories of persons, disadvantaged by unfair discrimination in terms of section 217(2). Section 217(3) in turn provides that national legislation must prescribe a framework in terms of which section 217(2) must be implemented. (Anthony, 2013)

The framework referred to in Section 217(3) is controlled by the Construction Industry Development Board (CIDB) Act (38 of 2000) and the Regulations to the Act¹⁸. The Construction Industry Development Board has been established by the Act and is empowered to regulate construction procurement in terms of the Act and to publish best practice guidelines for further regulation and development of construction procurement.

¹⁸ Construction Industry Development Regulations Government Notice (GN) R8986 in Government Gazette (GG) 31603 of 14-11-2008

4.4.1 The Construction Industry Development Board Act 38 of 2000 (CIDB Act)

The Construction Industry Development Board Act 38 of 2000 (CIDB Act) defines the construction industry as "the broad conglomeration of industries and sectors which add value in the creation and maintenance of fixed assets within the built environment." The CIDB identifies best practice and sets national standards. It promotes common and ethical standards for construction delivery and contracts. To implement these objectives, the CIDB is mandated to

- Establish a national register of contractors and of construction projects to regulate, monitor and promote the performance of the industry for sustainable growth, delivery and empowerment.
- Promote improved delivery management capacity and a standard and consistent application of procurement policy throughout all spheres of government.
- Promote improved performance and best practice of public (government) and private sector clients, contractors and other participants in the construction delivery process.
- Promote continued and consistent participation of the emerging construction sector.

The Construction Industry Development Regulations issued in terms of this Act defines construction procurement as "procurement in the construction industry, including the invitation, award and management of contracts." Accordingly, construction procurement involves not only engineering and construction works contracts, but also supply contracts that involve the purchase of construction materials and equipment, services relating to any aspect of construction including professional services, disposals of surplus materials and equipment and demolitions¹⁹.

4.4.2 Standard forms of contracts

According to the CIDB regulations, public sector construction procurement must be undertaken on standard form contracts approved or prepared by the Construction Industry Development Board Regulations (CIDB Act Regulations). In addition, only contractors with an appropriate registration in terms of the CIDB Act and regulations may tender for and be appointed to perform construction work in the public sector.

The CIDB also encourages using these standard form contracts for private sector construction procurement to promote efficiency. The CIDB Standard for Uniformity in Construction Procurement requires that Employers contract for construction works using one of the standard forms of contract that are listed in this standard, namely

- The Fédération Internationale des Ingénieurs-Conseils (FIDIC) Conditions of Contract (produced by the International Federation for Consulting Engineers)
 - Plant and Design-Build, First Edition, 1999 (Yellow Book)
 - Construction, First Edition, 1999 (Red Book) and
 - EPC/Turnkey Projects, First Edition, 1999 (Silver Book).
- The New Engineering Contract (NEC) Engineering and Construction Contract (NEC3) produced by the Institution of Civil Engineers through its NEC Panel. NEC3 Engineering and Construction Short Contract or NEC3 Engineering and Construction

¹⁹ (<http://www.safcec.org.za/?page=ConstructLegisl>)

Contract. The most common standard forms of contracts used for large construction and engineering

- The Joint Building Contracts Committee (JBCC) 2000 suite of contracts produced by the JBCC.
- The General Conditions of Contract for Construction Works 2015 (GCC) produced by the South African Institute for Civil Engineering.

Public sector construction procurement must be undertaken on the above standard form contracts (and certain other standard form contracts approved or prepared by the Construction Industry Development Board (CIDB) (CIDB Act 38 of 2000 (CIDB Act) Regulations (CIDB Regulations).

The idea of standard form contracts is to include provisions that are beneficial to both parties to the contract in accordance with good practice. In dealing with contracts legal fraternity refer to the three Rs when deciding which contract to use

- **Rights**²⁰ – these are entitlements that one party has against another, entitling the party who has the right to compel the other party to do or not to do something.
- **Responsibilities**²¹ – these are obligations to do, or not to do something, for the party who has the right.
- **Risks**²² – these are the possibilities of something happening or not happening, which can result in additional liability arising for either or both parties. Risks can be absorbed, avoided, shared, transferred or mitigated under the terms of the contract²³. In this way, they can be dealt with in a way that both parties are comfortable with and not caught off-guard, as long as they are not ignored or not considered at all²⁴.

The General Conditions of Contract are to be used with the contract documentation format as prescribed by the Construction Industry Development Board in the Standard for Uniformity in Construction Procurement and in conjunction with SANS 1921 to set out the requirements and constraints relating to the manner in which the contract work is to be performed.

4.4.3 Relevance to eMMP

A contract is an agreement entered into between two or more people with the intention of creating legally enforceable obligations. Once properly concluded, a contract is binding on each party.

This means that each party has a legal obligation to do the things which the contract requires him or her to do. If a party does not do so, he or she may be in breach of the contract and the other party will have certain remedies, such as claiming for additional costs caused by the breach (called damages). They are also able to get a court order to force the party in breach to do what is required of them under the contract.

In terms of Responsibilities Administrative procedures/ compliance with all applicable laws – the main contractor has to ensure that the required licences, permits and the like are obtained before, during and after the construction works proceed. There are various approvals or

²⁰ Contractor has right to be compensated for compliance.

²¹ Contractor has responsibility to act with duty of care

²² Contractor has to be advised of risks related to environment

²³ Contract Risk: To respectively allocate the foreseeable and unforeseeable/ likely and unlikely risks to each of the parties

²⁴ <http://www.bowmanslaw.com/wp-content/uploads/2016/12/Guide-Construction-Contracts.pdf>

consents, required under applicable legislation (including environmental, and health and safety legislation and regulations), and relevant municipal or other building regulations in order to avoid situations where these issues lead to a delay in the construction process and therefore a delay in the works. To date contractual enforcement of environmental requirements have not effectively been applied in the Environmental Management Industry, although this regulatory tool was recommended as recommended in Fuggle & Rabie (1992). The eMMP thus sets out to create a contractual agreement that will bind the Contractor to comply with environmental requirements.

DRAFT

5 The Proposed Activities

5.1 Overview of existing canal infrastructure

The Lower Sundays River Water User Association (LSRWUA) canal system is an extensive and vital infrastructure network that serves the agricultural needs of the Lower Sundays River Valley, as well as some of the potable water requirements in Nelson Mandela Bay Municipality (NMBM). This system comprises a main canal, along with an interconnected network of branch/ secondary canals, tunnels, syphons, pipelines, rejects, earthen canals, and non-operational canals. Designed to facilitate efficient water distribution, this infrastructure supports the region's irrigation demands, ensuring a reliable water supply to users. Given the complexity and scale of the network, ongoing maintenance is essential to sustain its functionality and prevent disruptions that could impact agricultural productivity and local livelihoods. This chapter will discuss the various major components in the system.

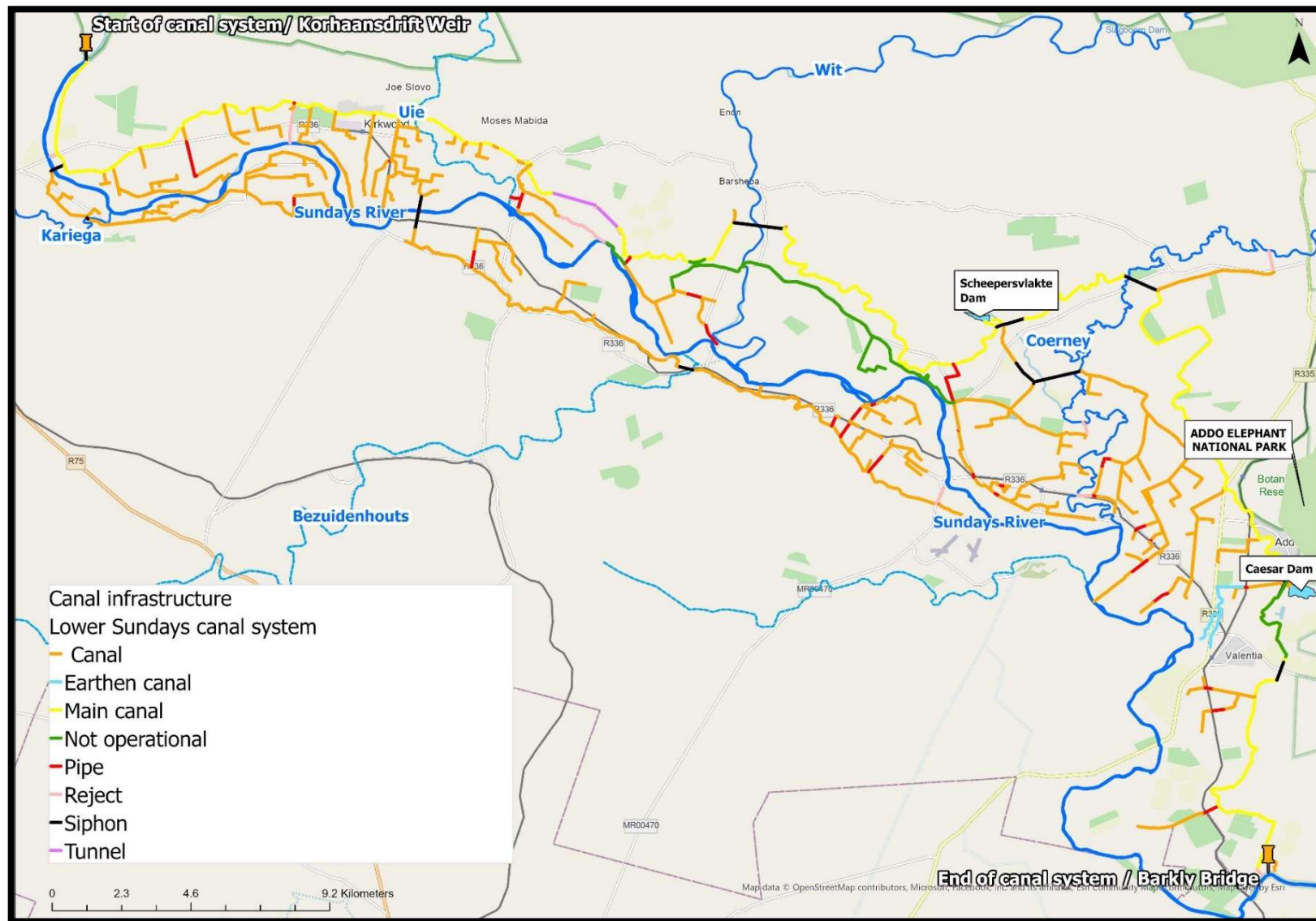


Figure 4. Overview of existing canal infrastructure system under LSRWUA jurisdiction

5.1.1 Dams

5.1.1.1 *Darlington Dam*

Darlington Dam, formerly known as Lake Mentz, is the primary supply dam in the Lower Sundays River Water User Association (LSRWUA) system. Located approximately 40 km northwest of Nqweba (formerly Kirkwood) within the Addo Elephant National Park, the dam is a concrete gravity-type structure that confines the Sundays River. Owned by the Department of Water²⁵, it was commissioned in 1922. The storage capacity of Darlington Dam has been reduced from 252 million m³ to 187million m³ due to siltation. The auxiliary spillway gates are also left in an open position for dam safety reasons which results in the dam spilling at 44.6% of its capacity. The dam spans a surface area of 16,700 km², with a crest length of 418 m and a height of 48 m above its lowest foundation.

As the backbone of the LSRWUA irrigation scheme, the dam ensures water delivery to various sectors critical for the region's economy while also supporting the surrounding communities and industries. Proper maintenance and management of the dam and its associated infrastructure are essential to sustaining its functionality and addressing the long-term water demands of the area.²⁶



Figure 5. Bird's eye view of Darlington Dam (source: LSRWUA)

5.1.1.2 *Scheepersvlakte Dam*

The Scheepersvlakte Dam is located about 15 km east of Nqweba and 5 km north of Sunland, in a dry tributary of the Coerney River. Completed in 1990 and designed by the Department of Water Affairs (DWA), the dam is now operated by the LSRWUA. With a total capacity of 820,000m³ and a maximum wall height of 19 meters, the balancing dam plays a crucial role in supplying water to the region through the canals. It provides an average of ±85Mℓ of water per

²⁵ Original name of the department at the time

²⁶ Not included in Application

day to the Nelson Mandela Bay Municipality (NMBM), serving a vital water supply need for the region.

The dam's infrastructure includes a homogenous earthfill embankment with the upstream face strengthened with soilcrete, a side channel (ogee) overflow, and a concrete-lined spillway. The outlet structure is a trapezium shaped concrete structure through the dam wall. The concrete structure houses two identical $\varnothing 1,000$ mm steel pipelines. Each of these pipelines has two butterfly valves and a diaphragm valve at the end. The butterfly valves serve as isolation valves while the diaphragm valves regulate water supply to NMBM. The Scheepersvlakte Dam supports both irrigation and the domestic water supply highlighting its regional water management significance.



Figure 6. Bird's eye view of Scheepersvlakte Dam (source: LSRWUA)

5.1.1.3 Caesar's Dam

Caesar's Dam is owned and operated by the LSRWUA. This dam plays a crucial role in balancing water supply for irrigation and domestic use in the Sundays River Valley, particularly for the Sundays River Valley Municipality (SRVM) and the irrigators in the Addo area. Caesar's Dam is located approximately 2.5km northeast of Addo. It is a concrete-faced earthfill embankment dam which is operated as a balancing dam and is supplied by the concrete canal system. Regular maintenance and monitoring are essential to maintain its functionality, especially in terms of controlling water levels and managing siltation or other structural issues. The LSRWUA supplies the towns of Addo and Paterson with water for domestic use and local irrigators with raw water from the Caesar's Dam.



Figure 7. Ceasars Dam (photo: T Govender)

5.1.1.4 *Korhaansdrift Weir*

Korhaansdrift Weir, located in a poort of the Klein Winterberg mountains west of Nqweba, plays a key role in the LSRWUA irrigation scheme. Construction of the weir began in 1911 and was completed in November 1913 (van Vuuren, 2012). The weir itself is 87.2 meters wide, with two abutments rising 9.1 meters above the crest. Water for irrigation is released through by eight sluice gates constructed perpendicular to the left bank of the river which divert flow to the 10-meter-wide trapezoidal canal.

A 6.096 meter, Parshall flume is used to measure the water diverted into the formal canal system. The trapezoidal concrete canal has a design capacity of 24.7 m³/s. Given the age and complexity of the structure, maintenance at Korhaansdrift Weir is crucial to ensure continued functionality.



Figure 8. Bird's eye view of Korhaansdrift Weir looking at the sluice gates (source: LSRWUA)



Figure 9. Bird's eye view of Korhaansdrift Weir looking at the start of the main canal (source: LSRWUA)

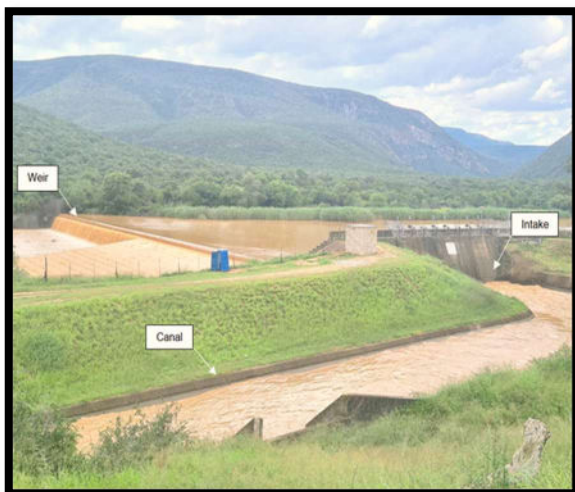


Figure 10. View of the weir, canal and inlet structure at Korhaansdrift (source: Nel, 2022)



Figure 11. Bird's eye view overlooking the weir from the canal side (source: LSRWUA)

5.1.2 Overflows/ concrete spillways

Spillways are critical structures at a dam allowing for safe release of surplus water and thus preventing structure failure. Typically, spillways are at the top of the dam wall and allows water to spill typically in an uncontrolled manner. Spillway components that require maintenance include the channel, apron, joints, and abutments, these needs to be inspected for signs of erosion, movement, cracking, or other damage. Erosion protection measures in the spillway and downstream of the spillway may require maintenance. This include Korhaansdrift Weir, Scheepersvlakte and Ceasars dams.



Figure 12. Spillway at Scheepersvlakte Dam (photo: T Duvenhage)

5.1.3 Sluice gates

Sluice gates are essential control structures used to manage the flow of water at key points within the LSRWUA system, including dams, weirs, and canals. These gates regulate the release, diversion, and distribution of water, ensuring a steady and controlled supply.

At Korhaansdrift Weir, eight sluice gates divert water directly into the main canal network. Along the main canal system, sluice gates are strategically placed to regulate water flow into specific branches of the network, ensuring equitable and accurate distribution to farms and communities.

These gates are typically constructed from durable materials such as steel and are designed to withstand high water pressure.

5.1.4 Canals

The canals are primarily trapezoidal in shape and constructed mainly from concrete to ensure long-term durability and stability. The canal system includes both main and secondary canals, with the total length of the canal network extending over 290km.

The main canal downstream of Korhaansdrift Weir has a design capacity of 24.7 m³/s. Water is distributed to various agricultural zones within the LSRWUA, with the main canal being wider and deeper to handle large flow volumes, while secondary canals, which branch off the main canals, are narrower but still essential for effective water distribution. The canals supply water to thousands of hectares of agricultural land. Regular maintenance is crucial for this extensive canal network, addressing potential issues such as sedimentation, blockages, cracking, settlement, and erosion to maintain the flow and efficiency of the system.

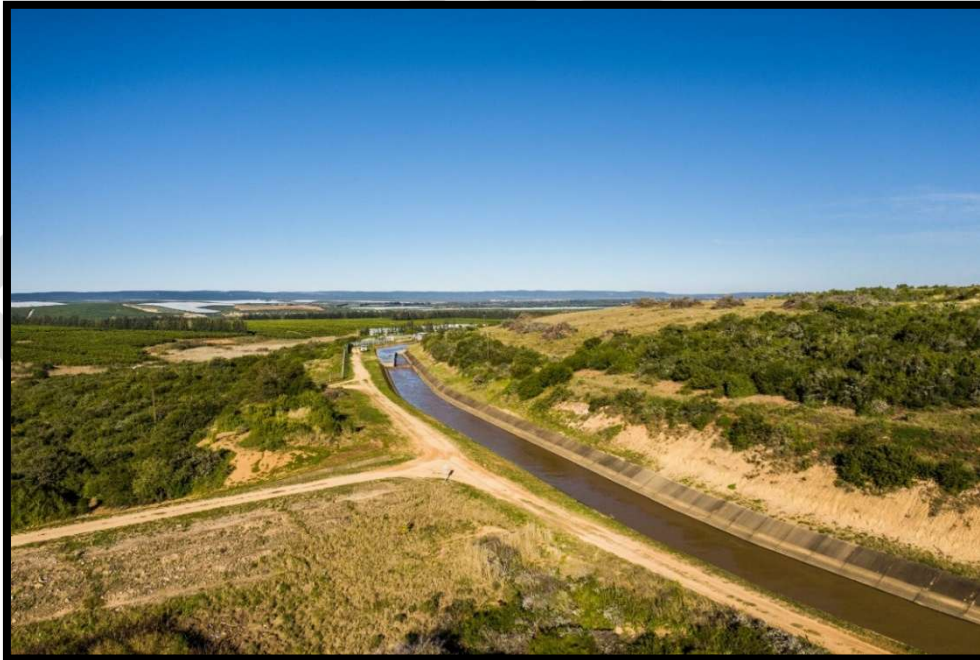


Figure 13. Main canal at Scheepersvlakte Dam (source: LSRWUA)

5.1.4.1 Reject structures

Reject canal structures, also referred to as escape structures, are designated points within the canal system where water is deliberately and safely discharged back into the environment. This is routine done to conduct maintenance, operationally done to regulate flow levels and to prevent flooding, or during emergencies to resolve distribution challenges. Within the

LSRWUA, these structures are colloquially known as ‘rejects.’ There are ten reject structures within the canal network that discharges into the Sundays, Bezuidenhouts, Wit and Coerney Rivers.

Most of these points are located on private properties and within or near a watercourse. A critical aspect of these structures is the volumes of water that may be released as most of the rejects have energy dissipation structures and may consist of concrete and/or gabion structures. These may need to be repaired or upgraded from time to time.



Figure 14. Reject at Barkley Bridge (photo: T Duvenhage)

5.1.4.2 Offtakes

In the LSRWUA canal system, offtakes play a crucial role in regulating and distributing water from the main canal to individual farms or secondary distribution canals. Their primary function is to divert water efficiently while ensuring equitable allocation to users. To achieve this, offtakes are equipped with control gates, such as sliding sluice gates. Many of these structures also include flow measurement devices to monitor and regulate water usage. Additionally, some offtakes incorporate sediment control features, such as settling basins or screens, to prevent debris from entering farm pipelines, which are also covered in this eMMP. Structurally, offtakes are constructed of reinforced concrete to withstand water pressure and erosion, and convey water through pipes or open channels. The system contains more than 100 main offtakes, spread across various infrastructure types within the canal system.



Figure 15. Wesbank Main offtake (photo: C Jonker)

5.1.4.3 *Culverts*

Culverts create drainage path for stormwater to safely cross roads and bulk water canals. Culverts typically consist of reinforced concrete precast pipes (or boxes) with reinforced concrete wingwalls at the inlet and outlet. It is also typical to find some form of energy dissipating structure immediately downstream of the outlet of the culvert, or to have an energy dissipating structure form part of the downstream wingwall. The culverts in the LSRWUA system are mostly located at road crossings between the secondary canals.

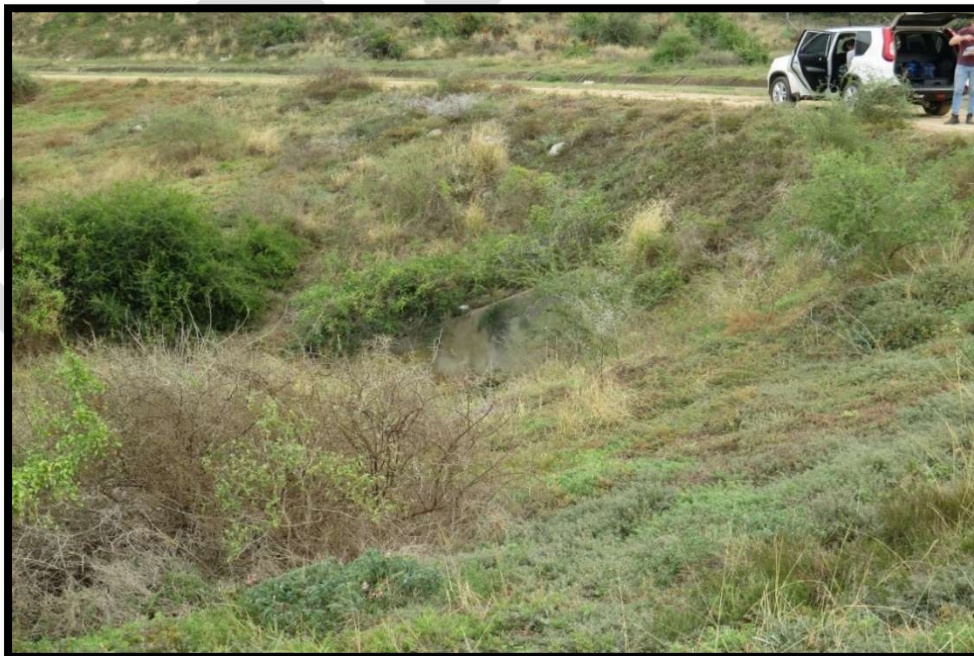


Figure 16. Typical culvert structure to allow stormwater under the canal (photo: T Duvenhage)

5.1.4.4 *Super structures and bridges*

Super structures are designed and constructed to convey storm water over the bulk water canals. These concrete structures require limited maintenance and is unlikely to trigger any licensing requirements.



Figure 17. Super structures (photo: T Duvenhage)

5.1.4.5 **Screens**

Screens along the canals are installed to prevent debris, vegetation, and other materials from flowing through the canal system, where they could cause blockages or disrupt water distribution. These screens are typically installed at key points, such as canal or syphons inlets. They are typically constructed from stainless or galvanized steel and allowing water to pass through while trapping unwanted materials. Regular cleaning and monitoring of these screens are required.

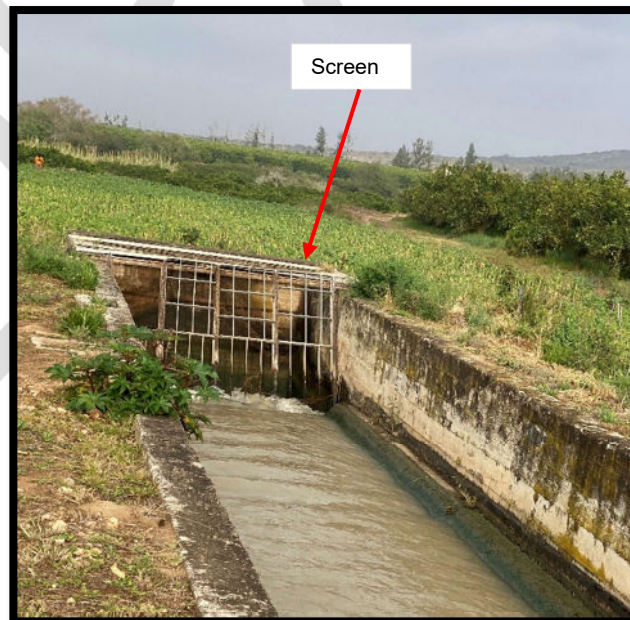


Figure 18. Typical screen found along the canal system (photo: T Govender)

5.1.4.6 *Telemetry*

Telemetry is installed at strategic points along the canal infrastructure to accurately and efficiently manage supply operations. The instruments need to be protected from the elements and theft, thus requiring it to be fenced or housed in a formal structure. These may be in sensitive areas.



Figure 19. Typical masonry structure associated with telemetry installations (photo: T Govender)

5.1.5 **Tunnels**

The LSRWUA system includes two tunnels to traverse hilly terrains. These tunnels are situated east of Nqweba and west of Enon, where the steep terrain makes conventional open canals unsuitable. Cylindrical in shape, the tunnels are designed to promote laminar water flow, with diameters varying based on the required water volume. The two tunnels are connected by an open canal.

Regular inspection and maintenance are essential to ensure the tunnels remain free of debris and sediment, structurally sound, and capable of uninterrupted water flow.



Figure 20. Entrance of the tunnel looking out towards the open canal (photo: C Jonker)

5.1.6 Syphons/pipes

The syphons and pipelines within the LSRWUA system are crucial for water supply along the Sundays River Valley, particularly where conveyance infrastructure needs to cross valleys, watercourses, or existing infrastructure.

The syphons in the system are typically cylindrical in shape, constructed of concrete, and vary in diameter depending on the required flow rate, with some larger syphons having diameters up to 1000 mm. Pipelines are typically manufactured from Unplasticized Polyvinyl Chloride (uPVC) or High-Density Polyethylene (HDPE). The syphons and pipelines are designed to withstand the pressure exerted by the water flowing through them and are buried underground to minimize environmental impact.

Maintenance of the syphons and pipes is essential to ensure proper functionality, prevent blockages or leaks, and extend the life of these critical components in the conveyance network. Regular inspections and cleaning are necessary to address sediment buildup, blockages, and other potential issues that could hinder water flow.

The LSRWUA network consist of 12 syphons, with the larger and more significant ones crossing the Coerney, Uie, Wit, Bezuidenhouts and Sundays Rivers (Figure 43).



Figure 21. View of the outlet of the Scheepersvlakte syphons (photo: H Forbes)

5.1.7 Scour valves

Scour valves are critical components in canal systems installed to drain the canal infrastructure. These valves are typically located at strategic low-lying sections of the conveyance infrastructure where sediment tends to settle. The sound operation of these valves is critical to limit losses to the canal, and to allow infrastructure to be drained during an emergency or to allow routine maintenance.



Figure 22. Typical scour structure at the Enon syphons (photo: T Govender)

5.1.8 Valve chambers

Valve chambers house various control valves used to regulate the flow of water within the canal network. These chambers are typically located at key points along the canals and pipelines where water flow needs to be regulated or closed off entirely. They are generally rectangular or square in shape and are designed to provide easy access for operation and maintenance.

Valve chambers are typically constructed of reinforced concrete to withstand water pressures in the system and to ensure durability. The chambers are constructed to be water-tight to prevent seepage and ensure proper functioning.

Regular inspection and maintenance of these valve chambers are essential to ensure adequate access, to ensure that the valves are safeguarded, and are functioning properly.



Figure 23. LSRWUA Valve chamber (photo: C Jonker)

5.2 Proposed Activities

Maintenance is the set of activities required to keep a component, system, infrastructure asset, or facility functioning as it was originally designed and constructed to function. LSRWUA classifies any reinvestment in the system, including routine maintenance, capital improvements for repair or rehabilitation, inspection activities, and monitoring activities as maintenance. Capital improvements for system expansion are not classified as maintenance.

Effective Operation and Maintenance (O&M) programs are based on knowledge of the asset register, capacity, budgets and day-to-day operations. This allows system maintenance to be performed by either a proactive or reactive approach. Proactive maintenance allows for the development and scheduling of long-term improvement. Ordinarily proactive maintenance will include preventive maintenance, and predictive maintenance.

- Preventive Maintenance (PM) is a proactive response, defined by a preprogrammed and systematic approach to maintenance activities. This type of maintenance will result in

improved system performance and can be scheduled based on criteria such as known problem areas or lifespan of infrastructure. The preventative maintenance program will allow an organisation to plan routine maintenance and schedule repair work.

- Predictive Maintenance (PdM) is a method of establishing baseline performance data, monitoring performance criteria over a period of time, and observing changes in performance so that failure can be predicted, and maintenance can be scheduled in a planned manner based on relevant database.

Reactive maintenance is less predictable and thus responsive in nature, in colloquial language known as an Emergency or a Break-down. For this purpose, LSRWUA has developed a standard Disaster response procedure in Appendix D.

This eMMP primarily allow for preventative maintenance, but from time-to-time there will be a need for reactive maintenance or “emergency situations”. The eMMP therefore includes the planning, construction, operational and rehabilitation activities necessary to replace the existing infrastructure, such as canals, weirs and syphons for water conveyance services during maintenance programs. The activities detailed below, are intended to create an understanding of the actions involved during maintenance and therefore limit the impact on the surrounding environment.

Before any construction activities are to be engaged, it must be ascertained that environmental compliance is met with regards to the environmental legislation and that any additional relevant authorisations have been obtained from the regulatory authorities particularly in terms of NEMA. This is particularly pertinent when working in the vicinity of environmentally sensitive areas.

5.2.1 Access

To do any maintenance work on infrastructure there is a need to access the area where work will be conducted. It is important to note that this access will need to allow for construction vehicles such as light delivery vehicles, Tractor-Loader-Backhoe (TLB), Excavators²⁷, dredging equipment and materials. Large vehicles require a turning circle of 12-13 meters, so dedicated clearings with turning points must be provided. Alternatively, a delivery access route with separate entrance and exit points can be established. Defining and preparing these access routes is crucial for efficient and safe maintenance operations.

Standard pre-construction processes ensure that planning all aspects of the construction work is thought through. Safe working procedures (SWP) and method statements (MS) that describe a process may be requested from a Contractor. In case of emergency repairs, very little or no time is available and usually in these situations, a maintenance team will be instructed to work with minimal notice and it is therefore crucial to define access routes. This identified access and exit points including travel routes²⁸, need to be included in all contract documentation.

²⁷ Excavators and any other heavy plant and equipment need to be delivered by articulated vehicle so there needs to be space to offload the plant and for delivery vehicle to turn around, if necessary.

²⁸ See MMP/MS03

Where possible, existing roads and tracks should be used to minimise the impacts on the environment. Where no access roads are available, the route should be predetermined and demarcated to limit the extent of the damage created by the construction vehicles. The Environmental Officer (EO) needs to be consulted regarding access that have not been identified. Temporary roads should not impact on the drainage of the area and should take the potential for erosion into account or unnecessary removal of vegetation. Upon completion of the project, temporary roads should be rehabilitated and the area reinstated to its original condition unless agreed upon otherwise, as it may benefit the community.

5.2.2 Vegetation clearing

It may be necessary to clear small areas of vegetation to allow for vehicles to enter the construction area and/or trenching to access canals, syphons, reject structures, etc. In construction, the terminology clearing and grubbing are used. Clearing and grubbing describes the stages of land development in which vegetation is removed (known as clearing), and then a device is used to remove the roots that remain in the ground (known as grubbing). Grubbing is defined as removing and disposing of all unwanted vegetative matter from underground, such as stumps, roots, buried stumps, or other debris from a site. Grubbing is performed following clearance of trees to their stumps preceding **construction**. During clearing, all woody material should be chipped and wind-rowed on the uphill side of any work area. As described in Section 5.1.3, before any clearing commences, all working areas and access routes must be clearly demarcated. Caution must be exercised that no protected species are cleared during this activity, EO to mark all protected species. Grubbing should be limited to cases to a minimum to limit potential erosion.

5.2.3 Site establishment/ working area

Site establishment is a very important element in the performance of any contract. If the site establishment is well planned and executed, the contractor can greatly increase productivity and efficiency. Depending on the maintenance work, a site establishment might be required for longer maintenance activities, such as canal replacement, but majority of the maintenance activities are mostly short interventions therefore, it is unlikely that a site camp will need to be established. Temporary storage of equipment and material will be incorporated in working areas.

Work areas will include those parts of the site where the contractor will construct the works, as well as any areas that are used to assemble or produce elements for the works. The construction footprint will be limited to the agreed working footprint except for site camps, laydown areas and stockpile areas. The contractor will demarcate the footprint and any other area outside the working footprint as per the Health & Safety requirements. Demarcation shall be maintained for the duration of construction. All areas outside approved and demarcated footprint are to be treated as no-go areas.

5.2.4 Working footprint

The working footprint for the proposed maintenance and repair activities is anticipated to remain within the boundaries of the existing canal servitude, meaning that no significant expansion or new land clearance is expected. As the canal infrastructure has already been established, topsoil stripping and stockpiling will generally not be necessary, since the area is already disturbed and developed.

5.2.5 Sediment removal

A more routine and ongoing maintenance activity involves sediment removal from the canal system. Over time, sediment builds up within the canal and must be cleared to maintain water flow efficiency.

The sediment removal process typically involves the excavation of sediment from the canal bed using mechanical equipment such as excavators or dredging tools. Once removed, the material is temporarily stockpiled adjacent to the canal to allow for drying, which reduces moisture content and improves handling. After drying, the sediment is either reused, commonly as a natural fertilizer on adjacent agricultural land to support sustainable land practices, or disposed of appropriately, depending on its composition. Sediment must not be stockpiled on steep slopes or within drainage lines, and it must be protected from erosion and runoff. If space adjacent to the canal is insufficient for stockpiling, dedicated stockpile zones must be identified and approved by both the Environmental Officer (EO).



Figure 24. Example of existing LSRWUA canal servitude (photo: T Duvenhage)

5.2.6 Dredging

5.2.6.1 *Syphons and tunnels*

In most cases the syphons and tunnels can be cleaned as described under section on sediment removal.

5.2.6.2 *Desilt dams*

Dredging to remove deposited sediment in a dam or behind a weir is one of the methods to regain lost storage capacity. Problems encountered in dredging include depth, consolidated sediment, debris and disposal limitations. The dredging industry is highly specialised, and each project has its own purposely designed dredging equipment, taking into account soil properties, water depth, environment, cost and logistical constraints (Basson & Rooseboom, 1999). For the purpose of this application the focus is mainly on the activities related to and not the type of dredging and include:

- Access
- Dredging Equipment
 - Conventional Dredger

- Mechanical dredgers
 - Hydraulic dredgers
- Specialised Dredging Equipment
 - General
 - Water injection
 - Jet pump
 - Air lift pump
 - Pneumatic pump
 - Syphons dredging
 - Deep dredgers
 - Underwater rotary hoe
 - Walking dredger
 - Disc bottom cutter
 - Ploughs
 - Permanent dredger installations
- Disposal
 - Directly downstream
 - In dead storage area
 - Next to dam basin
 - Areas downstream of the dam
 - Off-site disposal
- Auxiliary services

In discussing sedimentation, it should consider that that this material is not waste as discussed in Section 4.3.8, but a valuable commodity that can be a soil enhancer. In addition to this dredging is not a mining operation, as highlighted in Section 106 of the MPRDA (section 4.3.7) and therefore this eMMP should be sufficient to address the legislative requirements.

This activity requires careful management to prevent downstream sedimentation and environmental impacts. Given the dredged material should be stockpiled in designated areas or disposed of according to environmental guidelines.

Dredging is expected to be limited to Korhaansdrift Weir. A temporary access road may need to be utilised on the western bank of the Weir in order to position the excavator. The dredging process will involve an excavator with long-reach arms, positioned along the bank or on a floating platform, to remove accumulated sediment and debris. The dredged material will then be loaded onto dump trucks designated disposal or sediment drying areas. A possible more economically viable option would be to use high pressure pumping systems and specialised equipment to re-pulp the sediment at the existing sluice gates. If this is done during full flow occurrence it would scour the sediment into the canal system. This option would be time consuming with a small footprint but the advantage would be delivering sediment back into riverine system whet it would have been deposited before the construction of the weir. If properly managed, discharge of dredged sediment to the downstream river could be beneficial to the environment by restoring the sediment imbalance caused by the dam.

Transportability of the dredging equipment between sites by road is in most cases a necessity with dredging. This implies that the dredger must be dismountable which is normally not a problem, access to the water might be a challenge.

Electric power instead of conventional diesel power could bring about a major cost reduction. Electric power is normally supplied by overhead lines on the bank, with a floating line to the dredger which could be attached to the floating pipeline. Special precautions have to be taken with the safety aspects of the electric power supply. Electric power is often used at hydro-

electric power generation reservoirs and is recommended for use at any large-scale dredging operation.

Apart from the excavation of the sediment, transportation and disposal of the sediment are of major importance.

5.2.7 Excavation/ trenching

Excavation and trenching are considered limited maintenance procedures and are primarily undertaken in specific scenarios, such as canal panel replacements and pipeline repairs. In the case of canal panel replacements, excavation is localized to the sections where precast concrete panels have failed. The excavation process typically involves either mechanical or manual methods to achieve the required depth and width, in accordance with SANS 1200 LB specifications.

Trenching is required when damaged or blocked pipelines, such as syphons or pressurized lines, must be accessed and replaced. When trenching is necessary, an excavator, typically in the 19 to 24-ton range with an approximate reach of 5 meters, is used to excavate beyond the trench width to establish a safe and functional working platform. The excavated material must be managed according to its origin and type, including the separation and appropriate handling of bedding or filler material, subsoil, and topsoil. In instances where excavation for point repairs or replacements exceeds 10m³ within a watercourse, the activity may trigger listed activities under the National Environmental Management Act (NEMA, 2014), thereby necessitating the acquisition of relevant environmental authorisations.

5.2.8 Point repair

The term "point repair" refers to the need for construction to correct a severe problem at a specified location in a pipeline which cannot be corrected by in-pipe-activities as described above. Point repairs entail opening a pipe or syphons at a pre-identified point to address repairs that might be required. The point repair may include various actions, but most important for this application, it requires excavation to access a section of syphons/ pipeline. At minimum such an excavation might necessitate opening a length of syphons/ pipe to facilitate working access, in most cases the excavation would be the standard length of a syphons/ pipe with additional 1-2 meters on either side. It is therefore likely that excavations would exceed 10m³ meters in a watercourse thus triggering listed activities in terms of NEMA 2014 Regulations.

5.2.9 Sealing

Sealing and repairs in the canal are the most common activities, however this is unlikely to trigger any legislative requirements.



Figure 25. Example of canal sealing (photo: C Jonker)

5.2.10 Replacement

In some cases, the only option in terms of maintenance is the replacement of a section of a canal, syphons, tunnel, reject or pipeline. As this is usually in the existing servitude and normally less than 1km in length, one of the only triggers for this activity is excavation of 10m³ in watercourses. For that purpose, replacement should also be seen as a maintenance activity.



Figure 26. Example of replacement work on a canal (photo: C Jonker)

5.2.10.1 Excavation

As discussed in 5.1.5 for replacements.

5.2.10.2 **Pipe Bedding**

Under normal ground conditions, structural design considerations for pipe strength and increased bedding factors do not come into play for sewers up to 225 mm diameter. Standard rigid pipes are laid on either Class D or Class C beds.

5.2.10.3 **Backfilling**

Once the necessary replacement and/or maintenance work has been carried out on the infrastructure, the excavated and stockpiled soil needs to be replaced in the layers in which it was removed. The deeper bedding/ filler material is to be replaced first, followed by the shallower subsoil. The topsoil is to be backfilled last if applicable. Layers of fill material (the previously excavated subsoil material) are placed and compacted by mechanical means with the use of trench rollers, vibrating plate compactors and or rammers, in accordance with SANS1200LB. The final excavated layer of topsoil can be slightly overfilled when placed to allow for settlement which will occur over time and especially after heavy rainfall. The original contour of the area will be maintained while minimising potential erosion impacts on the disturbed area.

5.2.11 **Concrete work**

Concrete work is a fundamental component of maintenance activities across the LSRWUA's water conveyance infrastructure. In the context of canals, the majority of concrete work involves the replacement or repair of precast canal panels, which may become cracked, displaced, or degraded over time due to water flow, ground movement, or ageing. Additional work may include patching damaged sections, recasting joint sections, and reinstating anchor points.

For tunnels, syphons, and reject structures—particularly those located near watercourses—concrete maintenance typically involves the repair or replacement of structural elements such as support footings, headwalls, wing walls, plinths, and energy dissipation features.

For purpose of maintenance concrete work should be limited to small quantities, work where more than 6m³ concrete work is needed the contractor should submit a site-specific method statement. Concrete can either be delivered as ready-mix concrete or can be mixed on Site. If site mixing is adopted, suitable precautions must be in place to avoid contamination of the ground such as mixing platforms and protecting the ground. All material or concrete work should be delivered in bins and mixing should take place on mixing trays to prevent contamination of surrounding areas. In case of use of ready-mix, no concrete truck shall access areas in vicinity of a watercourse or drive on steep slopes.

The correct handling and management of this concrete will be approved by the EO and monitored accordingly during construction.



Figure 27. Example of works undertaken to replace canal panel (photo: C Jonker)

5.2.12 Valve replacement

For purpose of this report, the process for a valve replacement should be the same as a point repair. Repairs to valve chambers may require diversion of streamflow as described in section 5.2.13 watercourse crossings.

5.2.13 Watercourse crossings

Maintenance of pipelines, canals, or syphons that cross watercourses require the use of specialised techniques to minimise disruption to the aquatic environment. Methods such as cofferdams, flumes, or directional drilling may be employed to maintain streamflow and protect water quality during the execution of works. Currently, there are twelve syphons that cross watercourses within the system. If repairs or maintenance are required on any of these syphons, activities will need to take place within the watercourse itself. In addition, there are ten reject points that discharge into watercourses during canal overflow events. Any maintenance or repair work on these reject structures would also involve activities within regulated areas of a watercourse.

5.2.13.1 *Dry Open Trenching*

Larger watercourse crossings are likely to be carried out using a dry open trench methodology. In dry open methods water flow is maintained by diverting or damming the watercourse. Details of these methods are outlined below.

The site is first prepared by stripping the topsoil from the banks and areas adjacent to the river at the crossing point and storing it separately within the working area. If practical the bed material and a selection of vegetation is stockpiled separately for use during rehabilitation of the crossing. A dedicated vehicle crossing or bridge need to be constructed to allow plant and materials access along the pipeline route.

Initial backfilling will take place using excavated subsoil as per description in section 3.10.2 and using stored riverbed materials during final reinstatement. The banks are then reshaped to the original profile in accordance with DEDEAT/DWS and the landowners' requirements.

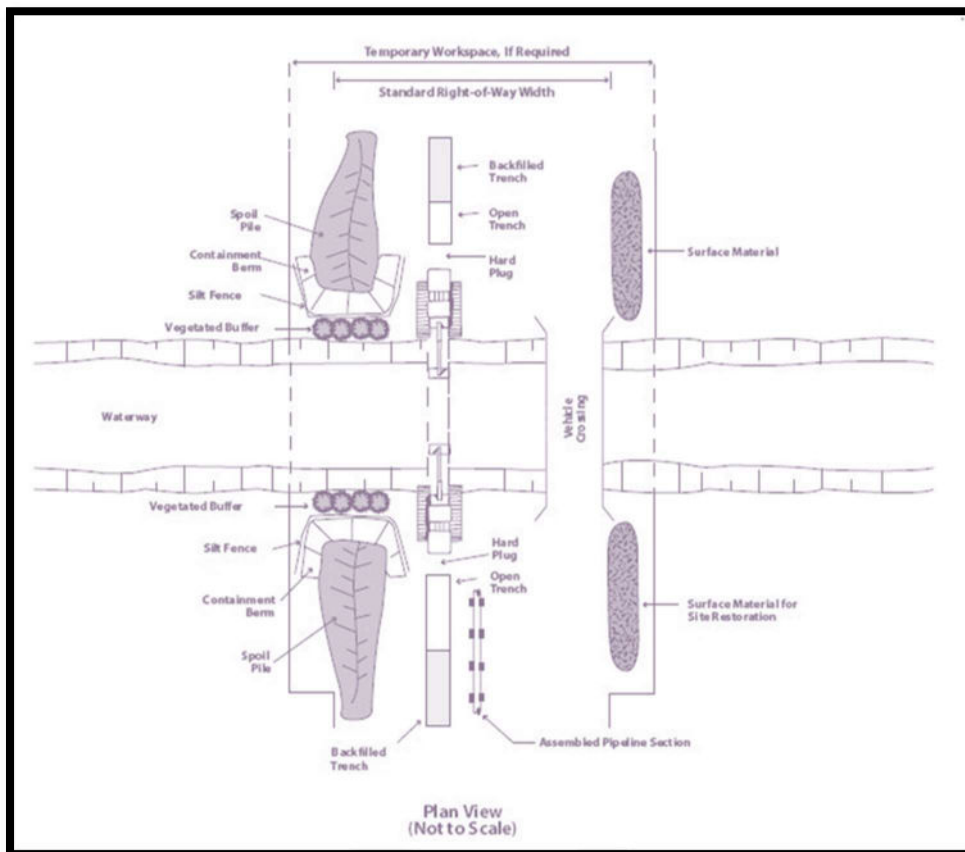


Figure 28. Open Cut Trenching

5.2.13.2 ***Damming***

If damming is adopted then soil filled sandbags are used to create a seal or dam across the watercourse and over pumping methodology is used. Pumps are set up to take the flow from upstream to downstream of the crossing point. The discharge hose(s) will be directed through a stilling pond or filtering medium to limit silt carry over or bed disturbance, before the pumped water is returned to the watercourse.

Initial backfilling will take place using excavated subsoil as per description in section 3.10.2 and using stored riverbed materials during final reinstatement. The banks are then reshaped to the original profile in accordance with DEDEAT/DWS and the landowners' requirements.

The pumps and sandbags are removed once the bed materials and bank profile is reinstated. Final bank reinstatement may require further measures to stabilise the banks and prevent erosion. Geotextiles such as geo-jute may be used in conjunction with seeding of an appropriate grass mix. Bank stabilisation works will be discussed with DEDEAT/DWS to ensure that suitable materials and methodologies are being used.

Any bank protection, where it is required, will be adequately keyed into both the bed and banks. Materials and methods employed will be in keeping with the surrounding environment and will be in line with consent requirements.

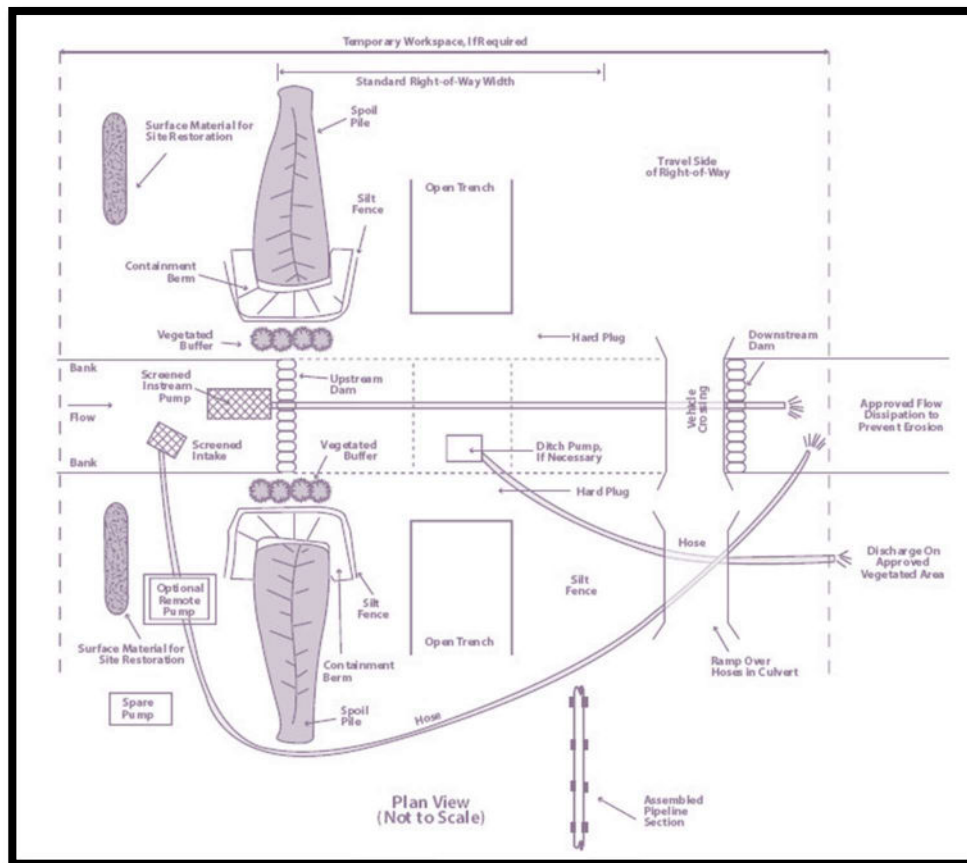


Figure 29. Typical Dam and over pumping methodology

5.2.13.3 Stream diversions

Diversions are constructed using various methods, including sandbags, aquadams median barriers, and instream material, process is similar as described in Damming (Section: 5.1.13.2), although part of stream is allowed to bypass the working area. It is not uncommon to use pumps or flumes in conjunction with diversions to handle seepage and groundwater, as well as reduce conveyance down the diversion channel. Construction of canals for diverted flow may increase suspended sediments in the stream.

The pumps and sandbags are removed once the bed materials and bank profile are reinstated. Is then reconstructed on opposite bank to allow for completion of excavation, following same methodology as described earlier.

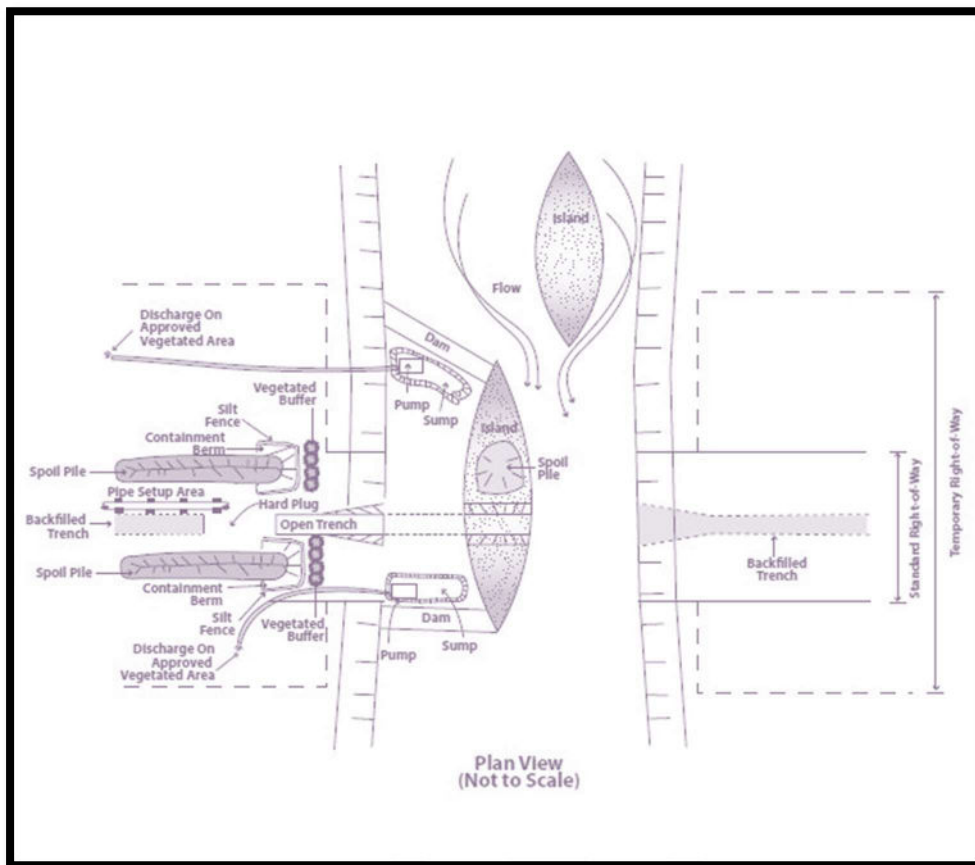


Figure 30. Diverting the flow

5.2.14 Horizontal/ Directional drilling

Horizontal Directional Drilling (HDD) is done in areas where open trenching is not feasible or in areas that are environmentally sensitive. Undercrossing water courses is becoming a common practice. A well-planned HDD operation commences with a preliminary survey of the proposed route to be followed. The choice of the drill rig depends upon the drill distance²⁹, the diameter³⁰ of the pipe to be installed and the soil type. The process starts with the receiving hole and entrance pits, these pits will allow the drilling fluid³¹ to be collected and reclaimed to reduce costs and prevent waste. The HDD process begins with drilling a small, horizontal hole (pilot hole) under the crossing obstacle (viz. a water course) with a continuous steel drill rod. When the drill head and rod emerge on the opposite side of the crossing, a special cutter, called a back reamer, is attached and pulled back through the pilot hole. The reamer enlarges the pilot hole so that the pipe can be pulled through. The pipe is usually pulled through from the side of the crossing opposite the drill rig. Pipes up to Ø600 made of plastic, steel and cast iron can be pulled in.

Drill units come in various models and sizes and are used in conjunction with supporting equipment and may include a drilling fluid (mud) recycling system, mud cleaner, multiple pumps and mud tanks. Basically, the drill rig consists of three main system components:

- Drill rig / drilling tools

²⁹ Lengths up to 500m

³⁰ 250-300mm for smaller rigs and up to 1 200mm for big rigs

³¹ Horizontal directional drilling is done with the help of a viscous fluid known as drilling fluid. It is a mixture of water and, usually, bentonite or polymer continuously pumped to the cutting head.

- Bentonite mixing system incorporating a two-tank system and a recycling system
- Hydraulic power unit for driving the Bentonite mixing system.



Figure 31. Horizontal Drilling process (photo: C Jonker)

To accommodate all the system components, it is necessary to have access to the drill area and at the drill area, on average the space requirements, for the drilling rig and additional vehicle to transport the Bentonite mixing system, may require an working area of up to 30m wide and 45m long, as described in section 5.2.3.

5.2.15 Tunnelling

5.2.15.1 Pipe- Jacking

Pipe-jacking uses a hydraulic ram or jack to thrust an open-ended pipe under the obstacle. Miners or mechanical methods are used to remove the soil as the pipe is thrust forward. The excavated material is removed via the exposed end of the pipe. As each pipe progresses forward then another is welded on and in this manner the pipe is installed. This construction method is generally used on large diameter pipes or to install a concrete carrier sleeve under the obstacle.

As in the case of HDD the process requires access for equipment, clearing of a work area and excavations of a receiving and entrance pits.

5.2.15.2 Micro-tunnelling

Micro-tunnelling is a broadly similar technique to pipe-jacking. The method involves the use of steerable remote-control pipe-jacking.

Pre-cast concrete jacking pipes are placed behind a Micro-tunnelling machine with a cutting head lubricated with water or a mud mix. The excavated material is removed with the drill fluid and is returned to the surface via a slurry pipe through the tunnel entrance where the fluid is filtered to remove the cuttings and returned to temporary mud storage tanks for re-use. A thrust wall is constructed at the launch pit from which to jack the pipe forward. As the tunnel

progresses new segments of pipe are attached at the launch pit until the micro tunnel reaches the reception pit, where the drill bit is detached from the tunnel and removed. The jacked pipe can be the final pipe itself or a sleeve through which a smaller pipe is then threaded. Shafts are often required in place of pits when the pipe is situated at depth.

Equipment associated with micro-tunnelling will include power units, slurry separation plant and a control cabin. Commonly the micro tunnel crossing technique is used to cross infrastructure such as railway lines, major rivers and major highways.

As with previous methods it requires additional work areas for launch and reception pits, drilling fluid management and to accommodate associated equipment.

5.2.16 Slip line

Another form of preventative maintenance is the slip lining method³² which involves accessing the deteriorated line at strategic points³³ within the system and subsequently inserting polyethylene pipe lengths, joined into a continuous tube, throughout the existing pipe structure.

Slip lining is a technique that involves the pulling in of an HDPE pipe into the existing pipe that needs to be rehabilitated. Normally, the HDPE Pipe is fused into long continuous lengths³⁴ by means extrusion welding and inserted using an Access pit into sewer or water pipelines. "Launching and receiving pits" replace the trench needed by conventional pipe-laying. Access pits will vary considerably in size and configuration, depending on a number of project related factors such as:

- Depth of the existing pipe
- Diameters of the liner and the existing pipe
- Stiffness of liner pipe
- Prevailing soil conditions
- Equipment availability
- Traffic and service requirements
- Site geography

Short sections of pipe can be inserted through sewer manholes to limit excavation, however larger access pits may be required when slip-lining a large diameter pipe that is buried deep in relatively unstable soil. The installation process would make use of the following techniques:

5.2.16.1 The "Pulling" Technique

The continues lengths of pipeline is fed through the section of pipe that is to be slip lined. Then a cable is fastened securely to the liner segment, thus permitting the liner to be pulled through the existing pipe and into place.

5.2.16.2 The "Push" Technique

The push technique for solid wall or welded polyethylene pipe is illustrated schematically in Figure 32. This procedure uses a choker strap, placed around the liner at a workable distance from the access point. An Excavator, TLB, or other piece of mechanical equipment pulls the choker to push the liner through the existing pipe. With each stroke of the TLB, the choker

³² Can be used to rehabilitate gravity sewers, sewer mains, water mains, outfall lines, drainage culverts and other piping structures

³³ Similar to point repair discussed in section 5.2.8

³⁴ Require laydown and working area that require vegetation clearance

grips the pipe and pushes the leading edge of the liner further into the deteriorated pipe. At the end of each stroke, the choker must be moved back on the liner, usually by hand. The whole process may be assisted by having a front-end loader or bulldozer simultaneously push on the trailing end of the liner segment.

5.2.16.3 *The Combination Technique*

The pushing and pulling techniques can sometimes be combined to provide the most efficient installation method. Typically, this arrangement can be used when attempting the placement of unusually heavy walled or long lengths of polyethylene liner. Slip lining can only be undertaken on 200 mm diameter and larger gravity-fed sewer pipes. It is therefore likely that excavations would trigger similar activities as described in section on Point Repair, as well as section on vegetation clearance.



Figure 32. Combination Technique for Solid Wall Polyethylene Pipe (Photos: C Jonker)

5.2.17 Erosion protection and slope stabilisation

Erosion protection is critical for all infrastructure types, particularly dams, weirs, and canals, to prevent structural damage and maintain operational efficiency. Measures such as installing gabion baskets, rip-rap, geotextile linings, or vegetation buffers can be implemented to stabilize vulnerable areas and mitigate erosion risks.

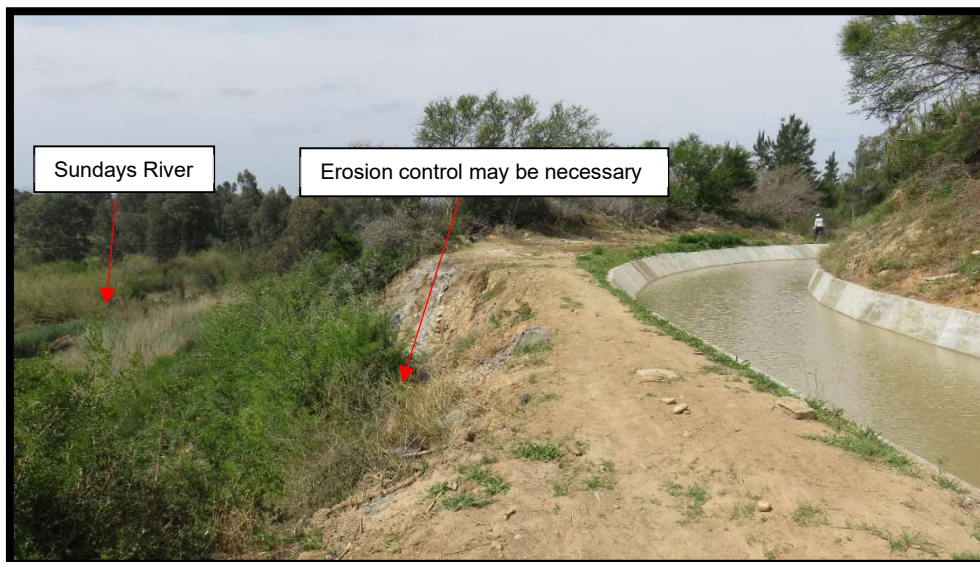


Figure 33. Erosion protection may be required on either side of the canal (source: T Duvenhage)

The erosion cycle - detachment, transportation, deposition - is a natural phenomenon. However, development³⁵ usually alters the natural pattern. Erosion control is a measure to substantially reduce erosion and thereby decrease the sediment input into the stream system. The aim is to reduce the accelerated erosion typically caused by poor agricultural techniques and other land uses.

Erosion Control is the process whereby the potential for erosion is minimized

Sediment control is the process whereby the potential for eroded soil being transported and/or deposited beyond the limits of the construction site is minimized

The concept of erosion protection is a diverse subject and a specialist study field and does not merely entail making a few berms or packing gabion baskets. Erosion control should be a long-term strategy for protecting natural resources against degradation, while sediment control should be seen as a temporary protective measure. The aim of both is to establish vegetation as the erosion control medium. The design of erosion and sediment control measures is a flexible process that responds to new information that is obtained throughout the construction phase based on site conditions and

field performance of implemented measures. Erosion and sediment control measures can be classified into two broad categories:

- **Temporary Measures**: Those measures during the construction phase that will be completely removed once permanent measures are installed and/or vegetative cover is established. Examples of temporary measures include top soiling, seeding, slope, texturing, synthetic permeable barrier, mulching, geotextile coverings, silt fence, rolls, straw bale barriers, etc.
- **Permanent Measures**: Measures incorporated into the overall design to address long-term, post construction erosion and sediment control. Examples of permanent measures include cut-off drains, energy dissipaters, contour banks, gabion, rip-rap, sediment ponds, etc. Dependent on-site conditions, some temporary measures will be retained for a longer duration to render its life span more permanent.

³⁵ One of the most unstable periods in any development occurs during the construction phase. Due to the denuded character of construction site water runoff tend to create erosion and thus increase the silt loads

Temporary erosion and sediment control measures should be installed at the start of the construction phase with additional measures added throughout the construction phase. Permanent erosion and sediment control measures can be installed during or at the end of the construction phase, mostly consisting of gabion baskets and reno mattresses. Standard construction process for gabions entails excavation for preparation of a platform, laying geotextile membrane, installation of wire baskets/ mattress, filling with stone and back filling behind gabions.

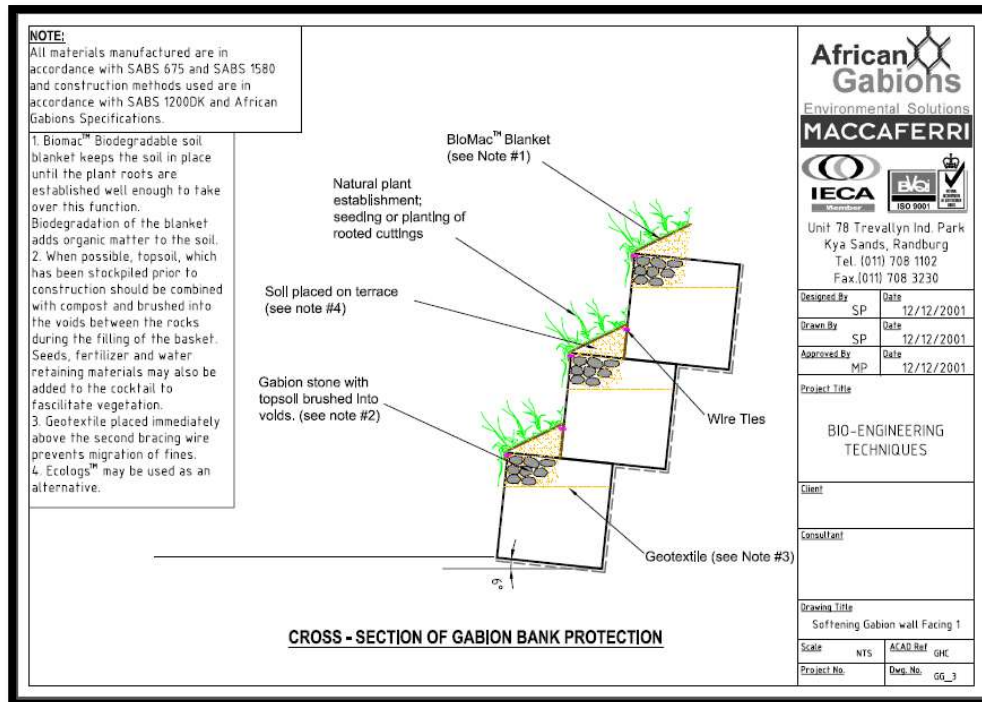


Figure 34. Typical gabions structures for river bank stabilisation/protection (riverbank)

- **Slope stabilisation**

The objective of the project is to mitigate rockfalls from the exposed rock face. The existing concrete panels that form the canal are in a poor condition. The rehabilitation, stabilisation and protection of the cliff face will not only mitigate future rockfalls but will afford an opportunity for much needed rehabilitation of the concrete canal itself

Various measures may be required to stabilize slopes adjacent to the canal. This will assist with safety and protecting the canal infrastructure this may include:

Removal of loose material on the fault plane should be scaled and removed from the cut face.

Slope Benches and Stepped Slopes assist with material revegetation from the adjacent plants. Stepped slopes are a series of small benches 250-500mm wide. Stepped slopes can be used in rippable material on slopes 2:1 or steeper.

Contour grading, slope rounding and topsoil replacement may be required reduce the potential for erosion and stormwater runoff and reduce maintenance activities.

Support Stabilization may include reinstating the slope with earthworks and gabions and installing ground anchors (soil nails) in combination with high tensile mesh. The solution will provide a flexible façade which will not allow for the build-up of pore pressures behind the mesh. Depending on the instability and material layer of steel reinforced shotcrete maybe applied to the surface.

A cut-off drain will be constructed over the top of slope to channel water away from slope. The cutoff drain is typically lined with reno mattresses or stone pitching.

An example of a combination of ground anchors and high tensile mesh installed along a stabilized slope is shown below.



Figure 35. Example of ground anchors and mesh (Source: A Nel)

5.2.18 Waste management

In most cases maintenance work should create limited waste, with the exception of dredging of the weir, canals and tunnel. The relevant teams should prevent a health hazard or a public nuisance by disposing of all waste material, removed during dredging, in weather- and vermin-proof bins with lids for removal to Municipal waste stream. All waste must be managed responsibly, with reusable materials recycled where possible. Hazardous materials, such as concrete residue or oil from machinery, must be handled according to environmental regulations to prevent contamination.

5.2.19 Rehabilitation

Rehabilitation involves restoring disturbed areas to their original condition or better. This includes regrading and compacting backfilled areas, replacing stockpiled topsoil, replanting indigenous vegetation, and implementing erosion control measures. Rehabilitation ensures long-term sustainability and minimizes the environmental impact of maintenance activities.

As discussed in Section 5.1.13 establishment of vegetation is crucial to prevent erosion, and management of rehabilitated areas is crucial to prevent alien plant invasion. As the maintenance team is not likely to have the skills or time to manage this aspect, it is recommended that a suitably qualified team conduct this work every time vegetation clearance of more than 5m² has occurred.

6 Stakeholder and Public Participation Process

As in the case of an EMP, the drafting and submission of an eMMP must follow the EIA process as legislated in the NEMA (Act No. 107 of 1998, as amended) as outlined below.

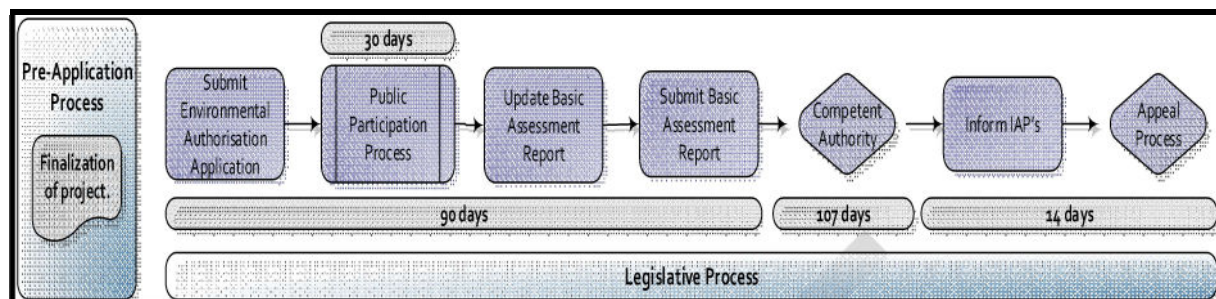


Figure 36. General overview of the application process for Environmental Authorisation

Engaging with the public and stakeholders is a key component of the NEMA (1998, as amended) and allows for Interested and Affected Parties (I&APs) to identify potential issues and concerns relating to the proposed activity which needs to be addressed. For the compilation of an EMP, the Public Participation Process (PPP) consists of the initiation phase and the commenting period on the draft EMP. During the initial phase, through the advertising of the proposed activity, I&APs were identified and invited to register in order to note their issues and concerns.

Due to the scale of the project and numerous landowners involved, a Public Participation Plan was put forward to the competent authority (CA) to express a deviation from the standard public participation requirements but still ensuring that the specific measures are carefully considered to ensure that the process is transparent and inclusive to all Interested & Affected Parties (I&APs), whilst legally compliant. The second phase of the PPP involves the availability of the draft eMMP for comment to the public, stakeholders and organs of state.

6.1 Placement of Notices

Eight site notices were placed across the Sundays Valley covering major intersections and key areas of canal infrastructure, indicating that an application will be submitted to the competent authority in terms of these regulations, the nature and location of the activity, where further information on the proposed activity can be obtained and the manner in which representations in respect of the application can be made.

The site notices were placed on the 7th of March 2025 at the following locations:

Site notice positions	No.	Latitude	Longitude
Access gate to Korhaansdrift Weir	1	33°24'21.60"S	25°20'46.25"E
R336 Hoofstraat & Barsheba Gravel Road	2	33°24'33.26"S	25°29'0.49"E
Intersection R342 & R335 (Zuurberg Road)	3	33°27'19.91"S	25°43'16.18"E
Intersection of R336 & R335	4	33°32'18.53"S	25°41'26.05"E

Intersection of Valencia Gravel Road & R335	5	33°32'55.14"S	25°41'22.63"E
On R335 at Sundays River Bridge	6	33°34'51.46"S	25°40'31.26"E
On Gravel Road at Harveyton Farm	7	33°37'8.69"S	25°43'50.23"E
On R336 at LSRWUA Office	8	33°39'1.02"S	25°37'42.06"E

Proof of the placement of the relevant notices is in Appendix C.

6.2 Notification of Basic Assessment (BA) process

As outlined in the agreed Public Participation Plan, newspaper advertisements were not selected as a communication method as the community does not have a formalised newspaper and printed media has mostly been discontinued. It was also noted that most landowners are part of a WhatsApp group managed by the LSRWUA, which serves as a key communication channel. Consequently, electronic notifications via email and WhatsApp were chosen as the most effective means to reach a broad audience. The Interested and Affected Parties (I&AP) database included LSRWUA registered water users, landowners, neighbouring organizations (such as Addo Elephant National Park and Kirkwood Correctional Services), forums, as well as authorities and ward councillors from the Sundays River Valley Municipality. The Background Information Document (BID) was sent to the I&APs via email and WhatsApp on the 7th of March 2025.

Proof of the notification and I&AP database is attached in Appendix D.

6.3 Comments and response report

All comments from the public, as well as responses to each comment, were recorded in a comments and response report which is attached in Appendix E.

6.4 Authority participation

Authorities are key interested and affected parties in each application and need to be provided with the opportunity to give input on the eMMP. The following authorities were informed:

- Provincial Department of Economic Development, Environmental Affairs and Tourism (DEDEAT)
- National Department of Water and Sanitation (DWS)
- South African National Parks (SANPARKS)
- Eastern Cape Parks and Tourism Agency (ECPTA)
- Eastern Cape Provincial Heritage Resources Agency (ECPHRA)
- Sundays River Valley Municipality Departments:
 - Department of the Municipal Manager
 - Environmental and Waste Directorate
 - Department of Water and Sanitation

- Infrastructure Planning and Development Directorate
- Sundays River Valley Municipality Local Ward Councillors for
 - Ward 2
 - Ward 3
 - Ward 6
 - Ward 7
 - Ward 8

List of authorities from whom comments have been received:

- On 19 March 2025, the Department of Water and Sanitation recommended that Zutari arrange a pre-consultation meeting to discuss any relevant WUL applications
- ECPTA confirmed that the project occurs outside ECPTA managed protected areas and buffers on 10 of March 2025
- ECPHRA requested the opportunity to conduct a heritage study in order to gather data for their database on 4 April 2025.

6.5 Consultation with other Stakeholders

Any stakeholder that has a direct interest in the site or property, such as servitude holders and service providers, should be informed of the application at least 30 (thirty) calendar days before the submission of the application and be provided with the opportunity to comment.

Comments been received from private stakeholders as well as stakeholder representatives and these have been captured in the comments and response report. Copies of correspondence to and from stakeholders are attached in Appendix F.

6.6 Issues Raised by Interested and Affected Parties

The main issue raised was:

- Concern regarding how to manage water supply during maintenance activities

Please refer to the Comments and Response Report in Appendix E.

7 Description of the Affected Environment

In this section of the report, the immediate environment will be discussed to determine the potential impacts that may arise from activities carried out in terms of the environmental Maintenance Management Plan (eMMP). The study area primarily encompasses the canal system and its surroundings. However, it is important to highlight that this application pertains to work on existing infrastructure, where the environment has already adapted to previous impacts, rather than a greenfield development that would introduce entirely new impacts.

7.1 Biophysical

7.1.1 Climate

The lower Sundays River area is situated close to the Eastern Cape coastal belt and falls under the Köppen-Geiger classification BSh, indicating a semi-arid environment. The region receives rainfall throughout the year, with higher precipitation levels typically occurring in spring through to autumn as seen from the monthly rainfall data collected from the meteorological weather station in Addo³⁶ (Figure 37). Rainfall amounts vary significantly due to the area's diverse topography. In higher-altitude areas like at Korhaansdrift Weir, annual rainfall can reach up to 1,100 mm, while regions near Barkley Bridge receive around 400 mm per year. Therefore, the valley receives approximately an average of 300-500 mm per annum¹.

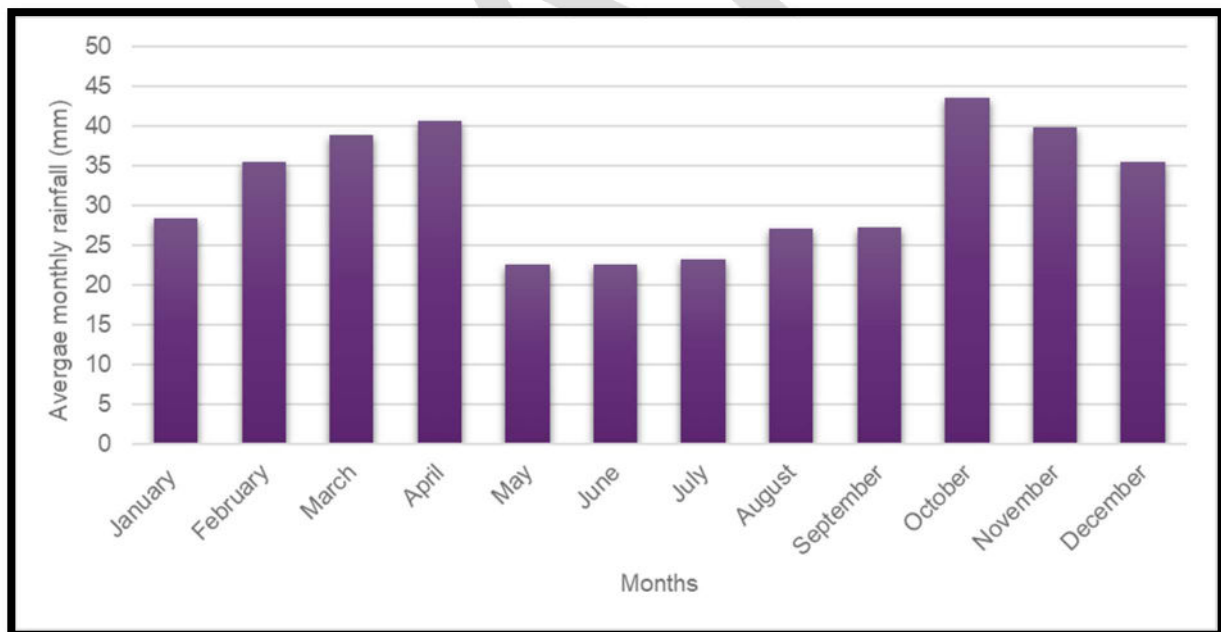


Figure 37. Average monthly rainfall (source: DWS)

The mean minimum temperature in July is 5°C while the mean maximum temperature in January is 30°C although temperatures close to 40°C can be reached. Average temperatures are shown below (Figure 38). The mean annual A-pan evaporation for the area is approximately 1,750 mm (Herald, 1991).

³⁶ Extensive historical meteorological datasets are available through DWS at [Verified data](#). Data was retrieved from Addo Station (N4E001).

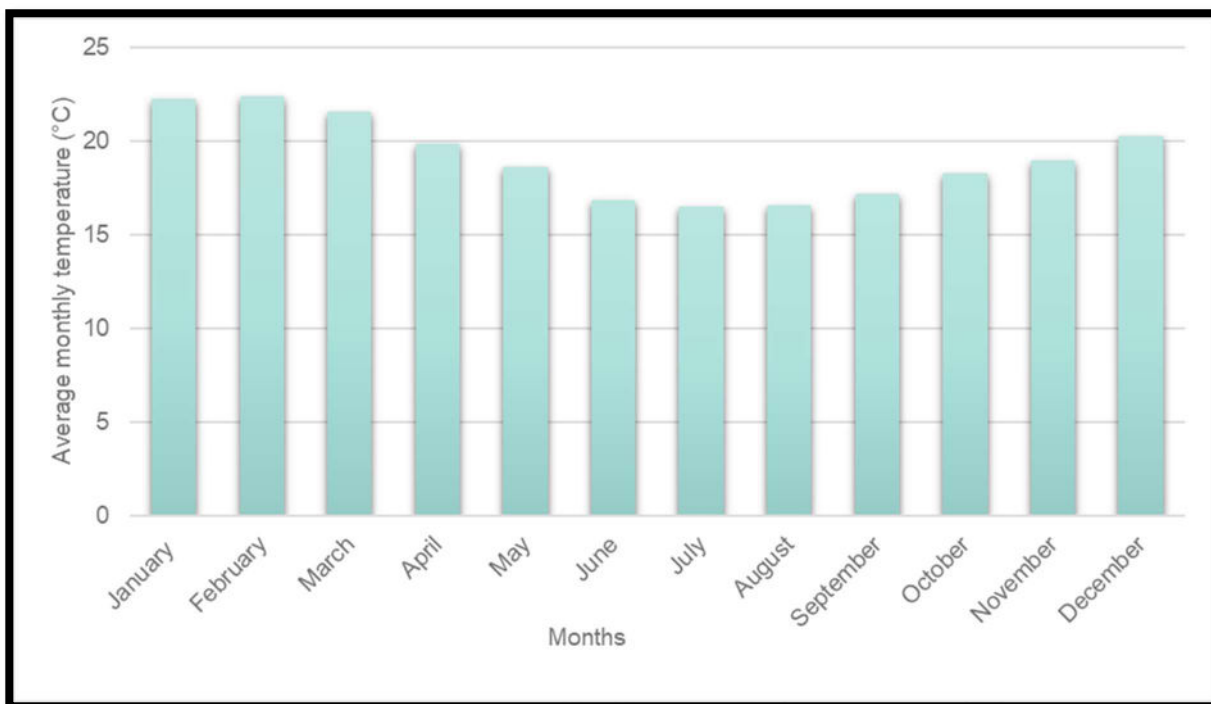


Figure 38. Average monthly temperature for Addo (source: WeatherAtlas)

The windiest month, with the highest average wind speed, is October³⁷. October's average wind speed is 20.3 km/h and the calmest month (with the lowest average wind speed) is May (16.4km/h) (Figure 39).

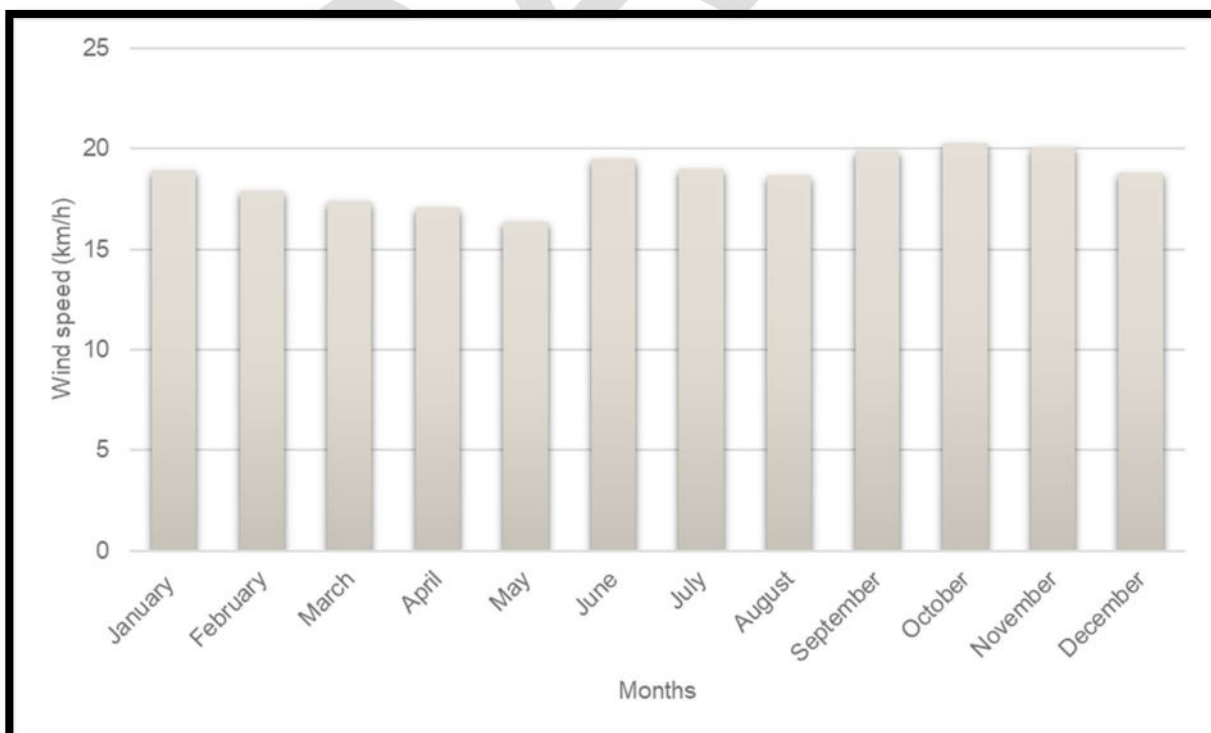


Figure 39. Average monthly wind speed for Addo (source: WeatherAtlas & Meteoblue)

³⁷ Meteoblue and Weather Atlas

7.1.2 Climate Change

The Sundays River region is anticipated to experience substantial environmental and demographic pressures by 2050 due to climate change and population growth. Climate projections suggest that average temperatures will rise by 1.5–2°C, which could lead to increased evaporation rates and higher water demand. Additionally, annual rainfall is expected to decrease by 5–10% (CSIR Greenbook, 2019), which may intensify drought conditions and further limit water availability. These climatic shifts pose a significant risk to water security, particularly for irrigation-dependent agriculture, which is the backbone of the region's economy.

Areas that the canal infrastructure goes through and supplies water to, including Nqweba, Enon, and Addo, are expected to experience a high potential increase in exposure to drought (CSIR, 2019). Nqweba and Enon, in particular, are also projected to experience a moderate potential increase in exposure to flooding. Increased drought conditions could severely impact the primary function of the canal system, which is to supply water for irrigation, support agricultural livelihoods, and sustain local communities. A reduction in water availability would not only threaten crop yields but could also lead to economic instability for farmers and businesses reliant on consistent irrigation. Meanwhile, an increased risk of flooding poses the threat of infrastructure damage, sedimentation, and potential contamination of water supplies, which could disrupt the reliability of the canal system.

In response to these challenges, this eMMP aims to assist in mitigating potential climate hazards through proactive infrastructure upkeep and preventative measures. Regular maintenance will help identify vulnerabilities, reinforce key infrastructure, and ensure the canal system remains operational during periods of both drought and flooding. By facilitating timely interventions in the event of infrastructure failure, the eMMP will enhance the resilience of the irrigation network, helping to sustain agricultural productivity and support local livelihoods despite the anticipated climate pressures.

7.1.3 Geology & Soils

7.1.3.1 Geology

The Sundays River Valley is predominantly underlain by the Kirkwood Formation, with additional contributions from the Sundays River and Enon Formations, all part of the Uitenhage Group within the Algoa Basin (Figure 40). The Kirkwood Formation is characterized by fluvial sedimentary rocks, including variegated mudstones, medium-grained lithic sandstones, poorly sorted estuarine sandstones, and fine clay-rich mudstones. The Enon Formation features thickly bedded, poorly sorted conglomerates with subordinate sandstone and mudstone (Muir et al., 2017). Lastly, the Sundays River Formation, the uppermost unit, comprises thin, grey sandstones interbedded with siltstone and mudstone, with marine fossils present, and thickens significantly towards the east (Chabangu et al., 2014).

Maintenance activities on canal infrastructure can affect the geology by causing erosion, sediment displacement, or changes in soil stability, especially in clay-rich or poorly sorted materials. Maintenance activities may alter compaction or permeability in localised areas, potentially compromising structural integrity. Excavation in previously undisturbed areas, although very unlikely, could result in the disturbance of fossils. Overall, however, impacts on geology are unlikely to be significant as the area has already been impacted on by the existing canal infrastructure, and proper construction and maintenance techniques and stabilization measures can further minimize any effects.

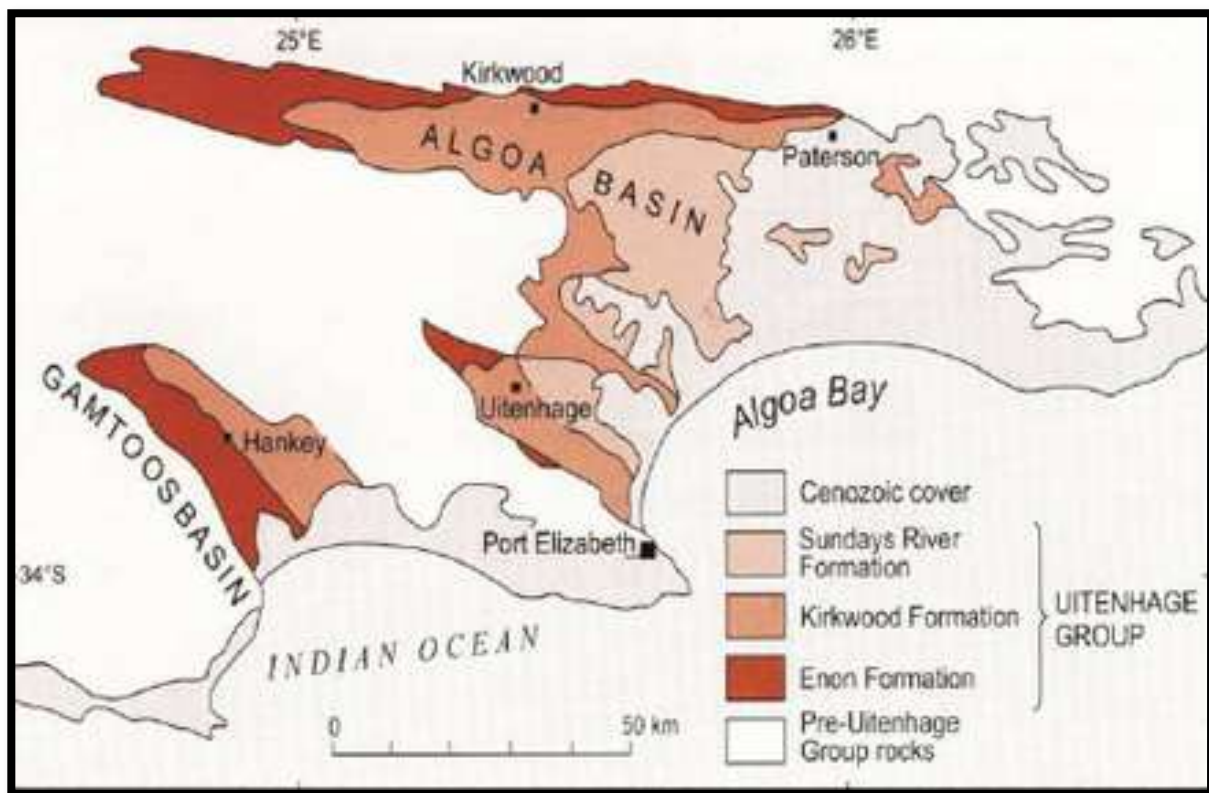


Figure 40. Simplified geology of the Uitenhage Group in the Algoa Basins (Lourens, 2013)

7.1.3.2 Soils

The soils in the Sundays River Valley can be characterized as minimally developed, typically shallow, and situated on hard or weathering rock, with intermittent diverse soil types present across the landscape³⁸. According to the Natural Agricultural Resources Atlas of South Africa (NARASA), the canal infrastructure in the study area falls within the calcareous soils classification. These soils are common in dry or semi-arid climates and are distinguished by their alkaline nature and high calcium carbonate content.

Given that the landscape is already significantly altered by agricultural activities and the existing canal infrastructure, the impact of maintenance activities on soil stability and structure is expected to be very low.

7.1.4 Topography

The Sundays River Valley exhibits diverse topography, ranging from gently rolling hills and fertile plains to areas of steep terrain, particularly around Nqweba and Enon (Figure 41). These steeper areas are a result of the valley's proximity to the Klein Winterhoek and Zuurberg Mountains, which serve as the headwaters for tributaries flowing into the Sundays River. The landscape transitions from riverine habitats along the river to more arid and rugged regions further away from the water source.

The main canal is primarily located at higher elevations. This positioning ensures effective water distribution to the lower valley plains, particularly the citrus orchards that dominate the agricultural landscape. The placement of canals in elevated zones also minimizes the risk of flooding and allows gravity-fed irrigation in certain areas, optimizing water use efficiency.

³⁸ Natural Agricultural Resources Atlas of South Africa ([Natural Agricultural Resources Atlas of South Africa](#))

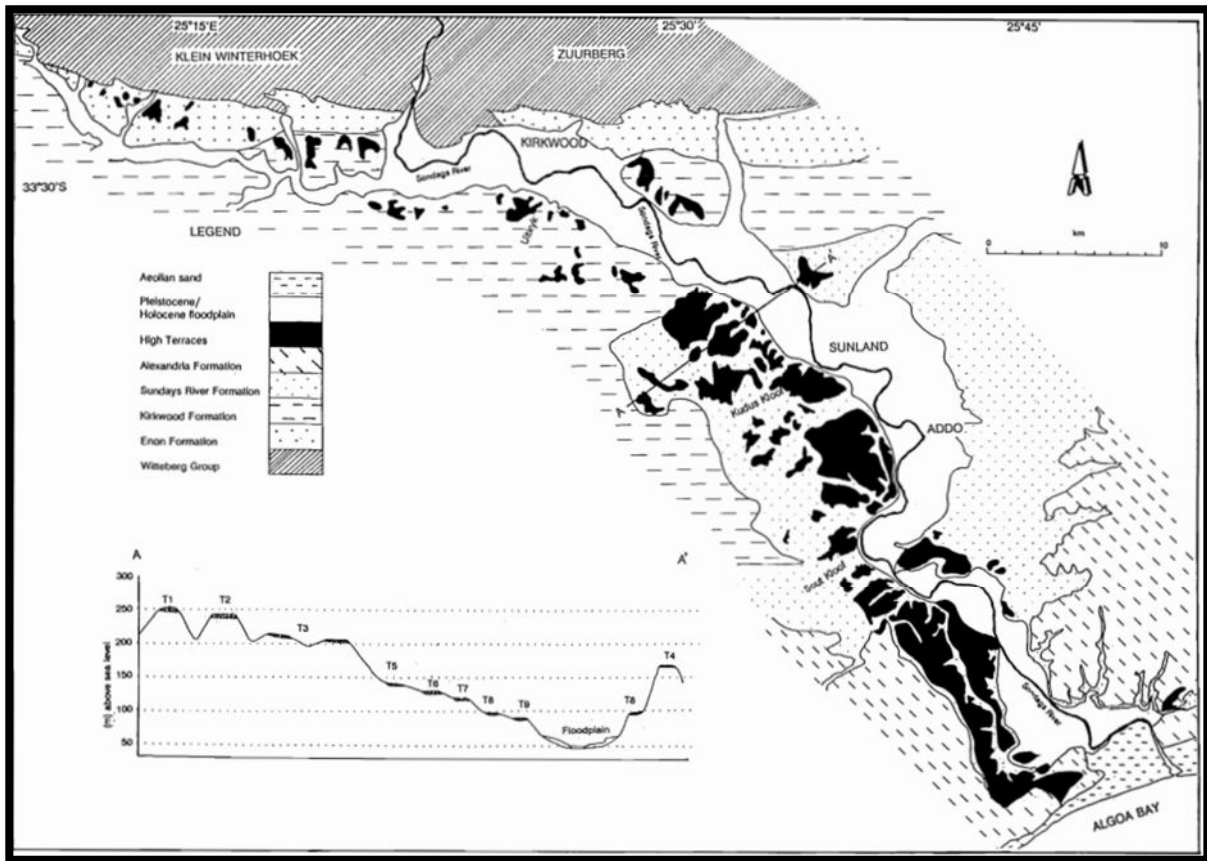


Figure 41. Topography of Sundays River Valley (Hattingh, 1994)

7.1.5 Land use and land capability

The land surrounding the LSRWUA canal system is primarily used for high-intensity agriculture, with the region being a major producer of citrus fruits, including 25% of South Africa's navel oranges and 50% of its lemons (Munro et al., 2016). Other crops such as vegetables, maize, wheat, and chicory are also cultivated, all reliant on the canal for irrigation (Baird, 2006).

Adjacent to these farmlands, the Addo Elephant National Park (AENP) supports a growing eco-tourism sector, drawing visitors and contributing to the local economy. Small towns like Nqweba, Enon, and Addo act as key service hubs, providing housing, schools, and healthcare for agricultural and tourism workers.

While agriculture and eco-tourism dominate the region, industrial activity is minimal, mainly consisting of citrus pack-houses and juicing factories, which depend on bulk water from the canal (Clifford-Holmes, 2015). Overall, the canal system is crucial in supporting both agricultural productivity and economic sustainability in the Sundays River Valley.

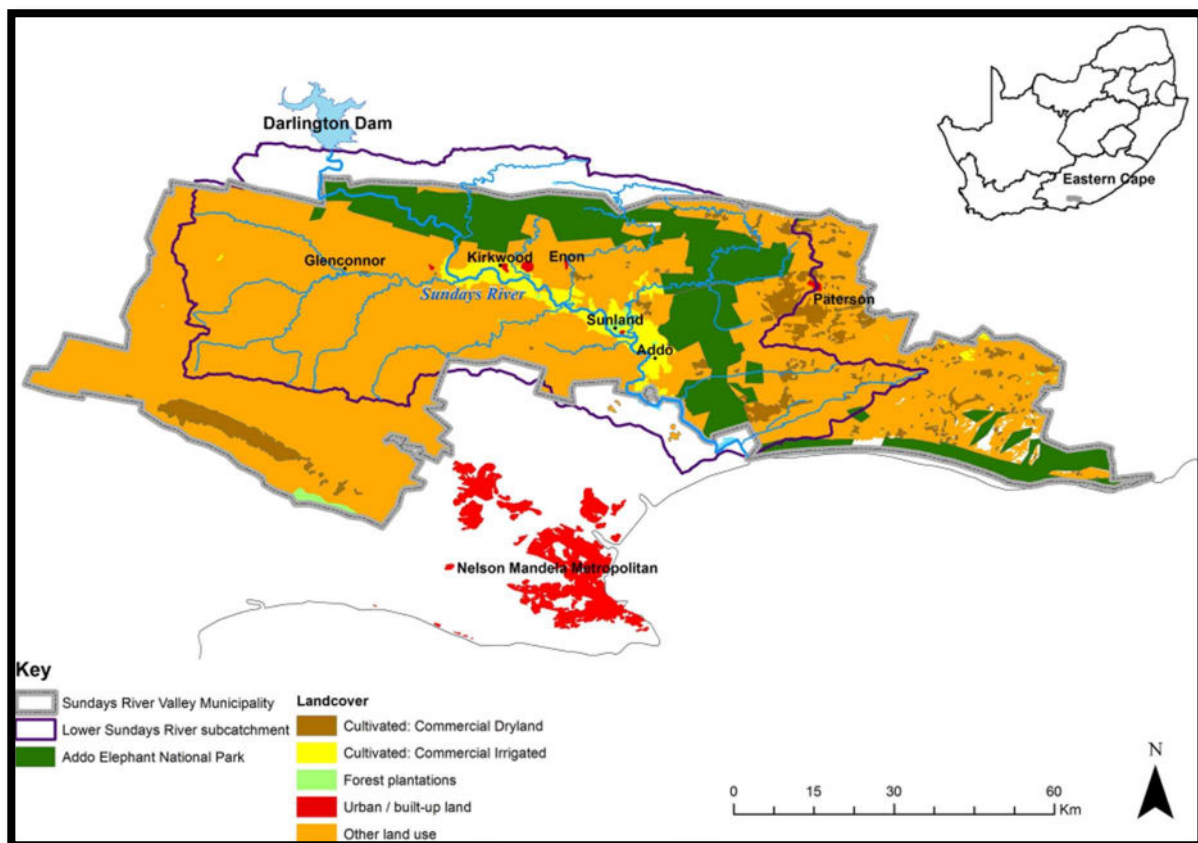


Figure 42. Land cover of the Lower Sundays River Valley (Holmes, 2015)

7.1.6 Hydrology

This section provides an overview of the hydrological systems within the study area. The study area falls within the **N** primary catchment within the Mzimvubu-Tsitsikamma Water Management Area (WMA).

7.1.6.1 Rivers

The Sundays River is a vital water source for the Eastern Cape, stretching approximately 310 km in length. It is fed by six main tributaries, listed from west to east as the Kariega, Uie, Wit, Bezuidenhouts, Coerney, and an unnamed tributary (Figure 43). The Kariega and Bezuidenhouts rivers originate in the Grootwinterhoek Mountains and flow into the Sundays River from the south-west. Of these tributaries, the Wit, Coerney, and Kariega rivers are perennial, although surface water may not always be visible. In contrast, the Uie, Bezuidenhouts, and unnamed tributary are non-perennial, with low flow.

These rivers surround various components of the canal infrastructure. Several syphons cross the Uie, Wit, Coerney, Kariega, and Sundays rivers, forming an integral part of the water transfer system. Additionally, the canal infrastructure has discharge points near the rivers when there is excess flow, such as at the Coerney, Uie, and Sundays rivers.

River Water Quality

The Sundays River can be described as a brackish, hard water system with high nutrient concentrations in certain sections. The most important contributors to high nutrient concentrations are point sources in the vicinity of towns along the river banks, as well as diffuse sources contributing to high nitrogen concentrations in the fertile Sundays River valley. The

natural river flow has consequently been artificially enhanced (Janse van Vuuren & Taylor, 2015).

It can be assumed that the tributaries feeding to the Sundays River have also been influenced by the irrigation run-off. Based on the PES, EI, and ES desktop assessment conducted by the DWS³⁹, the rivers in the Sundays River Valley are considered moderately to largely modified. Since these watercourses have already undergone significant alteration, any maintenance activities in their vicinity are expected to have minimal additional impact on water quality.

Table 3. Present Ecological State of the rivers in the study area

River	Ecological category	Ecological description
Bezuidenhouts River	B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.
Kariega River	C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.
Wit River		
Uie River		
Sundays River	D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.
Coerney River		
Unnamed tributary		

³⁹ Department of Water and Sanitation. 2014. A Desktop Assessment of the Present Ecological State, Ecological Importance and Ecological Sensitivity per Sub Quaternary Reaches for Secondary Catchments in South Africa. Secondary: [W5 (for example)]. Compiled by RQIS-RDM: <https://www.dwa.gov.za/iwqs/rhp/eco/peseismodel.aspx> accessed on 07/11/2024.

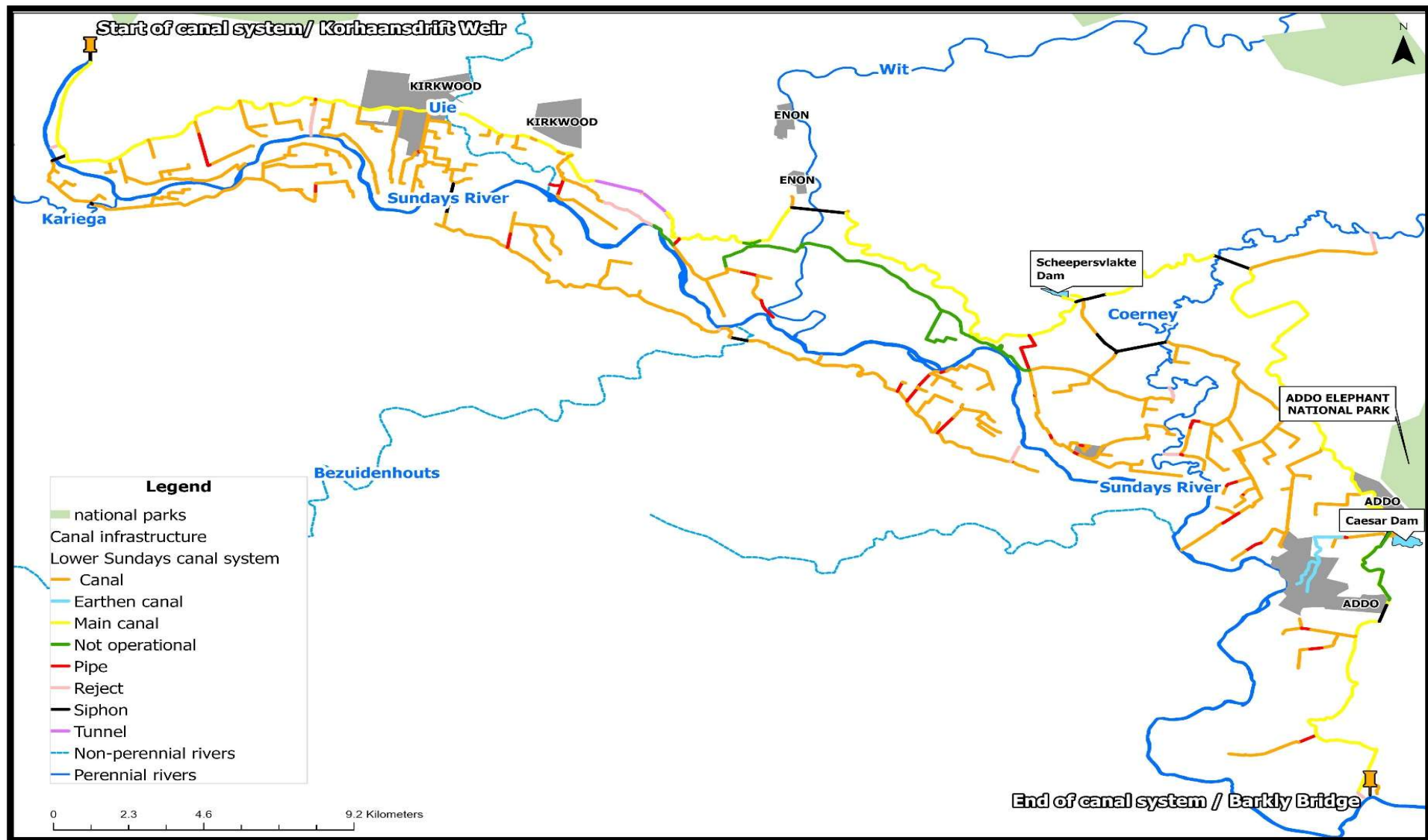


Figure 43. Overview of river network within Sundays River Valley

7.1.6.2 *Catchments*

The Sundays River catchment comprises of three hydrological sub-divisions: the Upper Sundays, Middle Sundays, and Lower Sundays with the LSRWUA canal system running through the lower catchment. Covering an area of approximately 22,000 km², the catchment supports sheep farming and citrus cultivation as primary activities throughout the basin and along the entire river (Baird, 2006).

The southern portion of the catchment forms the Lower Sundays sub-catchment, classified as the N40 catchment (DWS, 2017). Surface water yield in this sub-catchment is 14 million m³ per annum, while groundwater yield is 2 million m³ per annum. These yields are relatively low and highly variable due to seasonal fluctuations (DWAF, 2005). Large-scale irrigation in the Lower Sundays River Valley and upstream has significantly altered the natural conditions of the lower catchment.

Additionally, the Sundays River system is augmented through the Orange-Fish-Sundays inter-basin transfer scheme (IBT) as seen in Figure 44. The scheme involves the Orange River, the Gariep Dam, and the Sundays River catchments. This scheme transfers water from the Orange River to the Gariep Dam, which then channels water into the Sundays River basin to support agricultural and other water needs.

The entire scheme spans multiple catchments, including those from the Orange River system, such as the Upper Orange and Lower Orange catchments, and the Sundays River system. The transferred water supports the perennial flow of the Sundays River and its tributaries. This IBT scheme plays a vital role in maintaining water supply stability for agricultural activities and irrigation systems within the Sundays River catchment.

Maintenance activities on the existing infrastructure are unlikely to affect any of the catchments.

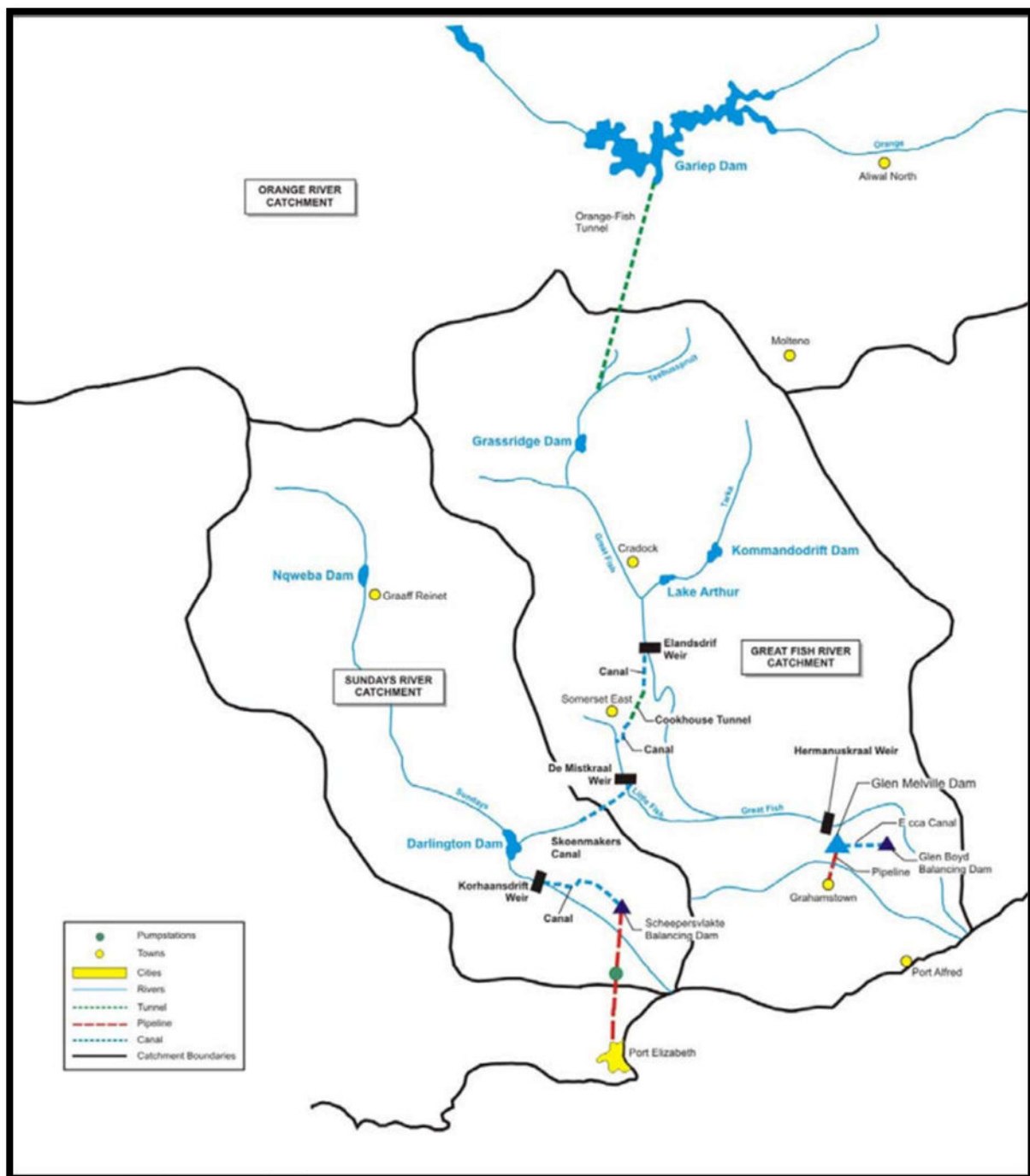


Figure 44. Overview of Orange-Fish-Sundays IBT (source: Fish to Tsitsikamma Water Management Area: Fish to Sundays ISP, February 2005 - Chapter 2)

7.1.6.3 Wetlands

Numerous wetlands have been identified within the Sundays River Valley and surrounding areas, as mapped by the National Freshwater Ecosystem Priority Areas (NFEPA) Project and updated through the National Biodiversity Assessment 2018 (NBA 2018) thereby producing the National Wetland Map 5 (Figure 45). It is important to note that a large majority of the identified wetlands are artificial. Determining their original natural state is challenging due to the influence of agricultural runoff and other human-related impacts. The natural wetlands are unlikely to be impacted by maintenance activities.

In the study area, the natural wetland types consist of depressions and channelled valley-bottom wetlands, while artificial wetlands are also present. Specifically:

- **Depressions:** Two depressions have been recorded within 500 meters of the canal infrastructure. These wetlands are situated at a higher elevation near the non-operational canal. Although the canal is currently inactive, if the LSRWUA decides to restore its functionality, this eMMP will encompass the necessary work for its reactivation. The potential impact on the wetland is expected to be minimal, as the canal is already in place, thereby reducing the extent of required work and limiting further disturbance to the area.
- **Channelled Valley-Bottom Wetlands:** One channelled valley-bottom wetland is located along the Sundays River near the end of the lower canal section. However, this wetland has already been altered by agricultural activities, leaving only a small remaining portion. Another channelled valley-bottom wetland is situated near Scheepersvlakte Dam, surrounded by agricultural operations and likely significantly modified. As a result, any work along the syphons and canal is expected to have limited significant impacts on these wetlands.

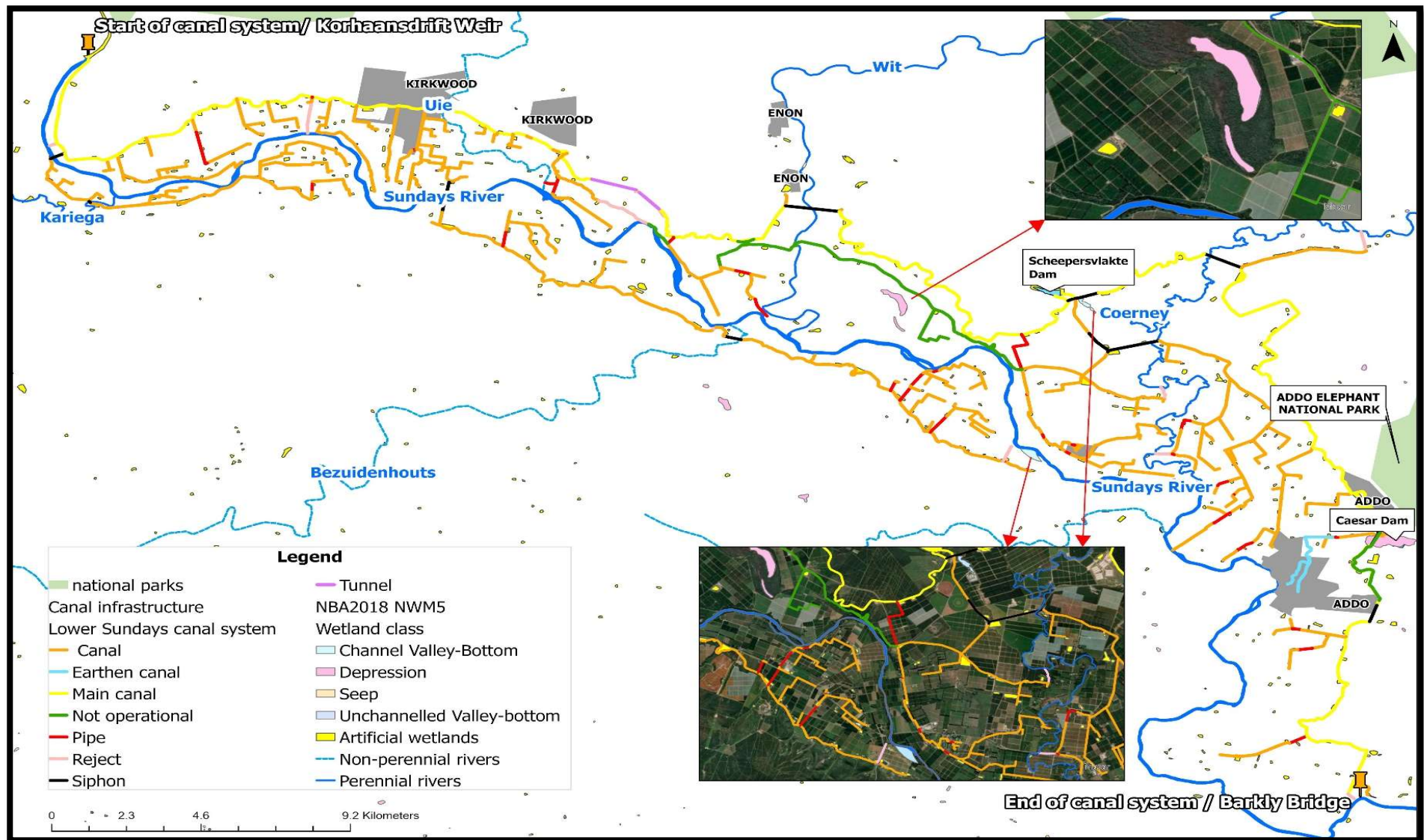


Figure 45. Overview of NFEPA and NBA2018 NWM 5 wetlands

7.1.7 Biodiversity and ecosystem threat status

7.1.7.1 *Eastern Cape Biodiversity Conservation Plan*

Aquatic

In the Lower Sundays River Catchment, all rivers and tributaries are mapped as Ecological Support Areas (ESA1). Maintenance activities on the existing canal infrastructure are unlikely to impact on the ecological support functions of the aquatic systems.

Terrestrial

The study site falls predominantly within Terrestrial Ecological Support Areas (ESA 1 and 2). These areas are recognized for their ecological importance in supporting biodiversity and maintaining ecosystem processes.

The region has undergone significant land use changes, predominantly driven by agricultural activities. As a result, much of the original natural vegetation has been altered or lost, leaving only fragmented or degraded remnants. The canal system itself is largely surrounded by modified landscapes, with minimal intact natural vegetation in its immediate vicinity. Given that the maintenance activities are focused on existing infrastructure, the overall impact is expected to be minimal if proper mitigation measures, such as limiting disturbance to any existing vegetation, preventing erosion, and managing runoff.

7.1.7.2 *The National Freshwater Ecosystem Priority Areas (NFEPA):*

The National Freshwater Ecosystem Priority Areas (NFEPA) project is a biodiversity planning framework that identifies FEPAs to support national freshwater ecosystem goals while promoting equitable socio-economic development. According to the NFEPA map, the Bezuidenhouts, Wit, and parts of the Sundays and Kariëga Rivers fall within a FEPA. This means that the surrounding land and smaller stream networks must be managed to maintain the river's condition. Other priority rivers, such as the Uie and Coerney Rivers, are Fish Support Areas, crucial for the migration of threatened fish species. The aim is to preserve the health of these rivers to prevent further decline of these fish populations. However, impacts to the Uie and Coerney Rivers are expected to be minimal.

7.1.8 Flora

Four vegetation types are identified within and surrounding the canal infrastructure system: Albany Alluvial Vegetation, Sundays Valley Thicket, Sundays Arid Thicket, and Sundays Mesic Thicket (Mucina & Rutherford, 2006; VegMap, 2018). The Albany Alluvial Vegetation and Sundays Arid Thicket are considered threatened ecosystems.

The Thicket Biome is characterized by dense woody shrubs, small trees, and a high diversity of species, including endemic flora such as *Encephalartos horridus* (tree cycad) and *Aloe bowiea* (succulent shrub).

Albany Alluvial Vegetation, which dominates along much of the canal infrastructure, is found along the Coerney and parts of the Sundays, Wit, and Kariëga floodplains. Common species include willows, reeds, and various indigenous plants such as *Vachellia karroo* and *Phragmites australis* (Nel & Basson, 2024). In terms of conservation status, Albany Alluvial Vegetation is considered as threatened and is classified as Poorly Protected and Endangered.

The Sundays Arid Thicket is also considered a threatened ecosystem type, being classified as Vulnerable. As most maintenance will take place on existing infrastructure, significant disturbance of these threatened ecosystems is not expected.

The Sundays River Valley Municipality Biodiversity Sector Plan (SRVM BSP, 2012) P lists the following plant species of special concern occurring within the municipal area:

Table 4. Plant species in the area and protected status

Plants					
Species Name	Red Data Category	Species Name	Red Data Category	Species Name	Red Data Category
Agathosma acutissima	VU	<i>Diosma thyrsoophora</i>	VU	<i>Leucadendron orientale</i>	EN
Agathosma gonaquensis	CR	<i>Disa lugens lugens</i>	EN	<i>Leucospermum muirii</i>	EN
Agathosma microcarpa	VU	<i>Encephalartos altensteinii</i>	VU	<i>Lotononis acuminata</i>	VU
Agathosma stenopetala	VU	<i>Encephalartos arenarius</i>	EN	<i>Lotononis monophylla</i>	CR
Albucca crudenii	VU	<i>Encephalartos horridus</i>	EN	<i>Marsilea schelpeana</i>	VU
Aloe bowiea	CR	<i>Encephalartos trispinosus</i>	VU	<i>Merxmüllera papposa</i>	VU
Amphiglossa callunoides	VU	<i>Erica abelii</i>	VU	<i>Muraltia brevicornu</i>	EN
Amphiglossa corrudifolia	VU	<i>Erica glumiflora</i>	VU	<i>Ocotea bullata</i>	EN
Apodolirion macowanii	VU	<i>Erica zeyheriana</i>	VU	<i>Paranomus reflexus</i>	EN
Argyrolobium barbatum	VU	<i>Euphorbia globosa</i>	EN	<i>Protea caespitosa</i>	CR
Argyrolobium crassifolium	EN	<i>Euryops ericifolius</i>	EN	<i>Protea rupicola</i>	EN
Aspalathus angustifolia robusta	VU	<i>Euryops linearis</i>	VU	<i>Rhombophyllum rhomboideum</i>	EN
Aster laevigatus	VU	<i>Euryops ursinoides</i>	VU	<i>Ruschia leptocalyx</i>	EN
Bobartia macrocarpa	VU	<i>Gladiolus huttonii</i>	VU	<i>Salvia obtusata</i>	VU
Bowiea volubilis volubilis	VU	<i>Gladiolus leptosiphons</i>	VU	<i>Selago polycephala</i>	CR
Brunsvigia litoralis	EN	<i>Gymnosporia elliptica</i>	VU	<i>Selago rotundifolia</i>	VU

Clivia nobilis	VU	<i>Haworthia aristata</i>	EN	<i>Senecio hirtifolius</i>	CR
Cotyledon tomentosa tomentosa	VU	<i>Haworthia attenuata attenuata</i>	EN	<i>Strelitzia juncea</i>	VU
Crinum lineare	VU	<i>Haworthia longiana</i>	EN	<i>Syncarpha recurvata</i>	EN
Cullumia cirsioides	VU	<i>Haworthia springbokvlakensis</i>	EN	<i>Syncarpha sordescens</i>	VU
Cyrtanthus spiralis	EN	<i>Haworthia venosa woolleyi</i>	CR	<i>Thamnochortus pluristachyus</i>	VU
Dioscorea sylvatica	VU	<i>Hypodiscus procurrens</i>	EN	<i>Trichodiadema aureum</i>	VU

Due to the already highly transformed nature of the likely working areas, it is considered highly unlikely that species of special concern will be present within the areas likely to be affected by maintenance. However, should any protected vegetation be found, the necessary permits to disturb the affected plants must be obtained prior to any maintenance work taking place.

7.1.9 Fauna

According to the SRVM BSP, the following faunal species of special concern can be found within the municipal area:

Table 5. Species of concern recorded in general area

Species	Common name	Red Data Category
AMPHIBIANS		
<i>Heleophryne hewitti</i>	Hewitt's Ghost Frog	CR
<i>Anhydrophryne rattrayi</i>	Hogsback or Rattrays Frog	EN
BIRDS		
<i>Anthropoides paradiseus</i>	Blue Crane	VU
<i>Bradypterus sylvaticus</i>	Knysna Scrub Warbler	VU
<i>Bucorvis leadbeateri</i>	Ground Hornbill	LC
<i>Circus macrourus</i>	Pale Harrier	NT
<i>Falco naumanni</i>	Lesser Kestrel	VU
<i>Spheniscus demersus</i>	Jackass Penguin	VU
FISH		
<i>Pseudobarbus afer</i>	Eastern Cape Redfin	EN
<i>Pseudobarbus asper</i>	Smallscale Redfin	EN
INVERTEBRATES		
<i>Aloeides cafferiae</i>	Border Copper	Not Listed
<i>Aloeides clarki</i>	Coega Copper Butterfly	EN
<i>Chrysoritis pyrois hersaleki</i>	Sand Dune Opal	Not Listed

<i>Chrysoritis thysbe whitei</i>	Common Opal	EN
<i>Ichnostoma fuscipennis</i>	Coega Beetle (Endemic)	Not Listed
<i>Lepidochrysops bacchus</i>	Winelands Blue	Rare
MAMMALS		
<i>Cercopithecus mitis</i>	Samango Monkey	LC
<i>Chlorotalpa duthieae</i>	Duttie's Golden Mole	VU
<i>Diceros bicornis</i>	Black Rhino	CR
<i>Dendrohyrax arboreus</i>	Tree Hyrax	LC
<i>Ourebia ourebi</i>	Oribi	LC
<i>Philantomba monticola</i>	Blue Duiker	LC
REPTILES		
<i>Bitis albanica</i>	Albany Adder	Not Listed
<i>Bradypodion teaniaboronchroum</i>	Smith's Dwarf Chamaeleon	EN
<i>Bradypodion ventrale</i>	Southern Dwarf Chameleon	LC
<i>Cordylus tasmani</i>	Tasmans Girdled Lizard	VU
<i>Lycodonomorphus rufulus</i>	Brown Water Snake	Not Listed
<i>Tetradactylus africanus fitzsimonsi</i>	African Whip Lizard	Not Listed

7.1.10 Heritage Resources

7.1.10.1 Palaeontology

In terms of the Fossil Sensitivity Map compiled by the South African Heritage Resources Agency (SAHRIS, accessed October 2024), the fossil sensitivity in the Sundays River Valley is moderate. The National Environmental Screening Tool also indicates that most of the study area has a moderate sensitivity to palaeontology resources, with a few areas – particularly those at higher elevations near the main canal and tunnel – are classified as having high sensitivity. This suggests that these areas may have a greater likelihood of containing significant fossil material, requiring careful monitoring during maintenance activities (Figure 46). However, the overall impact on paleontological resources is expected to be lower, as most disturbances would have occurred during the original construction of the infrastructure.

The study area is underlain by marine and estuarine sediments of the Early Cretaceous Sundays River Formation, which is known to contain a rich fossil fauna. These include marine invertebrates such as ammonites, belemnites, bivalves, and gastropods, as well as plant remains, vertebrate fragments, and microfossils like foraminifera and ostracods (Shone, 2006). The formation is linked to a shallow marine depositional environment, potentially including lagoonal, estuarine, and shallow shelf settings (McClachlan & McMillan, 1976). Good exposures of the Sundays River Formation, with grey-green sandstones, siltstones, and mudstones interbedded with thin shell-rich limestone layers, are visible in cliffs along the Sundays River, approximately 6km north of the study area (Rossouw, 2017).

Marine fossils were observed during cleaning and dredging activities at the tunnel during a site visit. These fossils were likely already present in the tunnel and were exposed during the maintenance work rather than being newly introduced or disturbed by the dredging itself. However, attention will need to be paid during future dredging operations to check for any additional fossils that may have been washed into the system from other areas. Given that maintenance will take place on existing infrastructure, the impact on palaeontological resources is expected to be negligible.

Table 6. Summary of geology and palaeontology

GEOLOGICAL UNIT	ROCK TYPES AND AGE	FOSSIL HERITAGE	COMMENTS
Sundays River Formation (Ks)	Shallow marine/ estuarine siliciclastic Early Cretaceous	Rich marine invertebrate fauna (molluscs, echinoderms etc), vertebrates (e.g. plesiosaurs), microfossils (foraminiferans, ostracods), trace fossils	Algoa Basin of E. Cape is the key area for terrestrial and shallow marine biotas of the Uitenhage Group in RSA
Kirkwood Formation (J-K)	terrestrial (fluvial / lacustrine) siliciclastic Early Cretaceous	Variety of small to large dinosaurs (theropods, sauropods, ornithopods), other reptiles, Mesozoic mammals, important floras of petrified wood ("Wood Beds"), leaves (ferns, cycads, conifers), freshwater invertebrates (bivalves, crustaceans) shelly marine biotas, microfossils (Colchester Shale Member)	

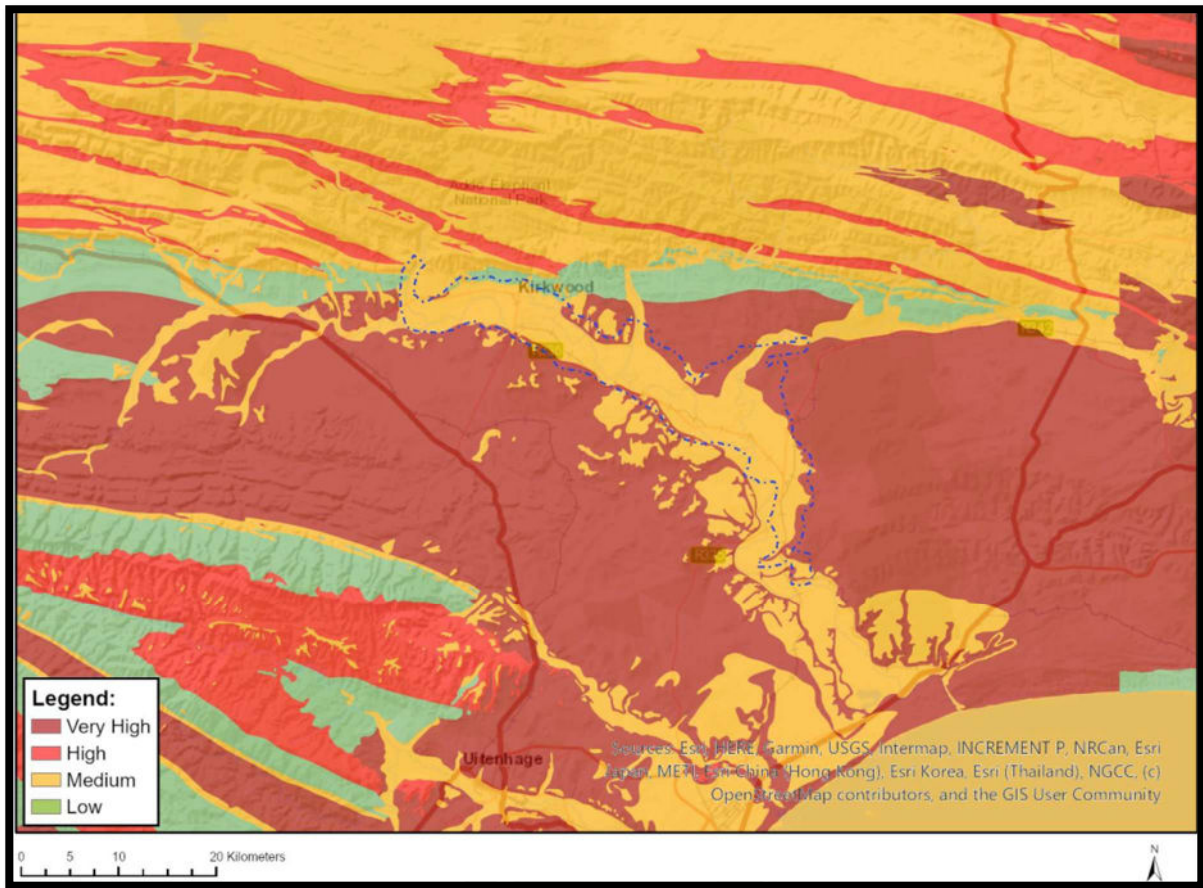


Figure 46. Map of palaeontology theme based on the DFFE Screening Tool

7.1.10.2 Archaeology

The Sundays River in the Eastern Cape holds significant archaeological and geological interest due to its rich alluvial terrace deposits.

Middle Stone Age (MSA) tools, which succeeded ESA artefacts, have been discovered in the region's gravels and are characterized by smaller, flake-based tools dating between 250,000 and 30,000 years ago. Later Stone Age (LSA) sites, associated with San hunter-gatherers and Khoi pastoralists, reveal a more recent archaeological layer, with evidence such as campsites, rock art, and shell middens. These LSA sites often contain limited stone tools and bone fragments due to poor preservation.

The proximity of the study area to the Sundays River means that cultural materials, such as freshwater mussel middens linked to rivers may potentially be present, past findings have been noted along the riverbanks near Barkly Bridge (Binneman & Reichert, 2019). However, given that the infrastructure to be maintained is already in existence, the disturbance of archaeological resources is extremely unlikely.

7.2 Socio-Economic

The Sundays River Valley is a key agricultural hub in the Eastern Cape. The area is recognized for its diverse farming activities, with citrus cultivation being a major contributor to the local economy. The Sundays River Valley also plays a significant role in the agricultural export sector, with farms supplying both local and international markets. Other important economic sectors include livestock farming, particularly sheep and game farming, as well as tourism and agro-processing.

7.2.1 Demographics

Population, education, and employment levels

The Sundays River Valley Municipality has experienced steady population growth, with an increase of 1.8% between 2011 and 2016 (IDP, 2022/27). The population is predominantly African (95%), with a large portion (63%) being in the working-age group of 15 to 64 years. Despite this, unemployment remains a significant challenge, with an unemployment rate of 32.4% at the latest census count, underlining the importance of job creation initiatives in the region.

Education levels in the municipality are relatively low, with only 34% of people aged 20 and older having completed matric. This indicates that the demand for jobs is predominantly within the unskilled and semi-skilled sectors, while opportunities for further education and training are crucial to improve employment prospects. The Human Development Index (HDI) of the Sundays River Valley Municipality stands at 0.52, placing it within the United Nations "Low Human Development" category. This highlights the ongoing need for interventions aimed at improving education, employment, and overall development in the region.

Certain maintenance activities will likely require manual labour, which will be sourced from the local unskilled labour force wherever possible.

7.2.2 Economy

A critical component supporting the agricultural sector is the LSRWUA canal system. This extensive canal network ensures a consistent and reliable supply of irrigation water to farmlands within the Sundays River Valley, enabling large-scale citrus production and other agricultural activities. Given that agriculture is a cornerstone of the local economy, the efficient operation and maintenance of this water infrastructure are essential for sustaining productivity, employment, and economic growth in the region.

7.2.2.1 *Agriculture*

The primary economic drivers in the Sundays River Municipal area are agriculture and tourism. The agricultural base is primarily located in citrus production, this contributes to both the national and global citrus export market. South Africa exports about 78% of its citrus, with the citrus exports generated over R30 billion in foreign exchange in 2022 (DALRRD, 2023). Globally, South Africa is the second-largest citrus exporter, contributing 10% of global exports, with the Eastern Cape contributing 26%.

Citrus farming in the Eastern Cape directly provides 19,700 jobs in production and 10,000 in packing, processing, and marketing. The industry contributes approximately R3.4 billion annually to the provincial economy (DALRRD, 2023).

The Sundays River Valley (SRV) is one of the country's most productive citrus regions and a key contributor to the Eastern Cape figures. The area has 17,173ha under cultivation, with 73% dedicated to citrus and 99% of citrus areas are under irrigation. The industry also contributes to local socio-economic development through support for established and individual BEE citrus enterprises, the creation of a large-scale "greenfields" (iKamva Lethu Farms) empowerment project to generate employment, and the development of education hubs and community wellness clinics (Sundays River Citrus Company (SRCC, 2016)

The biggest challenges facing the industry are climate change and irrigation water availability. Citrus trees require consistent irrigation throughout the year, especially during flowering and

fruiting stages. The trees need 850–1000mm of water annually, with over 50% of that requirement between November and February (Danckwerts, 2019).

Reliable water supply infrastructure is therefore essential to ensure stable production and sustained export quality.

7.2.2.2 **Domestic Water Supply**

In addition to the irrigation LSRWUA supplies water for Sundays River Valley Local Municipality and NMBM for domestic water supply. The LSRWUA uses Scheepersvlakte Balancing Dam to distributed to irrigators/small towns and the NMBM. The LSRWUA also supplies the towns of Addo, Nqweba and Paterson with water for domestic use from the Caesar's Dam.

NMBM's current allowable abstraction volume from the Scheepersvlakte dam, through the Nooitgedagt water treatment works, amounts to roughly 160Mℓ/day, which is in the process of being increased by an additional 50Mℓ/day, to a total of approximately 210Mℓ/day. This supplies water for the eastern part of NMBM, including Kariega, Dispatch , Motherwell and Coega IDZ.

The development of the Coega IDZ is a critical factor on future water demand in the NMBM. Projected figures for a total potable water and return effluent demand of 84Mℓ/day (Potable = 31Mℓ/day and Industrial = 53Mℓ/day). The Coega IDZ has 45 operational investors, with an investment value of R11.579-billion private sector investment and R9.53-billion foreign direct investment. In line with its mandate, the CDC achieved 112 974 jobs and trained more than 100 000 people since its inception in 1999 (Media, 2024).

Sundays River Valley Local Municipality receives approximately 12.65Mℓ/day for domestic water supply.

8 Potential Impacts & Associated Mitigation Measures

This section deals with the potential impacts that were identified as being likely to arise from the proposed maintenance activities. It also discusses proposed mitigation measures.

Positive impacts are indicated by “+” and negative ones by “-”.

CRITERIA	CATEGORY	DESCRIPTION	Score
Degree to which impact can be mitigated	Low	Mitigation not possible; or will only slightly reduce the significance of impacts	
	Medium	Mitigation exists and will notably reduce significance of impacts	
	High	Mitigation exists and will considerably reduce the significance of impacts	
Duration	Immediate	Impact will self-remedy immediately	1
	Brief	Impact will not last longer than 1 year	2
	Short term	Impact will last between 1 and 5 years	3
	Medium term	Impact will last between 5 and 10 years	4
	Long term	Impact will last between 10 and 15 years	5
	On-going	Impact will last between 15 and 20 years	6
	Permanent	Impact may be permanent, or in excess of 20 years	7
Extent	Very limited	Limited to specific isolated parts of the site	1
	International	Impacts felt at an international level	7
Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	1
	Very low	Natural and/ or social functions and/ or processes are slightly altered	2
	Low	Natural and/ or social functions and/ or processes are somewhat altered	3
	Moderate	Natural and/ or social functions and/ or processes are moderately altered	4
	High	Natural and/ or social functions and/ or processes are notably altered	5
	Very high	Natural and/ or social functions and/ or processes are majorly altered	6
	Extremely high	Natural and/ or social functions and/ or processes are severely altered	7
Probability	Rare	Conceivable, but only in extreme circumstances (< 5% chance of occurring)	1
	Unlikely	There is a small chance that the impact could occur although it is not expected (<30% chance of occurring)	2
	Possible	There is a moderate chance that the impact could occur	3
	Likely	It is most likely that the impact will occur (> 60% chance)	4
	Almost certain	There are sound reasons to expect that the impact will definitely occur (> 90% chance)	5
Confidence	Low	Judgement is based on intuition	
	Medium	Determination is based on common sense and general knowledge	
	High	Substantive supportive data exists to verify the assessment	
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	
	Medium	The affected environment will only recover from the impact with significant intervention	
	High	The affected environment will be able to recover from the impact	
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	
	Medium	The resource is damaged irreparably but is represented elsewhere	

	High	The resource is irreparably damaged and is not represented elsewhere	
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The SIGNIFICANCE of an impact is then derived by taking into account the temporal and spatial scales and magnitude. The means of arriving at the different significance ratings is explained in the following table.

Significance	Negative	Positive	Score
Neutral/Negligible	neutral	neutral	0-15
Very low	very low -	very low +	15-30
Low	low -	low +	31-45
Medium	med -	med +	46-60
Medium-high	med-high -	med-high +	61-75
High	high -	high+	76-90
Fatal flaw	fatal flaw	Very high +	>90

8.1 Screened Impacts

The following impacts (Table 7) were screened out during the impact assessment due to their likely negligible significance. These impacts can easily be prevented and mitigated and are addressed as standard items in this eMMP document.

Table 7: Summary of the screened impacts

MAINTENANCE PHASE
Impact on the surrounding community As part of the environmental authorisation process, a thorough public participation process was conducted (Section 6). One of the concerns raised was the potential disruption of water supply to farmers due to maintenance activities. While some localised disruptions may occur, they will be temporary, and alternative water supply measures will be implemented for affected users. Future engagement with interested and affected parties will be guided by the implementation phase. The construction phase is expected to have minimal impact on surrounding residents and farmers, and the overall outcome is anticipated to be beneficial for farmers if the eMMP is effectively implemented.
Clearing for site camp, laydown and stockpile areas The site camp, laydown and stockpile areas will be placed strategically in areas that will have been approved by the ECO, preferably in areas that have already been transformed/disturbed. Stockpiling will not take place close to rivers or any stormwater drainage areas. Refer to the eMMP and Method Statements (Appendix G).
Waste generation and disposal Small quantities of domestic and construction waste will be generated. No hazardous waste is expected. The construction waste generated will consist mainly of excavated material that will be utilised as backfill material. Where not used, material will be disposed of at a designated spoil site or landfill site. Sediment waste will be transported off-site and disposed of in a suitable manner.
Palaeontology and Archaeology Much of the route is situated in predominantly Kirkwood Formation and Sundays River Formation of the Algoa Group (high fossil sensitivity rating). Due to the land transformation of the area it is highly unlikely that any significant new paleontological findings will be present

on site. However, a heritage specialist generally recommends a standard procedure for the discovery of archaeological / paleontological objects and this is included in the eMMP.

Impact on water quality

Currently, the water quality of all the rivers in the study has been moderately to largely modified with high nutrient concentrations due to irrigation run-off. During maintenance, small quantities of pollutants such as sediment, oils and cement could potentially be released into the canals or rivers. Amounts are however likely to be limited and the risk can be well managed by good working practices.

Displacement/impact on fauna

Despite the transformation of the landscape due to agricultural activities, certain species, such as frogs near rivers, rodents commonly found in agricultural fields, and various bird species, are still expected to inhabit the area, as the crops provide a food source. Impact on these species is likely to be minimal as the species are disturbance-tolerant, mobile and alternative habitat exists.

Loss of species of special concern

This impact is considered highly unlikely to occur due to the fact that the infrastructure to be maintained is already in place and work will be taking place within existing disturbed footprints.

Nuisance impacts

Maintenance activities may result in some minor nuisance impacts, such as dust, noise and temporary blocking of access. These impacts are expected to be minor, temporary and easily mitigated by good working practices. They are therefore not assessed further.

Reduced access for public use

The construction area will be demarcated and public access restricted during the construction period. This may have a minor impact on the residents who may frequent the area for recreational use. However, this impact will be short-term (construction period) and alternative access routes can be provided where possible.

Visual impact

Visual impact is likely to be negligible. The maintenance work will not change the existing visual environment and there are no sensitive receptors nearby.

8.2 Impacts Arising from the Maintenance Phase

8.2.1 Impact on the flora

Description: The construction phase can impact vegetation in various ways, including direct removal, degradation by construction vehicles and fragmentation of intact vegetation patches. While most vegetation in the maintenance areas has already been highly modified due to agricultural expansion and infrastructure development, riparian habitats remain areas of higher ecological sensitivity.

Clearing riparian vegetation can significantly increase the risk of sedimentation, leading to soil erosion, reduced water quality, and potential impacts on aquatic ecosystems.

Assessment: The study area is included riverine corridors (Critical Ecological Process Area). Although the area is currently mostly disturbed, areas of riparian vegetation (important for ecosystem functioning) are present near syphons and reject structures.

Criteria	Without mitigation (Low-)	With mitigation (Very low-)
Magnitude	Low	Very low
Extent	Site specific	Site specific
Duration	Long term	Medium term
Significance	Low	Very low
Probability	Likely	Likely
Confidence	High	High
Reversibility	High	Low

Mitigations:

- Clearly demarcate working areas and “no-go” areas (wetland buffers in particular)
- Only clear areas from vegetation where necessary
- Implement erosion and sedimentation control measures
- Use existing access as per MMP/SOP03 and use existing tracks or roads as far as possible
- Do not introduce any foreign or alien plant species
- Rehabilitate cleared areas with indigenous plant species
- Ensure imported material is free from weeds
- Stockpile and conserve topsoil properly in order to preserve the natural seedbank in the topsoil for later rehabilitation purposes
- Confine stockpiling of construction material to demarcated areas (preferably areas which are already cleared/part of the existing footprint) i.e. do not stockpile material on vegetated areas outside the construction footprint.

8.2.2 Spread of alien invasive species

Description: Lower Sundays River Water User Association notes alien vegetation as an issue with regards to blocking canals and hindering flow⁴⁰. Vegetation clearing and movement of machinery can inadvertently introduce or exacerbate the spread of alien invasive species, particularly in riparian zones which are highly vulnerable.

Assessment: Invasive alien plants can outcompete native species, alter hydrology, and degrade ecological integrity. Maintenance work presents both a risk of spread and an opportunity for control if invasive management is incorporated into planning.

Criteria	Without mitigation (Low-)	With mitigation (Very low-)
Magnitude	Low	Very low
Extent	Site specific	Site specific
Duration	Long term	Medium term
Significance	Low	Very low

⁴⁰ Canal Maintenance - Lower Sundays River Water User Association

Probability	Likely	Likely
Confidence	High	High
Reversibility	High	Low

Mitigations:

- Integrate alien clearing activities (e.g. mechanical removal or herbicide application by trained personnel) into regular maintenance schedules
- Dispose of invasive biomass appropriately to prevent re-establishment
- Clean all equipment before and after use to prevent seed spread
- Rehabilitate disturbed areas with indigenous, fast-establishing groundcover and grass species
- Monitor regrowth post-maintenance to manage potential reinvasion.

8.2.3 Impact on the aquatic environment

Description: Although the aquatic habitats in the study area are classified as impacted and modified, these habitats still play important ecological and functional roles in the biophysical environment. Examples include providing a habitat for invertebrates and small vertebrates.

Assessment: The main expected impacts on aquatic habitats arising from the maintenance include:

- Removal of riparian vegetation i.e. habitat loss
- Increase in suspended solids, specifically sediment
- Erosion and bank destabilisation.

Criteria	Without mitigation (Medium-)	With mitigation (Low-)
Magnitude	Medium	Low
Extent	Site specific	Site specific
Duration	Medium term	Construction period
Significance	Low	Very low
Probability	Likely	Likely
Confidence	High	High
Reversibility	High	Low

Mitigations:

- Maintain a buffer zone (e.g., 30m where possible) between maintenance activities and the watercourse
- Demarcate work areas to minimise impacts on untransformed vegetation
- Control alien invasive vegetation
- Rehabilitate disturbed areas
- Ensure that mixing of any chemicals as well as concrete mixing and mortar mixing is done on impermeable surfaces

- No washing of equipment
- Install necessary mechanisms in place to retain contaminated runoff and allow for the necessary treatment/filtering of polluted water
- Store chemicals in clearly marked, sealable containers in away from any watercourses
- Ensure that equipment and plant is in proper working condition and do not leak fuel or oil, especially during work in or near watercourses
- Train staff in the prevention and mitigation of spills
- Ensure that SANS approved spill kits are available and accessible to the responsible staff
- The construction camp and any major stockpiling or storage areas not near a watercourse
- Ablution facilities should be located at least 100m away from any watercourse. Workers should not be allowed to urinate or defecate near or in bushes or rivers/streams
- Solid waste should be managed properly in order to ensure that no waste is washed into nearby watercourses. All waste generated during maintenance (including broken materials and damaged infrastructure) must be removed.

8.2.4 Erosion and sedimentation

Description: The excavation and stockpiling of soil or sediment during canal maintenance activities can increase the risk of soil erosion, particularly at sites with higher elevation (e.g. along the main canal). Additionally, activities near the rivers could increase the risk of soil erosion. Eroded soil may be transported into adjacent agricultural land or natural watercourses, leading to sedimentation, reduced soil fertility, and potential ecological impacts on aquatic systems.

Assessment: These impacts are particularly relevant where riparian areas and disturbed embankments are involved. However, erosion and sedimentation risks are limited as canal infrastructure is already in pre-disturbed areas and limited to larger maintenance activities like replacement near watercourses.

Criteria	Without mitigation (Low-)	With mitigation (Very low-)
Magnitude	Low	Very low
Extent	Site specific	Site specific
Duration	Medium term	Short term
Significance	Medium	Very low
Probability	Likely	Unlikely
Confidence	High	High
Reversibility	High	Low

Mitigations:

- Stockpiles (topsoil, subsoil and imported materials) should be on flat surfaces and should be at least 100m away from any watercourse.
- Where necessary temporary stabilisation measures should be put in place to prevent the erosion of exposed surfaces during the construction period
- Do not stockpile soil or sediment on steep slopes or within 32m of drainage lines or watercourses
- Install silt fences, sediment traps, and bunding to prevent sediment from entering nearby rivers
- Disturbed areas should be rehabilitated as soon as possible after construction has been completed in order to stabilise exposed surfaces which are susceptible to erosion

8.3 Socio-Economic

The Lower Sundays River Water User Association (LSRWUA) operates a crucial irrigation canal system that delivers approximately 740 million kilolitres of water annually, irrigates 12,500–13,500 ha of high-value citrus farmland and supplies up to 210 ML/day to the Nelson Mandela Bay Metropolitan Municipality, supporting both agriculture and urban water needs.

Failure of the canal system would have far-reaching consequences:

- **Crop Losses:** Water shortages could slash citrus yields, leading to losses of R30,000–R50,000 per hectare
- **Employment Losses:** Thousands of jobs would be at risk in farming, packing, and related sectors
- **Industry Disruption:** Supporting industries like logistics, packaging, and agro-processing would face shutdowns
- **Export Revenue Drops:** A fall in citrus output would harm South Africa's export capacity and reputation
- **Municipal Impact:** Reduced revenue for local governments and disruptions to urban water supply
- **Social Unrest:** Rising unemployment and poverty could lead to instability
- the citrus industry in the Sundays River Valley is vital to both the local and national economy, supporting thousands of jobs and contributing billions in exports. However, its success is directly linked to the availability of reliable irrigation water. The LSRWUA canal system is the backbone of this industry. Ensuring its proper maintenance is not only crucial for the Eastern Cape, but essential for South Africa's agricultural stability and economic resilience particularly in light of the forecasted growth in export earnings

8.3.1 Employment opportunities

Description: The maintenance of the infrastructure will provide a number of temporary job opportunities for local labourers.

Assessment: The impact will be positive but very limited. However, the indirect impact of maintaining the canal system ensures reliable water supply for irrigation, which supports citrus

and other agricultural production. This, in turn, helps sustain agricultural jobs and export revenues.

Criteria	Without mitigation (Low-)	With mitigation (Low+)
Magnitude	Low	Low
Extent	Local	Local
Duration	Medium term	Medium term
Significance	Low	Very low
Probability	Likely	Likely
Confidence	High	High
Reversibility	Low	Low

Mitigations:

- Ensure that emergency and alternative water distribution measures are in place
- Regular maintenance required

8.3.2 Reliability of irrigation infrastructure

Description: The canals are inherently at risk of blockages and general deterioration over time. Unforeseen events such as the accumulation of foreign objects, structural failure, or extreme weather conditions could lead to disruptions.

Assessment: Given that the infrastructure was constructed more than 40 years ago and caters for 9,000m³/ha/a to numerous users, the risk of deterioration is high, particularly as climate pressures and water demand continue to increase. In the event of a failure, the immediate concern would be disruptions to water supply for agricultural irrigation, which could negatively impact crop production and local livelihoods. Therefore, rapid response and maintenance are crucial to preventing long-term damage and mitigating risks associated with infrastructure failure.

Criteria	Without mitigation (Low-)	With mitigation (Medium+)
Magnitude	Low	Medium
Extent	Local	Local
Duration	Long term	Long term
Significance	High	High
Probability	Likely	Likely
Confidence	High	High
Reversibility	Reversible	Reversible

Mitigations:

- Ensure that emergency and alternative water distribution measures are in place
- Regular maintenance required

9 Environmental Impact Statement

The environmental impact statement summarises the impact that the proposed activities and alternatives⁴¹ may have on the environment after the management and mitigation of impacts has been taken into account, with specific reference to types of impact, duration of impacts, likelihood of potential impacts actually occurring and the significance of impacts.

The proposed activities will occur within an already disturbed area; i.e those already impacted on by the infrastructure requiring maintenance. Impacts are thus predicted to be minimal. As maintenance activities are considered to be essential to prevent negative impacts that would arise from infrastructure failure or disrepair (e.g. collapse of canal walls leading to loss of water for irrigation and human consumption), the No-go alternative was not considered feasible and thus not assessed. Socio-economic impacts related to the construction phase were screened out as these were regarded as negligible or easily mitigated impacts, however the nett positive impact from maintaining the canal infrastructure on agriculture and protection of water resources is considered a positive impact. The mitigation measures are addressed in the eMMP and Section 8.

Negative environmental impacts related to the operational phase were also rated as low to very low in magnitude, site specific and reversible if the appropriate mitigations are implemented. A negative biophysical and socio-economic operational phase impact is the potential of a break in the canal system leading to water loss and a knock-on effect to downstream users but the probability of this impact is countered by the fact the functioning of the canal infrastructure will be improved. The alleviation of the negative impact on the environment was rated as positive (medium).

Decommissioning is not likely and was therefore not considered in detail.

If the socio-economic and environmental impact of the proposed maintenance activities are considered, the collective benefits seem to outweigh any negative socio-economic and environmental impacts.

This assessment has not revealed any indications that the ongoing maintenance of the canal infrastructure will not be sustainable. The likely maintenance activities will not result in a significant loss of biodiversity, will not disturb sites of cultural heritage, will not unfairly discriminate against disadvantaged groups and will not impact on any highly stressed or sensitive environment.

The proposed project aligns with the mandate of the Lower Sundays River Water User Association (LSRWUA) to oversee and maintain the canal system. Additionally, it will enable LSRWUA to facilitate emergency repairs by securing pre-approval for authorised maintenance activities.

⁴¹ No alternatives can be assessed due to nature of the project

10 Environmental Maintenance Management Plan

The requirement that an environmental Maintenance Management Plan (eMMP) be developed and enforced is indicative of the Lower Sundays River Water User Association (LSRWUA)'s mandate to maintain the canal infrastructure whilst ensuring that environmental damage during construction is minimised.

The purpose of this section is therefore to:

- Emphasise the existence of an eMMP and highlight its most salient features
- Aid the Authorities in understanding the eMMP
- Detail the role of the Contractor⁴² with respect to the implementation of the eMMP.

10.1 Structure & Approach

The various maintenance activities to be performed are described in “The Proposed Activities” Section. It is important to reiterate that maintenance will comprise of:

- Preventative Maintenance
- Corrective Work
- Emergency Work
- Refurbishment

It is not possible to predicted what activities or combination of activities will be applied, or at what location, or which Maintenance team (Contractor) will conduct the maintenance activity, therefore the approach in this document is to identify the various possible localities and discuss proposed activities in a generic format and identify a working area with possible intervention locations highlighted in locality maps in Appendix A.

Currently the LSRWUA have internal maintenance teams to assist with maintenance throughout the canal infrastructure extent. However, they have limited capacity, and it is further likely that detail designs might be required and therefore a Consultant(s) and a Contractor might be appointed through open tender to do this specialised maintenance.

To manage the actual maintenance process through a substantial document like this is not viable, neither is it realistically feasible to enforce requirements set in an EIA Application. The only viable option is to enforce compliance during implementation, through contractual requirements, incorporated in a contractual format as Contractual Agreement, Standard Operation Procedures (SOP) and Contract Specifications. For this reason, the aforementioned documents will serve as the eMMP, while this document will serve as guideline and in terms of procedural compliance to obtain authorisation from the relevant authority viz (DEDEAT: Sarah Baartman office).

The immediate priority is to identify and manage the environmental aspects and impacts at a practical, operational level. To this end it is necessary to develop and implement an EMS type procedure. The flow diagram and associated procedures could be expanded to deal with the

⁴² Companion Guideline for contractor will be included in the stand alone MMP (Appendix G)

entire suite of issues in a formal management system modelled⁴³ on ISO 14001 or ISO 9001, if so desired.

10.2 Administration & Obligations

LSRWUA exclusively makes use of the General Conditions of Contract (GCC) 2015, for that purpose GCC 2015 will form the basis for most procedural references. This will allow the Environmental documentation to align with Contractual procedure, thus giving contractual legality to the eMMP as discussed in Section 4.4.

10.2.1 Environmental Monitoring Committees

Environmental monitoring committees (EMC) are normally structures made up from representatives from stakeholders affected by a development activity. In this case given the duration, extent and uncertainty of the work it is believed that a monitoring entity such as an EMC is crucial to ensure sustainability and compliance. Their basic function is thus to monitor the implementation of the environmental maintenance management plan (eMMP), but they also fulfil an important communication function (DEA, 2005).

EMC⁴⁴s are structures created to promote sustainable environmental monitoring. This is based on the understanding that environmental monitoring is the total system within which various groups (e.g. civil society, business and government) implement environmental management initiatives aligned with national policy. Environmental management is not the sole domain and responsibility of the government. EMCs, therefore provide the means by which local communities and civil society can actively engage with project authorities and monitor the performance of project implementation.

For that purpose, it is recommended that an EMC is constituted to deal with Monitoring of the eMMP implementation in the Sundays River Valley area. For this particular project, it is recommended that the EMC should include:

- government organisations: DEDEAT
- the project proponent: LSRWUA
- non-governmental organisations (NGOs)
- community
- ECO.

10.2.2 Specifications

The definition of a Specification has various meanings including “An act of identifying something precisely or of stating a precise requirement” or a statement of legal particulars (as of charges or of contract terms) in both cases the concept precise is used⁴⁵. For this reason, Contractors are issued with Specifications as part of the procurement process. However, the Constitution (Section 217) requires fairness in

An act of identifying something precisely

⁴³ Document activities in the form of a step-by-step flowchart(s) to indicate the progression of activities (typically consisting of receiving of raw materials, operations, support processes, outputs and waste). The environmental aspects will emanate from the identified activities

⁴⁴ For details refer to: DEA (2005) Environmental Monitoring Committees (EMCs), Integrated Environmental Management Information Series 21, Department of Environmental Affairs and Tourism (DEAT), Pretoria

⁴⁵ Oxford Dictionary

procurement processes, for that exact reason Clause 2.3.1 in the GCC 2015 requires that all Technical data should be supplied to a Contractor. It is therefore only fair to supply Contractors with Environmental Specifications, as Clause 4.3.1 states that a Contractor should comply with applicable laws, including various pieces of legislation as discussed in section 4.

Contractors do not have Environmental studies as part of their core curriculum during their schooling and can therefore not be expected to comply with this clause, if not advised accordingly. The Specification may be prescriptive but should also allow a contractor to amend or apply a methodology by means of a method statement. Specifications will serve a generic method statement for emergency repairs and in the case where there is not sufficient time for the Contractor to submit a Method statement.

10.2.3 Environmental Method Statements & Standard Operation Procedures (SOP)

In case of emergency procedures or unscheduled maintenance the Contractor will not submit a method statement but will follow the procedures in the specification document and the Standard Operation Procedures (SOP).

In the case of scheduled maintenance, the Contractor is still required to submit environmental method statements (MS) to the EO for approval prior to the commencement of maintenance related activities. A method statement is a document detailing with how a particular process will be carried out. It should detail the possible dangers/risks associated with the particular part of the project and the methods of control to be established and to show how the work will be managed in a safe and environmentally responsible manner. The method statement shall also include the following information (where applicable):

- the type of maintenance activity
- timing and location of the activity
- maintenance procedures
- materials and equipment to be used
- transportation of the equipment to and from site
- how the equipment/material will be moved while on site
- location and extent of Contractors laydown areas
- identification of impacts that might result from the maintenance activity
- community/institutional arrangements and
- rehabilitation procedures and continued maintenance of the impacted environment.

A Method Statement is a written document that details a system of work and identifies the conceivable hazards that may arise during the work that is undertaken.

The Method Statement should explain in detail the work that is to be undertaken and the necessary remedial measures that need to be in place in order to protect the site workforce and in some cases members of the public who may be affected by work actions.

Standard Operation Procedures (SOP) are in essence a method statement that was compiled and issued to a Technical Team in case of reactive maintenance. Currently the document consists of Standard Operation Procedures (SOP) but the EO may amend the document by submitting additional Standard Operation Procedures (SOP) to Competent Authority for approval.

The Technical Team will be accountable for all actions taken in non-compliance of the approved Method Statements⁴⁶. The Technical Team shall keep all the method statements and subsequent revisions on file, copies of which must be distributed to all relevant personnel for implementation. Method statements that are required during maintenance must be submitted to the Employer's Agent/EO for approval at least 14 days prior to the proposed commencement of the activity. The activities requiring method statements cannot commence if they have not been approved by the Employer's Agent.

10.2.4 Monitoring Strategies

10.2.4.1 Incident Management⁴⁷

Should there be any incident on site affecting the environment, the following lines of communication are to be implemented:

- All incidents are to be reported to the Employer's Agent and EO, immediately
- Depending on the severity of the incident, the Employer's Agent and/or EO are to notify LSRWUA, and the relevant authorities (if required) of the details of the incident
- Any incident or issue of non-compliance is to be reported by the EO, in a format that is to include the following aspects:
 - Description of the incident/non-compliance
 - Remedial action required, including the deadline for such action
 - Photographic Record
 - Relevant / supporting documentation: i.e. providing evidence of the non-compliance/ issue not complied with
 - Relevant diagrams to support the description of the non-compliance and/ or the remedial action to be taken
 - Provision for dates and signatures of both the EO and Employer's Agent at issuing of the report, as well as completion and verification of the remedial action, as specified in the report.

10.2.4.2 Emergency Procedures

The Contractor will be required to have available equipment and materials to be able to deal rapidly with the more serious pollution incidents, in particular fuel spillage and watercourse pollution.

Any contaminant spill or unexpected bed or bank disturbance will require immediate chemical and biological samples within 15m and 50m downstream of the accident, and daily measurements of indicator chemical parameters including the chemical constituents of the

⁴⁶ GCC2015 Clause 4.3.1

⁴⁷ GCC clause 8.5.1

contaminant spilled (where applicable). Should standards be exceeded for more than 24 hrs post-accident remedial actions should be undertaken. Daily measurements can cease once all parameters are within required standards.

10.2.4.3 ***Emergencies: NEMA Section 30(A) Procedure***

Should an accident or incident be significant and it constitutes an "emergency situation" as defined in section 30A (7) of the NEMA and if rectification will trigger a listed activity then the EO needs to be informed immediately, in order to submit an oral request for a verbal directive in terms of section 30A (1) of the NEMA to DEDEAT.

10.2.5 **Record Keeping**

The Environmental Officer needs to record and report on compliance and non-compliance on site. This information needs to be submitted to DEDEAT and the EMC (where relevant) as specified in Appendix 7 of the NEMA 2014 EIA Regulation. Furthermore, remedial or mitigatory action shall also be recorded and reported. Monthly reporting to the Environmental Officer and the Employer's Agent is also required.

10.2.6 **Photographic Record**

The EO and Contractor's Environmental Officer will be required to compile a photographic record of all activities on site prior to maintenance related activities starting, during the maintenance process and on completion of maintenance related works. This will include photographs for:

- Monthly environmental audit reports
- Weekly environmental monitoring reports
- Corrective action
- Progress of environmental works
- Non-conformance reports.

10.3 **Compliance & Penalties⁴⁸**

Environmental management is not only concerned with the final results of the Contractor's operations to carry out the Works but also with the control and method of how those operations are carried out. Tolerance with respect to environmental matters applies not only to the finished product but also to the standard⁴⁹ of the day-to-day methods and operations required to complete the Works.

In terms of Clause 8.5.1⁵⁰ it is the Contractor's responsibility to report any damage and submit a written report within forty-eight (48) hours. It is thus required that the Contractor shall comply with the environmental specifications and requirements on an ongoing basis and any failure on his part to do so will entitle the EO to certify the imposition of a penalty.

Except in an emergency situation (defined as a situation requiring immediate action and where failure to implement appropriate actions timeously may result in environmental damage), where instructions may be given directly to the Contractor, **all instructions given**

⁴⁸ GCC 2015 clause 8.5

⁴⁹ GCC 2015 clause 7.2.1

⁵⁰ GCC2015

by the EO shall go through the Employer's Agent, who will then convey these to the Contractor.

10.3.1 Environmental Monitoring

Environmental monitoring will be undertaken on a regular basis in order to ensure compliance with all aspects of the eMMP. This monitoring will take the form of regular site inspections.

10.3.2 Non-compliance with the eMMP

Operational difficulties may be encountered that may result in non-compliance. Non-compliance may arise due to poor communication across the LSRWUA's various line departments, staff turnover, budget shortfalls, logistical challenges etc. The LSRWUA's Board will put in place measures to ensure that the various LSRWUA will remain compliant with the eMMP as far as possible. Non-compliance with the eMMP will be logged, and a report compiled on each non-compliance event will be submitted to DEDEAT post rehabilitation and maintenance work.

10.3.3 Non-Compliance Action Plan

Non-Conformances

A non-conformance may be issued to the Contractor by the Employer's Agent/Environmental Officer where:

- The incident response procedure described above (including administrative requirements) were not successfully implemented
- There are repeated incidents because of inadequate environmental practices on site
- Documentation required to comply with the MMP is not prepared or maintained adequately on site
- Any non-compliances with the requirements of the Environmental Authorisations, the MMP and Environmental Specifications are identified

A non-conformance is a departure from an agreed arrangement between an approval authority (or orthodox position) and an individual or group performing work. In the context of quality management an "arrangement" is commonly an agreement to conform to

The following information should be recorded in the NCR:

- details of non-conformance
- any plant or equipment involved
- any chemicals or hazardous substances involved
- work procedures not followed
- any other physical aspects

- nature of the risk.

Actions agreed to by all parties following consultation should adequately address the identified non-conformance. This may take the form of specific control measures and should take the hierarchy of controls into account. This must accompany the NCR for filing purposes. All parties must agree on the timeframe by which the Contractor should have implemented the actions. The Employer's Agent should verify that the agreed actions have taken place on or soon after the agreed completion date. Where the actions are complete, the Project Manager and Contractor should sign the Close-Out portion of the Non-Conformance Form and file it with the contract documentation.

What is the difference between a non-conformance and a non-compliance?

- **A non-compliance** is the failure to adhere to an Act or its Regulations
- **A non-conformance** is the failure to comply with a requirement, standard, or procedure

10.3.3.1 *Environmental Emergency Response*

The Contractor's environmental emergency procedures must ensure that there will be an appropriate response to unexpected or accidental actions or incidents that could cause environmental impacts. Such incidents may include:

- accidental discharges to water and land
- accidental spillage of hazardous substances (sewage, oil, petrol, and diesel)
- specific environmental and ecosystem effects from accidental releases or incidents.

10.3.4 **Procedure in the Case of Non-compliance**

It is the Contractors responsibility to prevent pollution⁵¹ and ensure that quality workmanship⁵² and approved plant⁵³ are on site. The Employer's Agent will continuously monitor the Contractor's adherence to the approved specifications. In terms of Clause 3.3 of the General Conditions of Contract 2015, the Employer's Agent has the authority to appoint a representative to act as the Environmental Officer (EO) for the Contract. The EO shall be responsible for monitoring compliance with the eMMP. Adherence shall also be monitored and audited on behalf of the EMC by the ECO. In the event of non-compliance with the provisions of the authorisations or EMP, the following process and procedure is recommended as a guideline:

- The Employer's Agent shall issue to the Contractor a notice of non-conformance⁵⁴. The notice should state the nature and magnitude of the non-conformance.
- The EO should document the nature and magnitude of the non-conformance, the action taken to discontinue the non-conformance, the action taken to mitigate its

⁵¹ GCC 2015 clause 8.1.2

⁵² GCC 2015 clause 7.2.1

⁵³ GCC 2015 clause 7.1.1

⁵⁴ GCC 2015 clause 4.2.1

effects and the results of the actions. The non-conformance should be reported in the Employer's Agent's monthly report (site meetings) and a copy must be forwarded to the EO and the EMC.

- The Contractor shall act to correct the non-conformance within twenty-four (24) hours of receipt of the notice, or within a period that may be specified within the notice.
- In the case of the defaulting party failing to remedy the situation within the predetermined time frame, the Employer's Agent, monetary penalties shall be applied based on the conditions of contract⁵⁵.
- In the case of non-compliance with the requirements of the eMMP or Environmental Specifications by the defaulting party giving rise to physical environmental damage or destruction, such as but not limited to erosion, unlawful dumping or pollution of the river, the Employer's Agent (or LSRWUA) shall be entitled, itself, to undertake or to cause to be undertaken such remedial works as may be required to make good such damage and to reinstate and/or revegetate affected areas and to recover from the defaulting party the full costs incurred in so doing.

10.3.5 Contractual Penalties

Any avoidable non-compliance with the conditions of the eMMP shall be considered sufficient ground for the imposition of a penalty⁵⁶.

Possible offences, which should result in the issuing of a contractual penalty, include, but are not limited to the following:

- Damage to specified vegetation
- Negligent hydrocarbon spills / leaks
- Non-use of ablution / toilets
- No method statement submission
- Intrusion of workers into "No Go" areas
- Non / inadequate bunding of hydrocarbon storage facilities
- Preventable contamination of water bodies
- Non-sanctioned crossings in watercourses, wetlands
- Damage to areas of Environmental or Heritage significance
- Non-induction of staff
- Dumping, burning, burying of refuse, rubble, non-agreed items

10.3.5.1 Contractual Penalties

The contract between LSRWUA and the Contractor will contain some monetary/financial penalties for non-compliance. Once the relevant clauses of the contract have been drafted, LSRWUA will submit them to the EMC for review.

Below are some guidelines to be considered for the contractual penalties for non-compliance as well as rewards for compliance. The suggestions given should only be considered if they do not conflict with the general conditions of contract of the contractor. The objective is to

⁵⁵ GCC 2015 clause 6.10.1.7

⁵⁶ This aspect is always controversial and if not clearly addressed and included within the Contract documentation at Tender stage could cause conflict.

encourage sustainable construction practices with potential problems being resolved quickly and correctly.

Contractual penalties, that do not involve fines, or payment of monies to any 3rd parties, should be developed. This type of penalties would be more effective and would not result in contractual difficulties in applying the penalties. The following should be considered:

- Ensuring that there are appropriate payment items for all environmental aspects in the Contractual Documentation.
- Ensuring that these items are split between “fixed costs” and “time related costs” is equally spread over the entire contract period.
- Suitable mechanisms included in the contract to allow for withholding payment for these items should the Contractor not comply, and for the continued withholding thereof should the situation not be rectified.
- Suitable mechanisms to address the Contractor’s non-performance through other means, with the costs accruing to the Contractor.

10.3.5.2 ***Incentives***

It is recommended that LSRWUA consider an incentive system for compliance to the requirements of an eMMP. It is recommended that Contractors be rated in terms of their environmental performance during the contract. It is recommended that letters of commendation are issued to contractors who abide by the eMMP during the contract. It is recommended that the Contractor’s relevant environmental experience be considered in the adjudication of tenders. For that purpose, Contractors are requested to provide these recommendation letters in the Conditions of Tender section of the Tender Document during the Tender stage (in order to ensure environmental compliance through previous “environmental” experience).

10.3.5.3 ***The Right to Stop Activity***

GCC2015 Clause 5.11.2 allows for the Employer’s Agent to suspend the work especially in case of a non-compliance as noted in section 10.3

10.3.6 **Force Majeure⁵⁷**

The Employer’s Agent and/or the Contractor shall not be liable for failure to perform their obligations in terms of the eMMP in the event and to the extent that such failure is caused by a condition of force majeure, which arises from circumstances beyond the reasonable control of the Employer’s Agent and/or the Contractor.

The Employer’s Agent and/or the Contractor shall give notice immediately to LSRWUA and to the EO of the occurrence of an event of force majeure, which causes or is likely to cause any failure to perform any of their obligations of the eMMP.

10.3.7 **Determination of Disputes**

In the event of a dispute, difference of opinion, want of agreement or deadlock (herein, collectively referred to as “a dispute”) between any parties in regard to or arising out of or by way of:

⁵⁷ GCC 2015 clause 2.2, although the term in GCC is “Adverse Physical Conditions”

- The interpretation of the conditions of the eMMP or
- Any want of agreement on the implementation or otherwise, or the method of implementation, of any recommendation made, or any advice given, by the Employer's Agents contained in the eMMP or
- Any, or any alleged, breach, non-performance or repudiation on the part of any party of any of its obligations arising in terms of or out of the eMMP or
- Any claim on the part of any other party in respect of an interdict and/or an order for specific performance and/or for monetary damages and/or for further or alternative relief and/or a monetary penalty issued for non-compliance with the eMMP requirements

Any party shall be entitled, by written notice to the remaining parties, to require that experts refer such dispute for determination⁵⁸.

In the first instance of any declared dispute or in the case of an event to be resolved urgently, the Employer's Agent, EO, EMC and LSRWUA are to reach an agreement regarding the dispute within five (5) days, failing which the procedures stated in the general conditions of contract will then be followed⁵⁹.

10.3.8 Amendments to the eMMP

No eMMP amendments (relaxation or revision of any mitigation measure or procedural requirements) will be allowed without approval from DEDEAT. Motivations for amendments will be placed in writing and submitted to DEDEAT for consideration.

10.4 Project Specific Conditions

10.4.1 No-Go Areas

If so required by the Specification Data, certain areas shall be considered "no go" areas. The Contractor shall ensure that, insofar as he has the authority, no unauthorised entry, stockpiling, dumping or storage of equipment or materials shall be allowed within the demarcated "no go" areas. "No go" areas shall be demarcated with fencing consisting of wooden or metal posts at 3m centre-to-centre.

10.4.2 Establishment period

It must be emphasised that, where revegetation is specified as part of the construction activities, the contract has not been completed until the end of the establishment period (*viz.* the period required to achieve the specified cover). To address this, it is suggested that the Certificate of Completion is issued for all aspects of the contract except for the revegetation establishment requirements. A Final Approval Certificate (GCC 2015 Clause 5.16.1) should only be issued once the establishment period has been successfully completed. It is recommended that the establishment period for contracts be extended to two years or at least extended to cover the growing season where applicable.

⁵⁸ GCC 2015 Clause 10.3&10.4

⁵⁹ GCC 2015 Clause 10

10.4.3 Stakeholder Notification and Reporting Process

Stakeholder notification

A week prior to commencement of activities in respect of this management plan, the LSRWUA will erect signage indicating the intent to commence with activities as it relates to maintenance. Information to be displayed on the sign will include the following:

- Nature of the work to be undertaken
- Expected commencement and completion date, and
- Contact numbers for further information.

Pre-reporting

Prior to commencement of activities in respect of this management plan, the LSRWUA will, with a minimum of 21 days' notice, inform DEDEAT of the intended work. The following information will be provided to the competent authority (see report template attached as Annexure E).

- Intended date of commencement and duration of the activity
- Brief description of activity to be undertaken and reason for undertaking activity
- Description of the location with aerial imagery of the area in which the activities will be undertaken, and
- Contact details of lead project manager at LSRWUA with contact details of alternate official.

Post-reporting

Following from the completion of work undertaken, a close out report will be submitted to the delegated authorities (Annexure F) detailing:

- Date of commencement and completion of work
- Materials used, estimated quantities of sand removed and replaced
- Whether there was any non-compliance with the eMMP, and
- Any additional information.

This eMMP will be revised every five years to ensure that the management/maintenance remains effective and to accommodate any changes in institutional arrangements.

11 Recommendations & Conclusions

11.1 Recommendations

The positive socio-economic and environmental benefits outweigh the potential low negative impacts on the physical and social environment. It is recommended that the proposed application be approved due to the following reasons:

- The work to be executed is limited to maintaining existing infrastructure that has a historic impact footprint in the environment
- The application is made for work on existing infrastructure, thus assuming that this is not a greenfield development and impacts during original construction and current operation have been assimilated by the environment. For this reason existing corridors and servitudes will be utilized and the working footprint will be limited to these as far as feasible
- The age and condition of the existing infrastructure present a risk of damage or structural failure, which could potentially disrupt the water supply to farmers for irrigation. This, in turn, may have significant consequences for agricultural activities, potentially affecting livelihoods.
- It is in the professional opinion of the EAP that the predicted impacts can be mitigated to an acceptable extent
- This forms part the LSRWUA's mandate
- There is great need and desirability (socio-economically) for the proposed project

The application should be approved on the condition that the mitigation measures as per this report and the eMMP are implemented, with special emphasis on:

- The use of existing roads as access routes
- The use of transformed land (fields/existing roads) as laydown, stockpile and site camp areas
- All material or concrete work should be delivered in bins and mixing should take place on mixing trays to prevent contamination of surrounding areas
- Slope stabilisation measures are implemented on all slopes in the study area
- Due to the unpredictable nature of maintenance work and quick response times required the EO shall be experienced. Therefore, the EO shall be a Registered Built Professional with qualifications in Environmental Management and a minimum of 8 years' experience in doing Environmental Monitoring for the Civil Engineering Industry
- The environmental Maintenance Management Plan (eMMP) is a process that needs to be refined over time to become more detailed to address the detail O&M related issues. It is proposed that the eMMP be refined on an annual basis and reviewed every five years.
- The study identified the along the main canal and tunnel have a potential for archaeological finds. Therefore, it is essential that a screening is performed on the construction footprint by a suitably qualified Heritage specialists prior to any commencement of sand moving

- Vegetation clearance is not a skill that is likely to be part of a Civil Contractor, thus it is recommended that a suitably qualified team conduct this work as part of the search and rescue process. If LSRWUA cannot provide the capacity internally then a dedicated horticulturist with a team needs to be appointed to assist every time vegetation clearance of more than 10m² is required
- All work to be done under supervision of EO or qualified Horticulturist
- As discussed in Section 5.2.17 **Error! Reference source not found.**, establishment of vegetation is crucial to prevent erosion and management of rehabilitated areas is crucial to prevent alien species invasion. Maintenance teams are not likely to have skills or time to manage this aspect, thus it is recommended that a suitably qualified team conduct this work (Working for Water or similar)
- During the defects and liability period, rehabilitation monitoring is to continue, with emphasis on alien plant control within the construction footprint
- The establishment of an EMC (section 10.2.1) to allow for integrated compliance management and long-term monitoring
- Training in the concepts of an eMMP are made compulsory and only trained staff should be allowed to work on areas. Staff should receive training in concepts of the eMMP, attendance should be compulsory
- Only dedicated trained teams to be allowed on site, this specifically applies to plant operators and other subcontractors
- The Contractor or LSRWUA Maintenance Team Leader should sign a declaration to comply. This may be delegated to Associations and other work groups
- The Contractor needs to pay special attention to all relevant environmental legislation and needs to ensure compliance with the requirements at all times
- In the case of weir dredging, the Contractor shall ensure that the contents of the containers used for dredging are disposed of legally as soon as the containers are full, no container shall be left full or partially full over weekends or public holidays
- It is recommended that the Contractor's previous environmental experience form part of the tender adjudication criteria
- Developing a monitoring and evaluation system, not only for achievement and revision of ecological and conservation targets or objectives, but also for institutional and individual performance measurements
- It is thus recommended that Authorisation be issued for a 20-year period, but it is also foreseen that in future this eMMP will become an integral part of the LSRWUA response time and should be updated with each five (5) year revision

11.2 Conclusions

The LSRWUA and the canal system under their management fulfil a critical role in supplying water for agricultural irrigation and the associated economic benefits, not only the province. but the country as a whole. A break in the system and delays to repairs, will also have a significant impact on the population of NMBM, as LSRWUA supplies approximately 30% of the total daily potable water used in the municipality.

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In diversity there is beauty and
there is strength.

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