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Implementation Support Sub-Report

Support of the Water Reconciliation Strategy for the Algoa Water Supply System

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Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF WATER AND SANITATION

Directorates: National Water Resource Planning and Options Analysis

Support of the Water Reconciliation Strategy for the Algoa Water Supply System

Implementation Support

Final: April 2020

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SUPPORT OF THE WATER RECONCILIATION STRATEGY FOR THE ALGOA WATER SUPPLY SYSTEM

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Reports that will be produced as part of this Study are indicated below.

Bold type indicates this Report.

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Executive Summary

Introduction

The objective of the Feasibility Component of the *Support of the Water Reconciliation Strategy for the Algoa Water Supply System* study is to:

- limit risks of shortfall in supply to the Nelson Mandela Bay Municipality (NMBM) and the Lower Sundays River Government Water Scheme (LSRGWS),
- remove potential operating system constraints for the sustainable delivery of bulk Orange River water supply to the LSRGWS and NMBM, for water requirements up to 2040, and
- limit operational risks to acceptable levels.

The existing Scheepersvlakte Balancing Dam is a balancing facility for water supply to the LSRWUA and the NMBM, and for emergency supply.

The focus of the investigation is on providing additional balancing storage in addition to the existing Scheepersvlakte Balancing Dam, which has lost storage due to siltation.

The main purpose of the proposed new balancing dam, at the Coerney site, is to eliminate the operational and balancing storage limitations imposed by Scheepersvlakte Dam.

Water use licencing and dam safety

A water use licence will need to be obtained for storing water and affecting and for altering the banks of a river (Section 21, National Water Act, 1998). This licence application is included in the scope of work for the EIA study (refer to Chapter 4.8).

In terms of Chapter 12 of the National Water Act (NWA), the dam will be a "*dam with a safety risk".* This means the design and construction of the dam must comply with the dam safety regulations (2012). The requirements in terms of dam safety regulations (licences) have been described in Section 13.4 of the *Feasibility-level Engineering Design - Balancing Dam Sub-Report* of this study, and are repeated in this sub-report.

Environmental compliance

In accordance with the NWA, any new or raised dam is required to make ecological water requirement (EWR) releases to sustain the downstream riparian environment. However, as the

stream is ephemeral the DWS Directorate Resource Directed Measures should determine whether to undertake an EWR determination study for non-perennial systems for this tributary.

In terms of the National Environmental Management Act (No. 107 of 1998, as amended) (NEMA), an Environmental Authorisation for the proposed project will be required. The Environmental Impact Assessment process for the proposed dam is expected to start in 2020. It follows a multi-staged approach to environmental impacts, public participation and stakeholder engagement stipulated by these regulations, as well as various specialist studies.

The portion of land upon which the dam is to be located is known as Portion 7 of Scheepersvlakte No. 98, owned by Scheepersvlakte Farms (Pty) Ltd. The footprint of the proposed Coerney Dam overlaps with portions of the planned future Scheepersvlakte Farms development. The area of proposed future orchards impacted by the proposed dam is approximately 36 ha. During development of the detailed design of the pipeline route the various landowners who could be affected should be consulted.

Operation and maintenance requirements

The proposed Coerney Dam will be filled, and topped up, over a lengthy filling period through gravity supply. The existing Scheepersvlakte Dam and proposed Coerney Dam, although filled from the same source, should be operated separately under normal operation. The proposed Coerney Dam will be used as balancing storage for NMBM (and the land owner) and the Scheepersvlakte Dam will revert to its original function and will only be used as balancing storage for irrigators.

Further investigations

A topographical survey for the dam site was completed for the (Lower) Coerney dam site in May 2018 and the boundaries extended in August 2018. The accuracy of these contour surveys is suitable for detailed design of the dam. However, it is recommended that a centreline survey of the final pipeline routes be undertaken prior to design and construction.

Geotechnical investigations of the (Lower) Coerney Dam site were conducted in 2018 and supplementary investigations at the (Lower) Coerney site in 2019. These investigations are reported in in *Lower Coerney Dam Supplementary Geotechnical Survey*. The current level of information should be adequate if a conservative design approach is followed. However, to rule out the possibility of the right bank spillway option further geotechnical investigations might be required. Investigation of the dam basin indicates that there is sufficient suitable material available for the construction of a homogeneous embankment.

A geotechnical investigation should be undertaken along the proposed pipeline routes and at the proposed chamber locations to inform the detailed design.

Other earthfill materials, such as coarse aggregate for concrete, sand for filters and riprap are not found in the basin or near the site and will have to be imported from commercial sources.

Geotechnical investigations along the pipeline route (as above) should be undertaken to determine the need and amount of bedding material that is available on site and the volume that will need to be imported from a commercial site.

A hydraulic model study of the spillway configuration is required to optimise the detailed design of these components.

Site specific determination of the magnitude of the recommended design flood and safety evaluation flood should be undertaken for the proposed dam site.

Implementation processes

It is recommended that the project should be declared as an emergency scheme, which will enable the detailed design to be undertaken by DWS in parallel with the environmental impact assessment process, thereby greatly reducing the time for implementation.

The proposed Coerney Dam and associated works will form part of the Lower Sundays River Government Water Scheme and the project will therefore be implemented as a Government Waterworks and funded by National Treasury.

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Abbreviations

APP	Approved Professional Person
DN	Nominal diameter
DEFF	Department of Environment, Forestry and Fisheries
DSO	Dam Safety Office
DWAF	(Previous) Department of Water and Forestry
DWS	Department of Water and Sanitation
ECPHRA	Eastern Cape Provincial Heritage Resources Agency
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EWR	Ecological water requirements
FSL	Full supply level
GN	Government Notice
GWS	Government Water Scheme
ha	hectares
ID	Internal diameter
LSRGWS	Lower Sundays River Government Water Scheme
LSRWUA	Lower Sundays River Water User Association
Mℓ	Megalitre
masl	Metres above mean sea level
NEMA	National Environmental Management Act of 1998
NEM:BA	National Environmental Management: Biodiversity Act
NFA	National Forests Act
NHRA	National Heritage Resources Act
NMBM	Nelson Mandela Bay Municipality
NWA	National Water Act of 1998
PMF	Probable Maximum Flood
RDF	Recommended Design Flood
RID	Record of Implementation Decisions
RL	Related level
SANCOLD	South African National Committee on Large Dams
SEF	Safety Evaluation Flood
WAR	Water Allocation Reform
WSS	Water Supply Scheme
WTW	Water Treatment Works
WUA	Water User Association
WUL	Water Use Licence

1 Introduction and background

1.1 Study Objective

The objective of the Feasibility Component of the *Support of the Water Reconciliation Strategy for the Algoa Water Supply System* study is to:

- limit risks of shortfall in supply to the Nelson Mandela Bay Municipality (NMBM) and the Lower Sundays River Government Water Scheme (LSRGWS),
- remove potential operating system constraints for the sustainable delivery of bulk Orange River water supply to the LSRGWS and NMBM, for water requirements up to 2040, and
- limit operational risks to acceptable levels.

The focus of the investigation is on providing adequate balancing storage for supply to the NMBM, to limit risks of shortfall in supply.

1.2 Purpose of this Sub-report

The purpose of this sub-report is to describe the information to support the implementation of the project. This includes:

- Legal requirements and processes
- Operation and maintenance requirements
- Further investigations and processes
- Implementation process, timeframe and milestones

This will form a Chapter/s of the Feasibility Design Report.

1.3 Background

Following the expected completion of the Nooitgedagt Water Treatment Works (WTW) Phase 3 in 2022, the WTW will have a maximum capacity of 210 Mℓ/day. The scheme has been designed to cater for peak/back-up supplies from the Nooitgedagt WTW at times when

the older infrastructure, from sources to the west of Port Elizabeth, will be requiring maintenance or emergency repairs.

Due to the age of the transfer scheme conveyance infrastructure and the inadequate storage capacity of the Scheepersvlakte balancing dam the risk of failure of water supply to Nooitgedagt WTW has increased over time. Additional balancing storage is therefore urgently required to limit the risk of supply failure to the NMBM. Increased balancing storage for NMBM will also enable more regular and proper maintenance of the canals to take place.

After investigation of several potential dam sites, as documented in the Options Analysis Report (DWS, 2019), the Lower Coerney Dam site was found to be the most favourable site for the proposed new balancing dam. The proposed dam is referred to as 'Coerney Dam' in this sub-report and future reports, as there is no Upper Coerney Dam. The site was approved for further evaluation and recommended for feasibility design.

1.4 Content of this Report

The various chapters in this report and their content are briefly described hereunder.

Chapter 1: Introduction and background

Provides a brief introduction and background to the project and report.

Chapter 2: Water use licensing and dam safety

Describes the legal requirements and processes that are required to make the proposed option implementation-ready in terms of water use licensing and dam safety regulation.

Chapter 3: Environmental Compliance

Describes the potential need for determination of an ecological water requirement and the environmental requirements and processes that are required to make the proposed option implementation ready.

Chapter 4: Operation and maintenance requirements

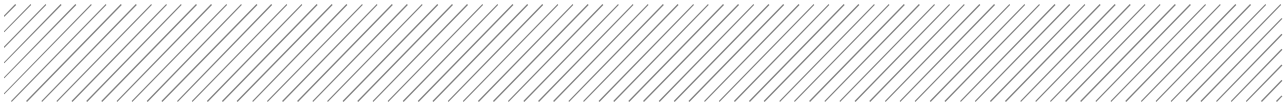
Describes the operation and maintenance requirements and institutional arrangements that will ensure that the project is functional and sustainable.

Chapter 5: Further investigations for detailed design

Describes further investigations required for detailed design.

Chapter 6: Implementation process, timeframe and milestones

An implementation process, timeframe and milestones dates are provided.



Chapter 7: Conclusions

Summary conclusions are provided.

2 Water Use Licensing and Dam Safety

This chapter describes the legal requirements and processes that are required to make the proposed option implementation ready in terms of water use licensing and dam safety regulation.

2.1 Water use licence

A water use licence will need to be obtained for storing water and affecting and altering the banks of a river (Section 21 (b), (c) and (i), National Water Act, 1998). This licence application is included in the scope of work for the EIA study Chapter 4.8:

> *The proposed dam will require a Water Use Licence Application (WULA) in terms of Section 21(b) of the National Water Act (NWA). As the proposed dam site is also located within minor drainage lines, Section 21 (c) and (i) applications will also be required. The appointed PSP must therefore make provision for an application for a water use licence for the proposed dam. The WULA process and deliverables will comply with GN R267/2017.*

The implementation of the proposed dam and associated conveyance infrastructure will trigger the requirement for a combined water use licence in accordance with Section 21 of the National Water Act (No. 36 of 1998, as amended) (NWA). The volume of water to be stored in the dam exceeds the maximum volume generally authorised under GN 538 (2016 with effect from March 2017) Appendix A. The dam will thus require a Water Use Licence Application in terms of Section 21 (b) of the NWA.

As the dam site is also located within minor drainage lines, Section 21 (c) and (i) applications will also be required. The associated conveyance infrastructure will also cross minor drainage

lines (Section 21 (c) and (i)) will therefore be included in the WULA[1]. Water uses that need to be included in the WULA are[2]:

i. storing water (dam),
ii. impeding or diverting the flow of water in a watercourse (dam and associated conveyance infrastructure),
iii. altering the bed, banks, course or characteristics of a watercourse (dam and associated conveyance infrastructure).

The WULA will be submitted via the DWS online eWULAAS platform. The relevant Water Management Area is *Catchment N - Fish to Tsitsikamma*, which means that the application will be processed by the Port Elizabeth DWS office.

The issuing of a water use licence is based on an evaluation of the proposed activity in terms of the impact on the resource as well as the potential social, economic and environmental impacts of the proposed use. Supporting documentation and studies are required to show the extent to which the proposed water use will impact on the resource, the steps that will be undertaken to mitigate this impact, the extent to which the proposed water use will contribute to the local and national economy, and the social benefits in terms of job creation and income generation in the area. A strong emphasis is given to water use that supports water allocation reform (WAR), the re-dress of previous inequitable allocation of water use licences and the equitable use of the natural resource.

The information required for a Section 21(a), (b), (c) and (i) application is listed in Table 2.1 below.

Table 2.1: Information requirements for Section 21(a), (b), (c) and (i) in terms of GN R267/2017 Annexure C

Description
Proof of Payment of Licence Application Processing Fee (Compulsory)
Copy of Identity Document of Applicant and Proponent (if applicable) (Compulsory)
Letter of Authority or Power of Attorney to Apply on behalf of Applicant
Letter of Consent if the Applicant is not the Property Owner (Compulsory)

[1] Note that although the conveyance infrastructure in isolation would have qualified for a General Authorisation in terms of GN 509/2016, the need for a full water use licence in terms of Section 21(b) of the NWA means that related Section 21 (c) and (i) water uses are also included in the licence application (Section 3 (c) of GN 509/2016)
[2] Note that the abstraction licence for the greater project/scheme has already been issued i.e. a Section 21 (a).

Description
*Applicant Information Form: Water Service Provider (DW 757 1 770)
*Applicant Information Form: Company, Partnership, Government (DW 7581771)
*Applicant Information Form: Water User Association (DW 759 1 772)
Property Details Form (DW 901)
Property Owner Details (DW 902)
Permission to Occupy (PTO), Title Deed, Lease Agreement, Community Resolution
A description of the location of the activity, including (aa) the 21-digit Surveyor General code of each cadastral land parcel, (bb) where available, the physical address or farm name, (cc) where the required information in sub -regulation (aa) and (bb) is not available, the coordinates of the boundary of the property or properties,
A plan which locates the proposed activity or activities applied for at an appropriate scale, or if it is- (aa) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is proposed; or (bb) on land where the property has not been defined, the coordinates of the area within which the activity is proposed
*Taking water from a water resource Form (DW 773)
Section 21(a) application
*Pump Technical Data Form (DW 784)
*Canal Technical Data Form (DW 786)
Irrigation Field and Crop Details (DW 787)
*Supplementary Info: Power Generation, Industrial or Mining (DW 788)
*Supplementary info: Domestic, Urban, Commercial or Industrial (DW 789)
Soil Suitability Report (for irrigation from Dept. Agriculture)
Section 21(b) application
*Storing water form (DW 774)
'Dam and Basin Technical Data Form (DW 789)
*Dam Classification Form (DW 793) (for dams >5m and >50 000m^3)
Dam Location Map
Section 21(c) application
* Impeding or diverting the flow of water in a watercourse form (DW 763)
*Altering the bed, banks, course or characteristics of a watercourse (DW 789)
*Supplementary Information for 21 (c) & (i) form (DW775)

The **disposal of inert waste** is unlikely to require a Section 21 (g) application and is therefore currently excluded from the authorisations/licences/permits required.

2.2 Dam Safety Regulation Requirements

The requirements in terms of dam safety regulations relating to authorisations and licences have been described in Section 13.4 of the *Feasibility-level Engineering Design - Balancing Dam Sub-Report* of this study, and are as follows:

In terms of Chapter 12 of the National Water Act, "dams with a safety risk" must be registered and classified, and the design and construction monitoring must be carried out under the supervision of an Approved Professional Person (APP).

The following legal requirements apply to new dams, alterations to existing dams or repair of dams that failed, as issued by the Dam Safety Office:

- Application for classification of the dam with the Dam Safety Office (DSO) (part of the Department of Water and Sanitation).

  The proposed dam is expected to be classified as a Category III dam, being of "medium" size with a "high" hazard rating.

- Application to the DSO for approval of an APP and professional team.

  The APP should preferably be registered with the DSO for the design of 20 m high or higher earthfill dams. The professional team members must have adequate experience in their field of expertise to support the APP. The APP will be responsible for the design of the dam.

- Application to the DSO for a Licence to Construct.

  This comprises an application form, design report, engineering drawings and construction specifications. This licence is required before construction of the dam may commence.

- A Water Use Licence or written authorisation must be obtained from the DWS Regional Director Eastern Cape before a Licence to Construct can be issued.

- During construction the APP is responsible for quality control and must submit quarterly reports to the DSO on the construction progress.

- Application for a Licence to Impound from the DSO.

  This involves the compilation and submission of an operation and maintenance manual and emergency preparedness plan. This licence is required before impoundment may commence.

- After completion of all construction work, the APP must submit a completion report, completion drawings and a completion certificate stating that the work has been completed according to specification.

3 Environmental Compliance

This chapter describes the potential need for determination of an ecological water requirement and the environmental requirements and processes that are required to make the proposed option implementation ready.

3.1 Ecological Water Requirement

In accordance with the NWA, any new or raised dam is required to make ecological water requirement (EWR) releases to sustain the downstream riparian environment.

The proposed Coerney Dam will be situated in a small ephemeral tributary of the Coerney River, which joins the lower Sundays River near the Nooitgedagt WTW. This tributary has no defined channel or any evidence of flow. The dam site however has a catchment area of 34 km^2.

It is therefore uncertain what provision, if any, needs to be made to route natural flows through the dam. DWS Directorate Resource Directed Measures should determine whether to undertake an EWR determination study for non-perennial systems for this tributary. It should also be noted that the proposed balancing dam would be operated close to full supply level. This means that any incoming flood would not be stored in the dam but would pass over the spillway to the downstream river valley.

If required, the EWR determination could be included in the Environmental Impact Assessment.

3.2 Environmental Impact Assessment

3.2.1 Introduction

The DWS is undertaking an Environmental Impact Assessment (EIA) process for the proposed Coerney Balancing Dam, in terms of all applicable environmental legislation. The EIA is expected to start in 2020 which will enable it to overlap with the technical feasibility evaluation. A detailed scope of services has been prepared by DWS to invite proposals from professional service providers.

In terms of the National Environmental Management Act (No. 107 of 1998, as amended) (NEMA), an Environmental Authorisation for the proposed project will be required from the Department of Environment, Forestry and Fisheries (DEFF). The procedural requirements for the EIA process are set out in GN R983 of 2014 (as amended). Of greatest importance is the multi-staged approach to public participation and stakeholder engagement stipulated by these regulations.

Impact mitigation measures and environmental management are to be set out in an Environmental Management Programme (EMPr) and must address the life-cycle of the project. The EMPr must be compiled in parallel with the EIA process and informed by the EIA process and submitted as part of the final EIA report to the competent authority.

3.2.2 Specialist studies

Various specialist studies will be required, as part of the EIA process, to quantify and assess social and environmental impacts of the proposed project and identify suitable mitigation measures. Standard specialist studies that are envisaged for this project include:

- A terrestrial ecology and botanical study,
- An aquatic ecology and wetland assessment (to be used for both the EIA and WULA process), and
- A Phase 1 heritage impact and paleontological assessment.

3.2.3 Applicable Legislation

The legislation applicable in terms of authorisation, permits and/or licences for the proposed Coerney Dam includes the following:

3.2.3.1 National Environmental Management Act (No. 107 of 1998, as amended)

The proposed project will require a Scoping-EIA process in terms of the National Environmental Management Act (NEMA), as it will trigger *inter alia* activities 15 and 16 of GN R984 (2014, as amended). The proposed project will also trigger various listed activities under GN R983 and R985 (2014, as amended).

3.2.3.2 National Environmental Management: Biodiversity Act (No. 10 of 2004, as amended)

The proposed project area is located within an 'Endangered' ecosystem associated with the AZa6 Albany Alluvial Vegetation type. The proposed dam site is also in a near natural state with notable species diversity. It is therefore anticipated that a permit might be required for the destruction or relocation (restricted activity as per Section 1 of NEM: BA) of plant species,

which are protected under the National Environmental Management: Biodiversity Act (NEM: BA).

3.2.3.3 National Forests Act (No. 84 of 1998, as amended)

The proposed dam site is located within an 'Endangered' ecosystem, which is in a near natural state. It is therefore anticipated that a permit might be required for the destruction of tree species that are protected under the National Forests Act (NFA).

3.2.3.4 Nature and Environmental Conservation Ordinance (No. 19 of 1974)

The proposed dam site is located within an 'Endangered' ecosystem, which is in a near natural state. It is therefore anticipated that a permit might be required for the relocation, damage or destruction of species that are protected under the Nature and Environmental Conservation Ordinance.

3.2.3.5 National Heritage Resources Act (No. 25 of 1999)

The proposed project requires notification of the Eastern Cape Provincial Heritage Resources Agency (ECPHRA), in terms of Section 38 (1)(a) to (c) of the National Heritage Resources Act (NHRA). In the event of a heritage object and/or site being identified during the Phase 1 Heritage and Paleontological Assessment, an application for a permit for destruction or relocation will be required.

3.2.3.6 Competent Authority

Note that in terms of Section 24C (2)(d)(i) of NEMA and Section 43 (1)(c)(i), the national Department of Environment, Forestry and Fisheries (DEFF) will be the competent authority for all listed activities under GN R983 to R985.

3.2.4 Scheepersvlakte Farms 98 EIA

The farm on which the proposed Coerney Balancing Dam will be located, Scheepersvlakte No. 98, has received an Environmental Authorisation dated 5 August 2019 for 852 ha agricultural development, from the Provincial Department of Economic Development, Environmental Affairs and Tourism (reference EC/06/C/LN2/M/47-2018). The Environmental Authorisation includes approval for an irrigation water storage dam of 140 000 m^3 capacity.

Comment was provided by DWS on the Consultative Scoping Report that the Department plans to construct a larger balancing dam on the same site. During consultation with Scheepersvlakte Farms (Pty) Ltd it was agreed that they would not build their storage dam but would abstract water from the proposed Coerney Dam when it is completed. An interim arrangement for supply from the Coerney canal has been agreed.

The proposed storage capacity of the Coerney Dam includes an allowance for the farm dam, namely one week of storage for the Scheepersvlakte farm, equal to 150 000 m^3 of storage. There will be little operational impact on the dam because of the irrigation offtake.

3.3 Land acquisition

Affected land has been identified and described in Chapter 4 of the *Affected Land and Infrastructure Sub-Report* of this study. A summary has been included below.

The portion of land upon which the dam is to be located is known as Portion 7 of Scheepersvlakte No. 98, owned by Scheepersvlakte Farms (Pty) Ltd.

The footprint of the proposed Coerney Dam overlaps with portions of the planned future Scheepersvlakte Farms development. The overlaps occur within the full supply level of the dam, the 1:100 year flood line in the basin, as well as portions of the dam wall and the spillway. The overlap with the spillway only occurs if it is sited on the left abutment. The overlapping areas are shown in **Figure 3.1**. The areas total area where the future planned orchards and dam infrastructure and 1:100 year flood line overlap is estimated as 36 ha.

The route of the proposed new supply pipeline from the long weir to the proposed Coerney Dam does not overlap with any of the proposed future farm developments.

During development of the detailed design route of the conveyance infrastructure the affected land owners should be consulted.

For the purchase of land, the affected areas should be indicated on a map that shows:

- The proposed purchase line,
- Areas (m^2) of different land uses affected,
- Potential borrow areas,
- Affected assets (to be complemented by a list of affected assets),
- Any land that may no longer be accessible or usable.

The acquisition of land and affected assets is undertaken in terms of the Expropriation Act of 1975 and the Constitution of South Africa. In conjunction with this the new Expropriation Bill has been approved by Cabinet and is expected to come before Parliament later this year (2020).

Servitudes to address issues, such as temporary and permanent access, would need to be prepared during the acquisition process.

The layout of the new citrus developments would need to be revised. Normally the DWS policy is that no development will be allowed within the 1:100 year flood line of the dam, and that development should also be outside the purchase line. In this case, since the unnamed tributary in which the Coerney Dam will be located seems to have not flowed for a very long time (reportedly at least not in the past 20 years), this policy may be relaxed. Development could be allowed between the flood line and the purchase line, but this would need to be negotiated.

The possibility that runoff and return flow from the new citrus orchards could affect the water quality in the dam, would normally require a buffer zone between the dam and the orchards. This aspect needs further investigation to determine whether a buffer zone or drain would be required.

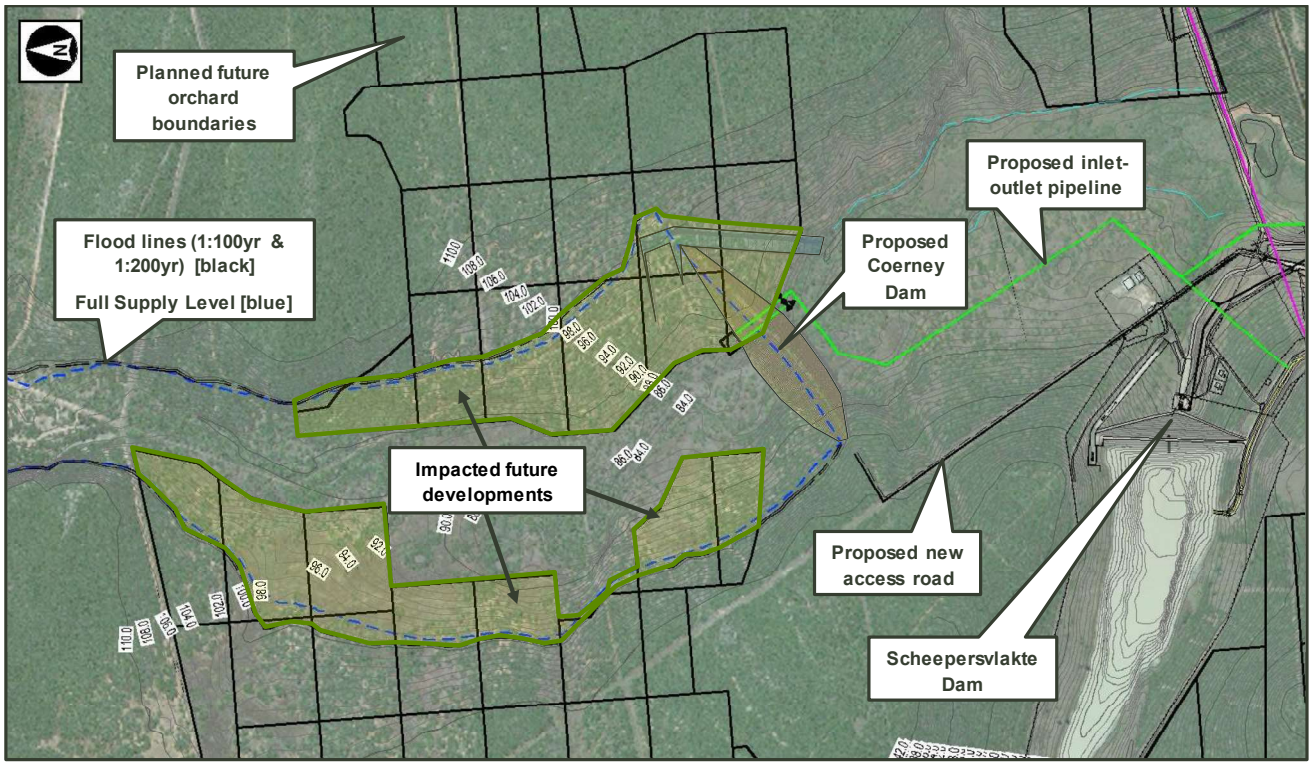


Figure 3.1: **Overlay of planned future farming development and FSL of new balancing dam**

4 Operation and maintenance requirements

This chapter describes an initial assessment of the operation and maintenance requirements, as well as the identification of any institutional arrangements that will ensure that the project is functional and sustainable.

4.1 Operation and Maintenance

Once the proposed Coerney Dam is operational and has been filled, the dam will be used as balancing storage for NMBM. The Scheepersvlakte Dam will then revert to its original function and will only be used as balancing storage for irrigators. It has been agreed that Coerney Dam will be operated and maintained by LSRWUA as part of the existing scheme.

The proposed balancing dam works will not have any impact on the operation of the current supply pipeline from the Scheepersvlakte Dam to the WTW and supply will still be controlled from the downstream end of the pipeline at the WTW.

The two dams, Scheepersvlakte and Coerney, although filled from the same source, should be operated separately under normal operation. Isolation valves on the existing connections between Scheepersvlakte Dam and the WTW supply pipeline will separate the systems but enable their linkage in the case of emergencies or maintenance.

The flow rate from the long weir to the WTW/dam will be controlled based on the water requirement from the WTW and the water level in the Coerney Dam. The LSRWUA can reduce the abstraction from the canal to the WTW when Scheepersvlakte Dam needs to be filled. If the supply pipe from the canal to the WTW/dam is closed, the WTW requirement will automatically be met from the Coerney Dam.

The dam should be operated just under its full supply level to leave some buffer storage to balance inflow and outflow. Water will be abstracted from the dam when the requirement cannot be supplied directly from the canal. Water in the dam would thus only be drawn down significantly in an emergency to supply the Nooitgedagt WTW (such as a canal break).

The dam will be filled, and topped up, over a lengthy filling period through gravity supply.

The joint use of water from the dam by NMBM and the Scheepersvlakte 98 Citrus Development Trust irrigation has been agreed by the parties concerned and will need to be formalised. The location of the Scheepersvlakte Farm offtake from the dam needs confirmation, although a floating offtake is preferred.

An earthfill dam does not require much maintenance, but certain components can be designed and/or specified to further reduce maintenance. These interventions during detailed design can also increase the operational life of the dam. These design / specification interventions include the following:

- Properly designed riprap to protect the upstream embankment slope.
- A layer of crushed stone for downstream slope protection instead of grass cover.
- A suitable gravel wearing course on the embankment crest to prevent erosion by rain and forming of ruts by vehicles.
- The use of stainless steel for the pipes under the embankment, from the intake tower to the outlet valve chamber.
- A properly designed gravel access road to ensure adequate drainage.
- Adequate corrosion protection of mechanical items in the intake tower, outlet chamber, etc.

4.2 Institutional Arrangements

The dam will be implemented and owned by DWS. The use of the dam is solely for the NMBM, with the additional storage for use by the Scheepersvlakte Trust.

It has been agreed that the new balancing dam should be operated by the LSRWUA. This arrangement is supported by NMBM. LSRWUA currently operate the supply scheme, and if the proposed dam is included, it will thus enable the operation of the full scheme as a single system, thereby simplifying operation.

5 Further investigations for detailed design

This chapter describes further investigations that are required to enable the detailed design to be undertaken successfully.

5.1 Topographical Surveys

A topographical survey was completed by DWS Southern Operations for the Lower Coerney dam site in May 2018. The results are reported in the (Lower) Coerney Dam Contour Survey report (EC 003/2018).

In August 2018, the survey was updated and expanded to include the immediate surrounding infrastructure, which is reported in the Scheepersvlakte Contour and Detail Survey Report (EC026/2018).

The accuracy of these contour surveys is suitable for detailed design of the dam. No further topographical survey of the dam site should be required to complete the detailed design of the dam wall and associated structures.

It is recommended that a centreline survey of the final pipeline routes, which connect the proposed Coerney Dam to the existing scheme, be undertaken prior to construction. This will serve as a final check on the pipeline vertical alignment and soil cover depths.

5.2 Geotechnical Investigations

Geotechnical investigations of the (Lower) Coerney Dam site were conducted in 2018. These investigations included geophysical surveys (resistivity), test pitting, in-situ field testing, sampling and laboratory testing, as well as rotary core drilling and water pressure (Lugeon) testing. The findings of this investigation are reported in *Lower Coerney Dam Geotechnical Survey* (Report no P WMA 07/N40/00/2619/2).

A detailed test pit investigation was conducted at the site using a tracked excavator, with the aim of collecting supplementary and supportive data. This investigation focussed on confirming available material quantities in the basin area, determining probable founding conditions for the spillway chute and providing some additional detail to the embankment founding conditions

Findings of this investigation are reported in *Lower Coerney Dam Supplementary Geotechnical Survey* (Report no P WMA 07/N40/00/2619/3).

Further geotechnical investigation of the dam site may be required to provide more information for detailed design, particularly to confirm the choice of spillway location on the left abutment by comparing this with further investigations into the founding conditions on the right abutment spillway location. The current level of information should however be adequate if a conservative design approach is followed. In other words, if excavation volumes and foundation depths are conservative, the contract price should be adequate for construction of the proposed dam without unnecessary cost overruns. A geotechnical investigation should be undertaken along the proposed pipeline routes and at the proposed chamber locations to inform the detailed design. The geotechnical investigation should also include a soil resistivity survey and testing for sulphate reducing bacteria to inform the coating selection and the need for cathodic protection.

5.3 Construction Materials

The geotechnical investigation of the dam basin indicates that the material properties are suitable for the construction of a homogeneous embankment. There are also sufficient quantities of material available.

Other materials, such as coarse aggregate for concrete, sand for filters and riprap are not found in the basin and will have to be imported from commercial sources. Several possible commercial sources for sand and coarse aggregates have been identified, but all are located some distances away from Coerney site. The closest identified possible commercial sources are in the Uitenhage and Coega areas, which is more than 60 km away from site.

A list of commercial sources is given in Chapter 5.6.2 of the *Feasibility-level Engineering Design - Balancing Dam Sub-report*. Sources of riprap, concrete aggregates and filter sand should be confirmed during detailed design.

Geotechnical investigations along the pipeline route (as above) should inform an estimate of the volume of suitable pipeline bedding material that is available on site and the volume that will need to be imported from a commercial site. A suitable source of import bedding material must be confirmed during detailed design.

5.4 Hydraulic Model Study

A hydraulic model study of the spillway configuration (overflow structure, side channel, discharge channel and energy dissipation structure) is required to optimise the detailed design of these components.

5.5 Electrical Power supply

The electrical power requirements of the balancing dam need to be determined, as well as the power source. It has been assumed that a power line can be constructed from Scheepersvlakte Dam.

Power at the proposed Coerney Dam will be required for lighting of the dam wall and valve chambers, operation of valves and hoists, and telemetry. This supply of these requirements from an existing supply point (assumed Scheepersvlakte Dam) should therefore be possible.

5.6 Site-specific flood determination

Site-specific methods should be used to determine the Recommended Design Flood (RDF) and Safety Evaluation Flood (SEF) for the proposed Coerney Dam site.

6 Implementation process, timeframe and milestones

This chapter provides information on the recommended implementation process, as well as the possible timeframe and milestones dates.

6.1 Implementation process

The recommended steps for the implementation of this project are discussed under the relevant headings below. The various actions are provided in chronological order, although some can be undertaken in parallel.

6.1.1 Declaration as Emergency Scheme

The implementation of the proposed Coerney Dam is critical to reduce the risk of failure of water supply to NMBM. The current risk to the system is mainly due to the condition of the conveyance infrastructure. There was a failure of the Kirkwood primary canal in 2017 and a failure of the Elandsdrift canal in 2019.

The water supply to NMBM is already under stress due to on-going water shortages from the storage dams to the west of Port Elizabeth. If water supply from Nooitgedagt WTW should be interrupted for more than a week, NMBM would have a crisis as there is no other water supply. It is therefore imperative that the proposed Coerney Dam be implemented as a matter of urgency.

The urgency of the project was discussed at the Study Management Meeting held on 19 February 2020. The committee agreed that the project should be declared as an emergency scheme. This will enable the detailed design to be undertaken by DWS in parallel with the EIA process. A submission therefore needs to be drafted to request the Minister of Human Settlements, Water and Sanitation to declare this project an emergency scheme.

6.1.2 Detailed Design of Coerney Dam and associated works

As discussed in the previous sub-section, it will be requested that the project be declared an emergency scheme. This will enable the detailed design of the project to be undertaken by DWS in parallel with the EIA process.

DWS Engineering Services has the capacity and expertise to successfully undertake the detailed design of the proposed Coerney Dam and associated works. This chief directorate has registered professionals with expertise in the various fields required for detailed design of this project. Their expertise includes dam design, geotechnical engineering, hydrology, hydraulic modelling, pipeline design, structural analysis, engineering drawing, tender documentation and report writing. The submission to the Minister will include a request to provide a directive to Engineering Services to undertake the detailed design.

6.1.3 Funding Arrangements

The proposed Coerney Dam and associated works will form part of the Lower Sundays River Government Water Scheme. The project will therefore be implemented as a Government Waterworks and funded by National Treasury.

Funding from National Treasury will need to be secured during the detailed design stage. This will enable the project to be implemented as soon as the detailed design and tender documentation are ready, and environmental authorisation has been received. Undertaking these three stages in parallel will substantially reduce the time required for implementation.

6.1.4 Record of Implementation Decisions

The Record of Implementation Decisions (RID) is the official internal DWS document to hand over the project for implementation. The RID describes the components of the project, design aspects, further investigations to be undertaken, institutional and funding arrangements, operational aspects and other pertinent information for implementation of the project.

The RID information relevant to the detailed design will be included in the directive to DWS Engineering Services. The RID will be completed and issued to DWS Infrastructure Development after the Environmental Authorisation has been received.

6.1.5 Environmental Authorisation

DWS is undertaking a comprehensive EIA process in accordance with the National Environment Management Act (No. 107 of 1998, as amended) (NEMA) and the 2014 EIA Regulations (GN R982 – 985, as amended). The EIA process is a legal requirement to obtain Environmental Authorisation for implementation of the project from the Department of Environment, Forestry and Fisheries.

6.1.6 Water use licences

The water use licence application for storing water and affecting and altering the banks of a river (Section 21 (b), (c) and (i), National Water Act, 1998) is included in the scope of work for the EIA study Chapter 4.8.

6.1.7 Dam safety regulation requirements

As discussed in Sub-section 2.2, applications for licences for complying with the dam safety regulations will need to be completed before certain tasks may continue.

A licence to construct must be issued by the DSO before any construction may commence. This application includes the relevant application forms, the Detailed Design Report for the dam with engineering drawings, the water use licence, EIA and engineering specifications.

Before the bottom outlets of the dam are closed, thereby commencing the impounding of water, the licence to impound must be obtained from the DSO. This application includes the relevant application forms, the operation and maintenance manual and the emergency preparedness plan.

6.2 Programme and Milestones

The project implementation programme that includes the described tasks and milestones, with rough estimated timeframes has been included in in **Appendix A**.

7 Conclusions

The following has been concluded in terms of implementation support for the proposed Coerney Dam and conveyance infrastructure:

7.1 Water Use and Dam Safety Licences

1) A water use licence will need to be obtained for storing water and affecting and altering the banks of a river (Section 21 (b), (c) and (i), National Water Act, 1998). This licence application is included in the scope of work for the EIA study (Chapter 4.8).
2) The WULA will be submitted via the DWS online eWULAAS platform to the relevant Water Management Area office for *Catchment N - Fish to Tsitsikamma*, which is the Port Elizabeth DWS office.
3) The proposed dam is a "dam with a safety risk" and is expected to be classified as a Category III dam, being of "medium" size with a "high" hazard rating. The dam safety regulations are thus applicable to the design and construction of the dam.

7.2 Environmental Impact Assessment

1) The DWS will undertake an Environmental Impact Assessment (EIA) process for the proposed Coerney Dam, in terms of all applicable environmental legislation. The EIA is expected to start in 2020, to overlap with the technical feasibility evaluation study, which will provide technical support.
2) Impact mitigation measures and environmental management are to be described in an Environmental Management Programme (EMPr) and must address the life-cycle of the project. This will be compiled and submitted as part of the EIA process.
3) Specialist studies will be required as part of the EIA.
4) Applicable legislation to consider includes the EIA process in terms of the National Environmental Management Act, National Environmental Management: Biodiversity Act, National Forests Act, Nature and Environmental Conservation Ordinance, National Heritage Resources Act, and National Water Act.

5) DWS Directorate Resource Directed Measures should determine whether it is necessary to undertake an EWR determination study for non-perennial systems for this Coerney River tributary in which the proposed dam would be located. If required, the EWR determination could be included in the Environmental Impact Assessment.

7.3 Affected Land

1) The portion of private land on which the dam is to be located is known as Portion 7 of Scheepersvlakte No. 98, owned by Scheepersvlakte Farms (Pty) Ltd. The State would need to acquire this land. The footprint of the proposed Coerney Dam and the 1:100 year flood line overlaps with approximately 36 ha of the planned future Scheepersvlakte Farms development on this property. Given the extreme ephemeral nature of the tributary river in which the dam will be located, the land owner may be interested in negotiating to farm some land within the 1:100 year flood line.

7.4 Scheme Operation

1) Once Coerney Dam is operational and has been filled, the dam will be used as balancing storage for NMBM. An operational agreement with the land owner will need to be drafted, for sharing of the impoundment and use of the additional volume that has been included in the dam volume for irrigation by the land owner. The Scheepersvlakte Dam will then revert to its original function and will only be used as balancing storage for irrigators. It has been agreed that Coerney Dam will be operated and maintained by LSRWUA as part of the existing LSRGWS.

7.5 Topographical Survey

1) The accuracy of the contour survey undertaken for the feasibility study is suitable for detailed design of the dam.
2) It is recommended that a centreline survey of the final pipeline routes, which connect the proposed Coerney Dam to the existing scheme, be undertaken prior to construction.

7.6 Geotechnical and Materials Investigations

1) Further geotechnical investigation of the dam site may be required to provide more information for detailed design. The current level of information should however be adequate if a conservative design approach is followed.

2) A geotechnical investigation should be undertaken along the proposed pipeline routes and at the proposed chamber locations to inform the detailed design. The geotechnical investigation should also include a soil resistivity survey and testing for sulphate reducing bacteria to inform the pipeline coating selection and the need for cathodic protection of the pipelines.
3) Materials such as coarse aggregate for concrete, sand for filters and riprap are not found in the basin or near the site and will have to be imported from commercial sources.
4) Geotechnical investigations along the pipeline route should be done to inform an estimate of the volume of suitable pipeline bedding material available.

7.7 Hydraulic Modelling

1) A hydraulic model study of the spillway configuration is required to optimise the detailed design.

7.8 Electrical Supply

1) The electrical power requirements of the balancing dam need to be determined, as well as the power source. It has been assumed that a power line can be constructed from Scheepersvlakte Dam.

7.9 Design Floods

1) Site-specific methods should be used to determine the magnitude of the design flood and safety evaluation flood for the proposed Coerney Dam site.

7.10 Detailed Design and Scheme Funding

1) The project should be declared as an emergency scheme. This will enable the detailed design to be undertaken by DWS, in parallel with the EIA process. A submission should be prepared to request the Minister of Human Settlements, Water and Sanitation to declare this project as an emergency scheme.
2) The proposed Coerney Dam and associated works will form part of the LSRGWS. The project will therefore be implemented as a Government Waterworks and should be funded by National Treasury.

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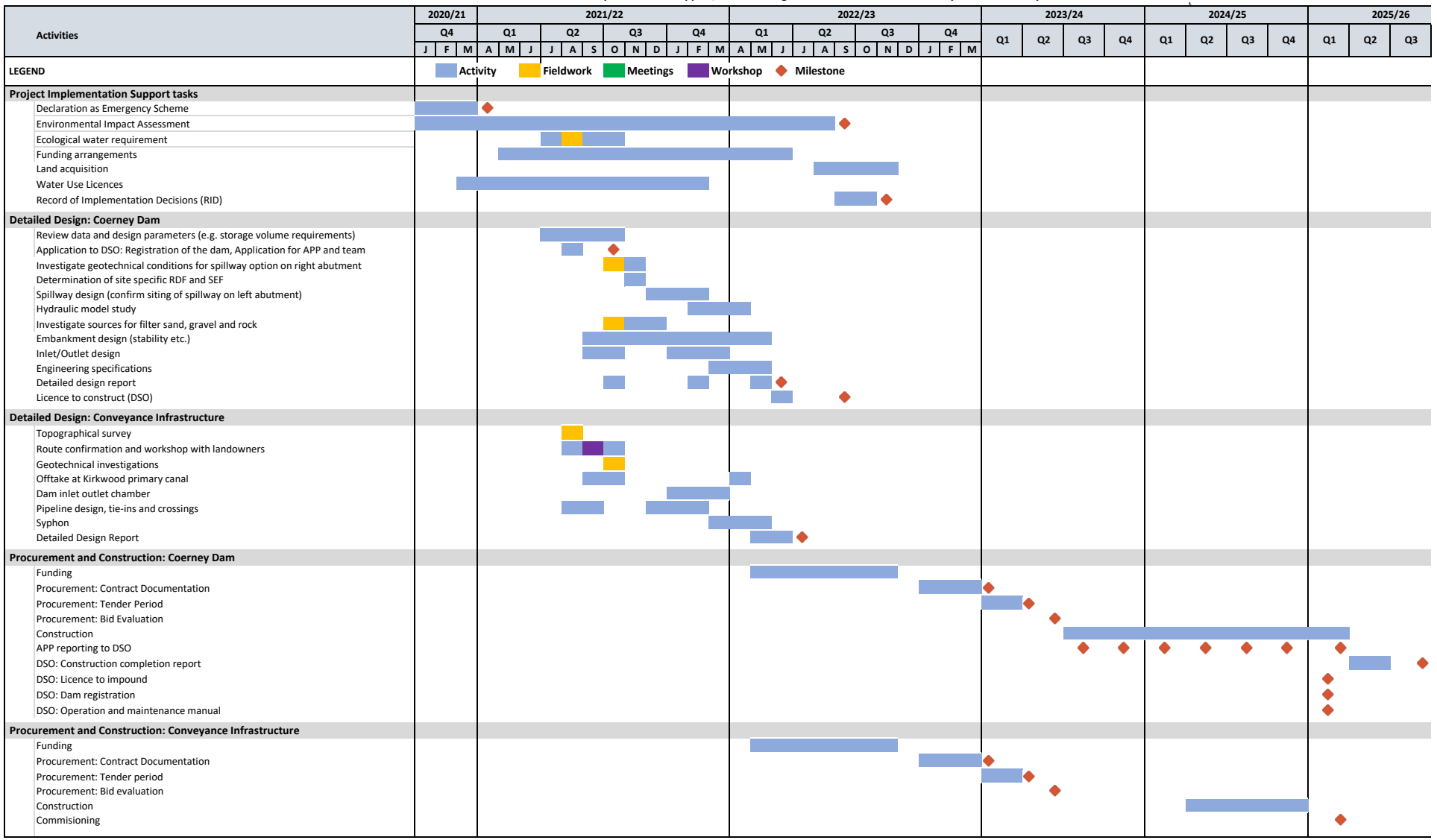
Appendix A: Implementation Programme

Water Reconciliation Strategy for the Algoa Water Supply System

IMPLEMENTATION PROGRAMME - Implementation support, detailed design and construction of the Coerney Dam and conveyance infrastructure



Abbreviations:

APP Approved Professional Person
DSO Dam Safety Office
RDF Recommended Design Flood
SEF Safety Evaluation Flood

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