Proposed Upgrade to the Woodlands Wastewater Treatment Works and Associated Sewerage Infrastructure

Water Use License Application Summary Report

Drone photo of the current wastewater treatment works in Woodlands with the adjacent landfill site.

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GLOSSARY

Buffer	A strip of land surrounding a wetland or riparian area in which activities are controlled or restricted to reduce the impact of adjacent land uses on the wetland or riparian area. Buffers are land use specific and are calculated for the specific environmental context and proposed land use.
Characteristics of a watercourse	Means the resource quality of watercourse within the extent of a watercourse.
Construction	Means any works undertaken to initiate or establish activities, site preparation including vegetation removal and ground levelling that may result in impeding or diverting or modifying resource quality.
Delineation of a wetland or riparian habitat	Means delineation of wetlands and riparian habitat according to the methodology as contained in the Department of Water Affairs and Forestry, 2008 publication: A Practical Field Procedure for Delineation of Wetlands and Riparian Areas or amended version.
Diverting	Means to, in any manner, cause the instream flow of water to be rerouted temporarily or permanently.
Flow-altering	Means to, in any manner, alter the instream flow route, speed or quantity of water temporarily or permanently.
Impeding	Means to, in any manner, hinder or obstruct the instream flow of water temporarily or permanently.
Regulated area of a watercourse	a) The outer edge of the 1 in 100-year flood line or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, dams and lakes. b) In the absence of a determined 1 in 100-year flood line or riparian area as contemplated in (a) above the area within 100m of distance from the edge of a watercourse where the edge of the watercourse (excluding floodplains) is the first identifiable annual bank fill flood bench. c) In respect of a wetland: a 500m radius around the delineated boundary (extent) of any wetland (including pans).
Rehabilitation	Means the process of reinstating natural ecological driving forces within part or whole of a degraded watercourse to recover former or desired ecosystem structure, function, biotic composition and associated ecosystem services.
Resource quality	Of a watercourse means the quality of all the aspects of a water resource including: (a) The quantity, pattern, timing, water level and assurance of instream flow; (b) The water quality, including the physical, chemical and biological characteristics of the water; (c) The character and condition of the instream and riparian habitat, and; (d) The characteristics, condition and distribution of the aquatic biota.

Site Assessment	Comprehensive evaluation of the proposed development site, including the identification of wetlands, watercourses, and soil characteristics.
Topography	The physical features of the land surface, considered for its potential influence on drainage and ecological features.

ABBREVIATIONS

CBA:	Critical Biodiversity Area
CD:NGI:	Chief Directorate: National Geo-spatial Information
CR:	Critical Endangered
DFFE:	Department of Environment, Forestry and Fisheries
DWAF:	Department of Water Affairs and Forestry
DWS:	Department of Water & Sanitation
EIS:	Ecological Importance and Sensitivity
ESA:	Ecological Support Area
FEPA:	Freshwater Ecosystem Priority Area
GA:	General Authorisation
GPS:	Global Positioning System
NEMA:	National Environmental Management Act
NFEPA:	National Freshwater Ecosystem Priority Areas
NWA:	National Water Act
NWM5:	National Wetland Map 5
PES:	Present Ecological State
SACNASP:	South African Council for Natural Scientific Professions
SWSA:	Strategic Water Source Areas
WCBSP:	Western Cape Biodiversity Spatial Plan
WUL:	Water Use License

1. INTRODUCTION

Confluent Environmental Pty (Ltd) was appointed to provide aquatic specialist inputs (Appendix *3*) for the proposed upgrade of the Wastewater Treatment Works (WWTW) and the replacement of the main sewer line in Woodlands, Easten Cape. SMEC South Africa was commissioned by the Koukamma Local Muniicpality for the design and implementation of the internal sewer reticulation, bulk sewer reticulation and wastewater treatment works within the Woodlands Settlement. A detailed design report with cost estimate (Appendix *2*) for the proposed WWTW and sewer reticulation was provided for the application.

The Woodlands settlement is located 15 km southwest of the town of Kareedouw and approximately 1 km south of the N2 Highway. The existing and non-operational WWTW is situated approximately 200 m south of the Woodlands settlement, adjacent to the Woodlands landfill site. The closest perennial river is the Groot River, approximately 900 m south of the WWTW. The scope of work for the Aquatic report is guided by the legislative requirements of the National Environmental Management Act (NEMA) as well as the National Water Act (NWA).

1.1 Applicant Details

Name of applicant: Koukamma Municipality
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1.2 Person Submitting the Application

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The South African Council for Natural Scientific Professions (SACNASP)
Registration Number 115166
Date of registration 27 January 2016

1.3 Project Background and Purpose

The Woodlands Wastewater Treatment Works (WWTW) is operated by the Koukamma Local Municipality. This treatment site currently serves the Woodlands settlement. An upgrade to the WWTW is needed, to allow for increased hydraulic load from the growing residential development within the site's catchment.

Currently the WWTW is not operating and to prevent serious environmental pollution through this present practice, new infrastructure is urgently needed. The aim of the proposed upgrade is to increase the treatment capacity of the WWTW from the current 250 m^3/day to 500 m^3/day. This upgrade will increase the footprint of the existing site to approximately 1.42 ha.

The Water Use License will be for water uses under Section 21(c), 21(i) and 21(f) of the National Water Act, 1998 (Act36 of 1998), which are defined as follows:

21(c): Impeding or diverting the flow of water in a watercourse

21(i): Altering the bed, banks, course or characteristics of a watercourse
21(f): discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit.

The Woodlands WWTW operated by Koukamma Local Municipality, has a General Authorisation letter (DWS letter reference 27/2/2/K480/7/8, WARMS28093786 (Appendix 6) for the discharge of treated effluent into the Groot River up to a volume of 1 722.8 m^3/a.

1.4 Location of Water Uses

The project in respect of which this water use licence application is submitted is in the Eastern Cape Province, near the town of Woodlands (Figure 1).

The water uses for the upgrade of the WWTW will take place on Eastern Cape Human Settlement property, Erf RE/1 Portion 0 (Remaining Extent) Woodlands. A letter of consent from the department, allowing the Koukamma Municipality to use this Erf is provided (Appendix 1), with the replacement of the sewage pipeline within Woodlands traversing Erf RE/1 and Portion 2/584 Humansdorp.

The project area is located in the Eastern Cape Province, within the Sarah Baartman District Municipality, south of the Woodlands settlement and within the Mzimvubu Tsitsikamma Water Management Area. The water use is within Quaternary Catchment K80D. Five non-perennial rivers are mapped within 50 to 300m around the proposed upgrade area, 2 flowing in a southern direction and 3 in an eastern direction (Figure 2).

The geographic location of the WWTW is at Latitude: -34.012272° and Longitude: 24.158678°.

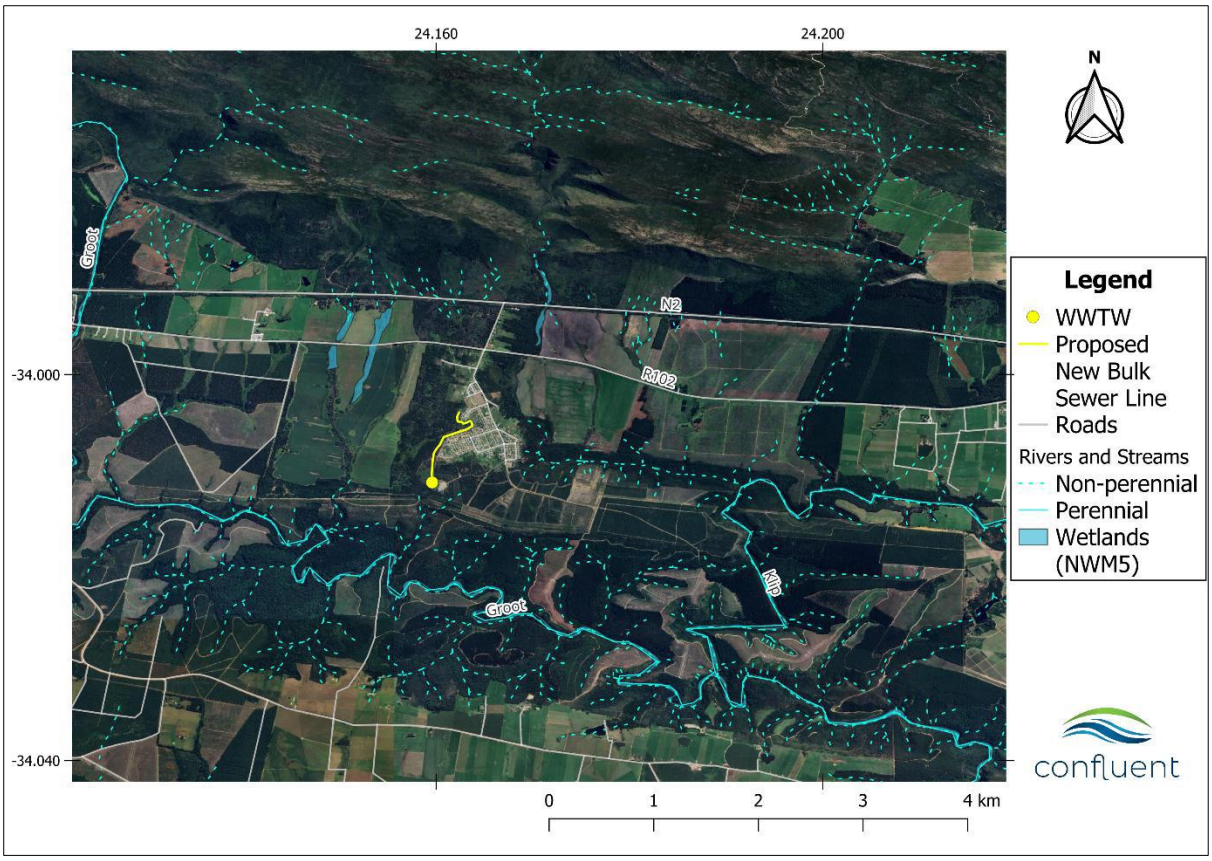

Figure 1: Location of the WWTW and bulk sewer line to be upgraded near Woodlands in the Eastern Cape.

Figure 2: Location of the WWTW and proposed new bulk sewer line in the quaternary catchment K80D.

2. ADMINISTRATIVE AND TECHNICAL DOCUMENTS SUBMITTED TO SUPPORT THE APPLICATION

2.1 Administrative Documents

The following administrative documents have been submitted in support of this application:

- Letter of appointment;
- Title deed of WWTW Erf RE/1 Woodlands
- Tax invoice of DWS fee
- Applicant's contact details
- Woodlands General Authorisation

2.2 Reports and Other Technical Documents

Table 1 lists specialist reports and other documents submitted as part of the application.

Table 1 – Specialist reports submitted for application

Report Title	Compiled By	Date of Report
Geohydrology report	Divan Stroebel, DHS Groundwater Consulting Services.	16 May 2025
Engineering Detail Design report	E. Du Toit; D. Funyufunyu , SMEC South Africa.	29 July 2025
Aquatic report	Dr Jackie Dabrowski, Confluent Environmental.	July 2025
WULA Technical summary report	Sonia Jordaan, Confluent Environmental.	August 2025

3. PROJECT DESCRIPTION

The proposal is to upgrade the internal sewer reticulation, bulk sewer reticulation, and WWTW at Woodlands to increase the treatment capacity to accommodate existing and projected future loads of wastewater from the plant's catchment area in Woodlands. The plant shall be designed for domestic sewage through a piped network as well as receiving sewage from honey suckers with a flow of 500 kℓ/d Average Dry Weather Flow (ADWF).

The current sanitation services at Woodlands Settlement consist of digester tanks and a 110 mm diameter smallbore gravity sewer reticulation system. Effluent from the digesters is regularly removed by vacuum tankers and transported to the WWTW at Woodlands Settlement, located 0.5 km south of the southwestern boundary of the Woodlands Settlement. The effluent undergoes an activated sludge treatment process via a package plant followed by clarification, where the solids and liquids are separated before the final effluent is discharged into a surface watercourse. Sludge is conveyed to a pit near the treatment works for disposal. Once the pit reaches 80% capacity, it is backfilled, and a new pit is created.

The existing small-bore gravity sewer reticulation and digester system has proven problematic, particularly during peak conditions such as the festive season, resulting in overflows. Additionally, the municipality's limited capacity to clean the digesters has often led to unsanitary conditions within the Woodlands Settlement (Appendix 2).

3.1 Upgraded WWTW

According to SMEC (Appendix 2), the proposed treatment process to be used is the Extended Aeration Activated Sludge process. Extended aeration means that the raw sewage only undergoes screening and grit removal and is then aerated in an extended aeration plant without any primary sedimentation. Extended aeration is the simplest form of activated sludge and, if using robust aeration equipment; it provides a simple and reliable treatment option. It is capable, due to long sludge ages and long hydraulic retention times, to accommodate shock loads better than conventional activated sludge with its shorter sludge age and hydraulic retention time. The long sludge age also offers the benefit that the sludge can dry on sludge drying beds without additional sludge treatment such as anaerobic digestion.

The project and process are described in detail in the SMEC Detail Design Report (Appendix 2). The typical process flow diagram (PFD) for an Extended Aeration System (EA) is shown in
Figure *3* below.

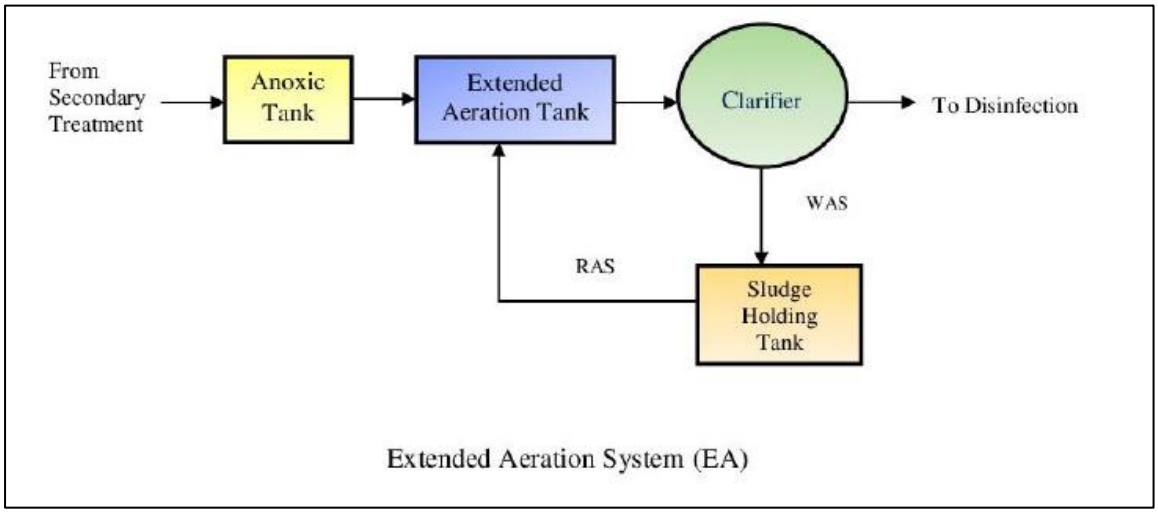

Figure 3: Process flow diagram of a typical Extended Aeration System (Figure 5 3-2 Smec Engineering report Appendix 2)

This Activated Sludge treatment system will extend the WWTW treatment capacity volume from 250 kℓ/day to 500 kℓ/day. See Figure 4 for the layout of the proposed WWTW with corresponding numbers and description below of the function of the various processing aspects of the plant.

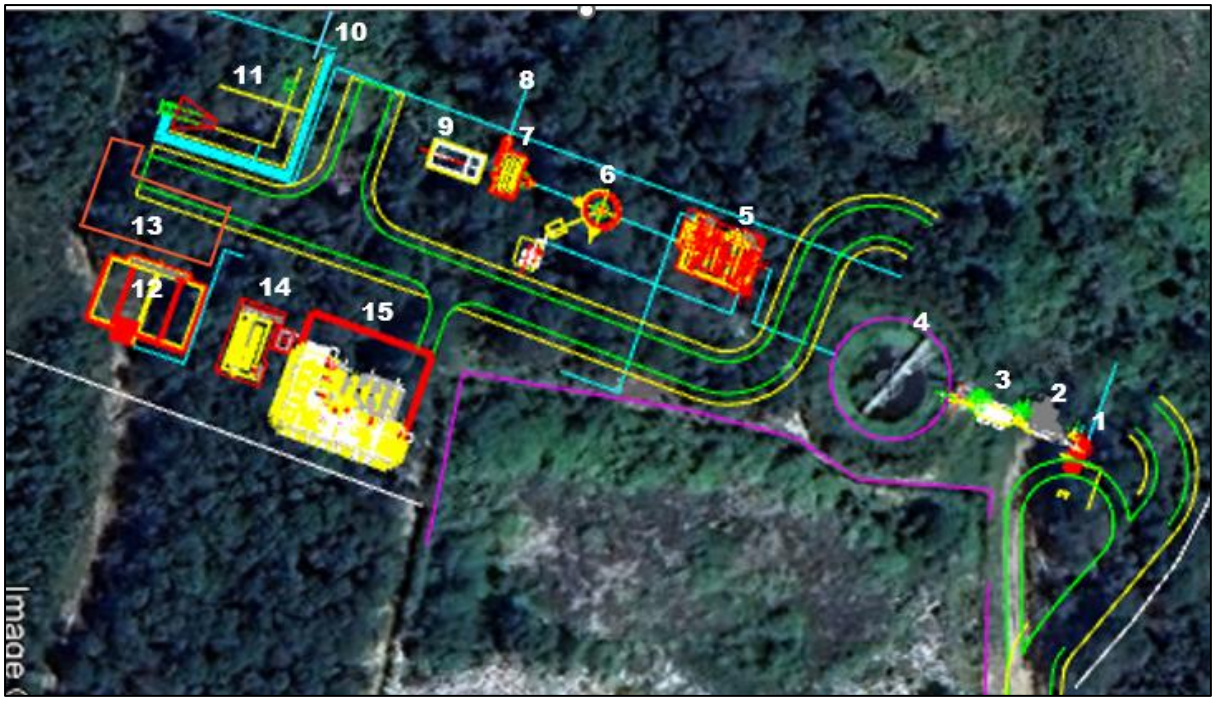

Figure 4: Layout of Activated Sludge processing plant at Woodlands, with corresponding numbers to indicate parts of the process flow of the plant.

Head of works

1. Tanker dumping area
2. 1x 10mm coarse mechanical screen and two de-gritting channels.
3. A Parshall flow flume and an ultra-sonic level sensor.

4. Balancing tank
   To attenuate peak flows through the system. The current package plant can be repurposed and adapted for use as a balancing tank for the upgraded plant.

5. Biological Reactor
   There will be one biological nutrient reactor comprising of the anaerobic, anoxic, and aerobic zones

6. Clarifier
   Separates solids by settling of activated sludge to produce clear effluent

7. Chlorination contact channel
   Pathogenic microorganism reduction. An auto-flow metering system will be installed to ensure that a chlorine dosing rate of 5mg/l is maintained.

8. Discharge of treated water to river
   Discharged effluent, treated to General Limits as per National Water Act 1998 (Act No 36 of 1998).

9. Chlorine building
   Storing of disinfecting chemicals

10. Emergency stormwater overflow
    Should the rain event exceed the capacity of the stormwater dam, the overflow will be discharged to the river.

11. Stormwater dam
    The excess overflow at the Inlet works, Balancing Tank, and Biological Reactor gravitates to a stormwater dam.

12. Two sludge drying beds
    For the dewatering of waste activated sludge. Supernatant from the drying beds collected in a channel and pumped back to the head of works. The A1a sludge is suitable for general landfill disposal.

13. Dry sludge storage area
    The sludge treatment process is designed to produce waste sludge suitable for general landfill disposal or an A1a sludge that can be used for beneficiation purposes. Supernatant from the drying beds will be returned to the head of works.

14. MCC building
    Electrical control equipment area.

15. Administration/Laydown building
    For personnel and ablution facilities.

Figure 5 shows the detailed process flow with return flow to the inlet works of supernatant effluent.

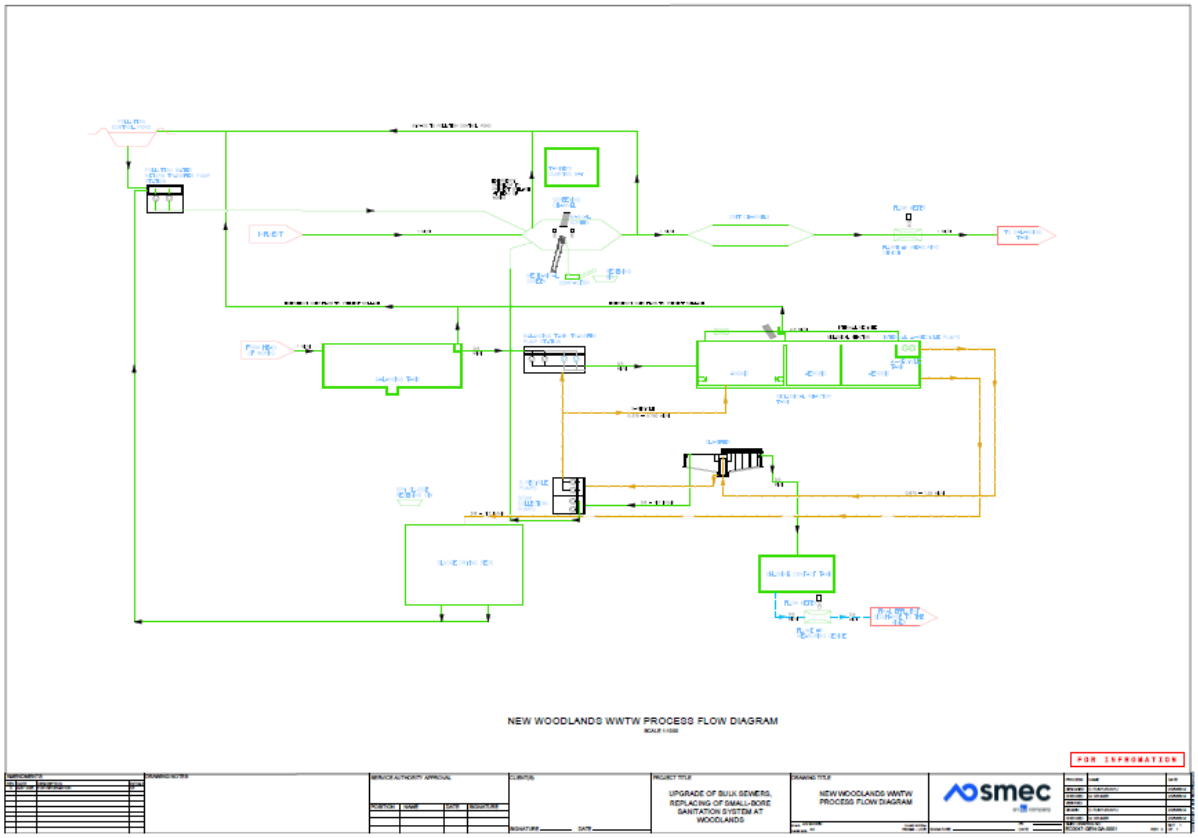

*Figure 5: Process Flow Diagram of Woodlands WWTW, including return flows of the plant to the head of works (*Appendix 4*)*

3.2 Bulk sewer line upgrade

The bulk sewer line which drains from Woodlands to the WWTW is to be upgraded to a 160mm diameter class 34 uPVC pipe with a 200mm diameter class 34 uPVC pipe for the final 900 meters before connecting to the WWTW. The preferred route of the pipeline is Option 3, see Figure 6 below for the route of the proposed bulk sewer line. The pipeline will allow for stormwater ingress. Manholes will be placed every 60 m. The entire bulk sewer line will be rerouted, while the old sewer line will be blanked off as soon as the new WWTW is commissioned. The preferred route (Option 3) is due the assessment by the aquatic specialist who determined that the other two options (Option 1 and Option 2) have a higher footprint of disturbance through wetland habitat.

The water uses for this application are:

21(c): Impeding or diverting the flow of water in a water course
21(i): Altering the bed, banks, course or characteristics of a water course
21(f): Discharging waste or water containing waste into a water resource through a pipe, canal. sewer. sea outfall or other conduit

This method of wastewater treatment has been chosen due to the expected composition of the wastewater inflow, the volume of the inflow, cost to upgrade, as well as proven reliability

of the process. Wastewater effluent from the site will be discharged, after chlorination into a tributary of the Groot River.

The bulk sewer line construction which will carry wastewater from the settlements to the Woodlands WWTW, requires work within watercourses and therefore constitutes water uses in terms of the NWA, Act No. 36 of 1998. Construction methods typical for pipeline installations will be followed. This would include earth moving and trenching. The use of heavy machinery and excavations along the pipeline route will be necessary for installation of the pipeline.

The footprint of disturbance for the pipeline is likely to be the actual pipeline route with an area of 5m either side of the line that could be disturbed during construction and maintenance. No-go areas must especially focus on wetland or stream habitat that is beyond 5m from the construction footprint of the infrastructure.

Construction projects involving large numbers of workers using heavy machinery, with movement of materials over a large area are likely to create more disturbance to the natural environment (and watercourses) than necessary. This impact is considered in the Aquatic specialist report and mitigation measures provided. Preferred wetland crossing option 3 (Figure 6) is across the narrowest section of the wetland, crossing approximately 37 m, and the proposal is that the pipeline should daylight across the wetland on concrete supports to avoid having to excavate through the wetland as far as possible (Appendix 3).

During the construction phase the majority of impacts anticipated would involve direct disturbance to wetland soils and vegetation, as well as indirect impacts such as sedimentation associated with runoff from construction areas. These impacts are assessed in the Aquatic specialist report (Appendix 3) and summarised in Section 8 of this report.

4. STORMWATER MANAGEMENT PLAN

Stormwater generated on-site should be managed according to Sustainable Drainage System (SuDS) principles during the construction as well as operational phase. This means that infiltration of low velocity flows should be encouraged as far as possible. High velocity, concentrated flows of water must be avoided. The mitigation measures to prevent erosion and high velocity flow rates of stormwater, such as not having the stormwater outlet enter the stream perpendicular and measures to take to ensure erosion is not exacerbated by the inflow of stormwater into the stream (as per the Aquatic specialist recommendations) are discussed in the mitigation measures under section 8 below.

A stormwater dam whereby the excess flow overflows at the Inlet works and gravitates to a stormwater dam is proposed as part of the layout and design of the upgraded plant.

Excess overflow at the Inlet works, Balancing Tank, and Biological Reactor will gravitate to a stormwater dam with a total storage capacity of ±1100 m³. The design will allow for a 500mm freeboard, for additional capacity during extreme events. The dam will be concrete lined to prevent seepage of raw sewage into the underlying soil. After storm events, the contents will be pumped back to the inlet works at a slow rate to ensure the microorganisms are not washed out. Should the rain event exceed the capacity of the stormwater dam, the overflow will be discharged to the river (Smec Engineering Services; Appendix 2).

The report further states that stormwater will be managed overland via sheet flow, caught into kerb inlets, and conveyed to the stormwater detention dam of the WWTW The minor and major storm events were analysed for 1:5-year and 1:100-year respectively. A stormwater berm along the adjacent landfill site will be constructed to ensure stormwater runoff from the landfill site adjacent does not enter the WWTW area.

Due to the increased impervious surfaces related to the proposed constructed WWTW, the runoff from the site will be higher than the pre-development runoff. The WWTW stormwater retention dam will be designed to accommodate the additional runoff from a 1:15-year storm event. The required storage volume will be 194 m^3. The retention pond's stormwater flow will be conveyed through a system of underground pipelines, with an outlet structure from the pond as an overflow, which will be governed with orifice flow principles.

In case of very high inflows of stormwater, an emergency overflow from the stormwater pond must be constructed in such a way the water is delivered to the watercourse downslope without causing erosion to the slope, stream banks, or stream bed. A stepped gabion structure with stilling basin is recommended (Appendix 3). The overflow structure will be constructed to discharge any overflowing stormwater from the stormwater pond to the drainage line (southwest corner of the WWTW; Figure 6).

This would only be necessary during flooding conditions because under ordinary circumstances the stormwater overflow captured in the stormwater pond would be recirculated back to the WWTW head of works. No detailed designs for these outlets were provided at the time of writing, but mitigation measures to minimise impacts on the watercourse through all phases of development are still provided here (Section 8), and were discussed with the engineers (Appendix 3).

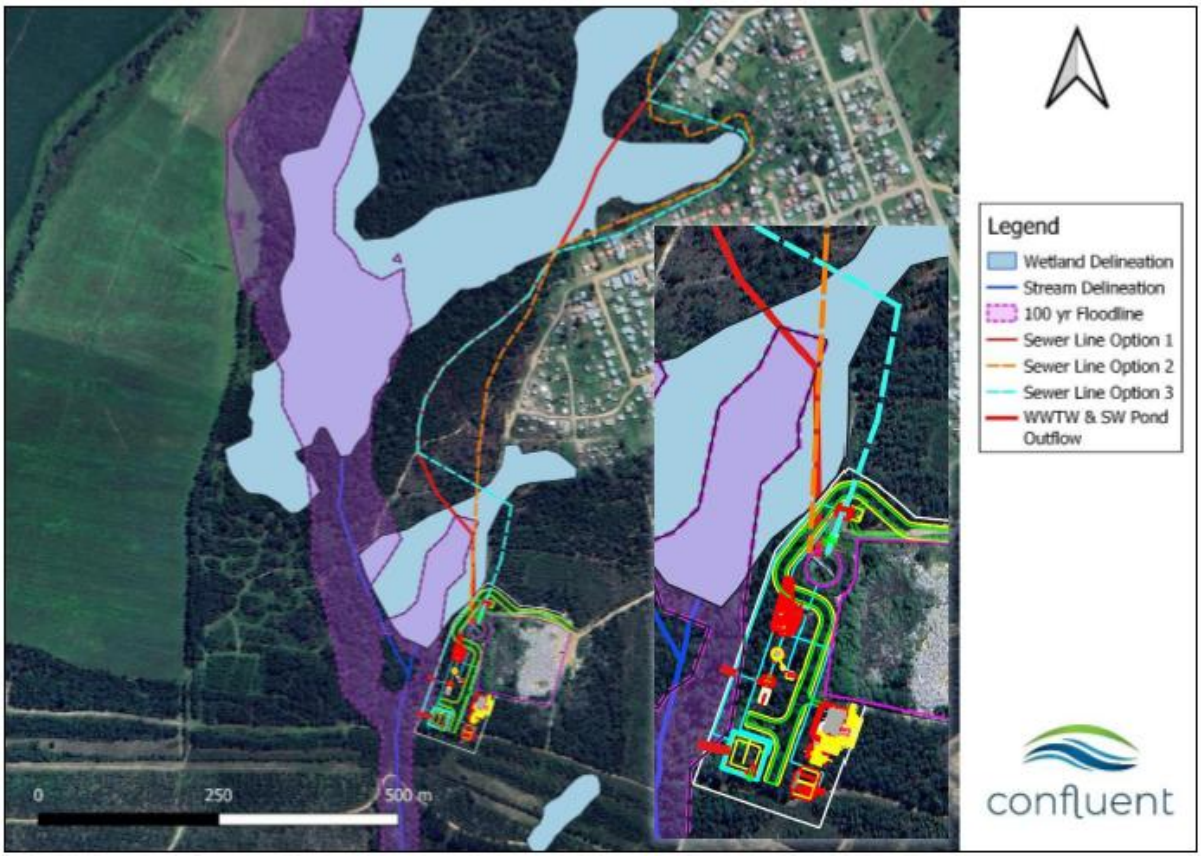

Figure 6: Layout of the proposed WWTW and pipeline options in relation to delineated watercourses and the 1:100 year floodline (determined by SMEC). Inset shows enlargement of the WWTW area for greater visibility of the two outlets proposed to the watercourse.

5. REHABILITATION PLAN

The footprint of the upgraded WWTW will not require a rehabilitation plan, it is built on the existing site, with only the bulk sewer line watercourse crossings being outside of the existing site's footprint.

The Aquatic specialist determined that the riparian zone is currently in good condition, impacted mainly by some minor alien vegetation which has somewhat modified the channel in places. But this impact could be rehabilitated, and future works (e.g. construction of the two outlets) must attempt to maintain the riparian zone in good condition through the removal of alien vegetation in the vicinity of works. Every effort must be made to avoid and minimise impacts and rehabilitate (revegetate) affected areas post-construction.

6. WATER USES APPLIED FOR

The applicable water uses in this application are provided in Table 2.

Table 2. Water uses for this application.

Water use(s) activities	Purpose	Capacity/ Volume	Property Description	Co-ordinates
Section 21 (c) – impeding or diverting the flow of water to a watercourse				
Bulk sewer pipeline, Option 3, crossing a wetland (crossing 1)	Convey wastewater to WWTW from Woodlands settlement	1 000 kℓ/day	Erf RE/1, Woodlands	-34° 0' 22.8852" 24° 9' 40.8846"
Bulk sewer pipeline crossing a wetland (crossing 2)	Convey wastewater to WWTW from Woodlands settlement	1 000 kℓ/day	Erf RE/1, Woodlands	-34° 0' 34.3044" 24° 9' 35.3838"
Section 21 (i) – altering the bed, banks course or characteristics of a watercourse				
Bulk sewer pipeline crossing a wetland (crossing 1)	Convey wastewater to WWTW from Woodlands settlement	1 000 kℓ/day	Erf RE/1, Woodlands	-34° 0' 22.8852" 24° 9' 40.8846"
Bulk sewer pipeline crossing a wetland (crossing 2)	Convey wastewater to WWTW from Woodlands settlement	1 000 kℓ/day	Erf RE/1, Woodlands	-34° 0' 34.3044" 24° 9' 35.3838"
Location of the WWTW within a 500m radius from the boundary of wetlands	Treat wastewater from Woodlands settlement	500 kℓ/day	Erf RE/1, Woodlands	-34° 0' 41.7018" 24° 9' 33.933"
Location of pipeline sections within a 500m radius from the boundary of wetlands	Convey wastewater to WWTW from Woodlands settlement	1 000 kℓ/day	Erf RE/1, Woodlands	-34° 0' 34.3044" 24° 9' 35.3838"
Discharge of treated effluents within the extent of a watercourse	Treated effluent discharge erosion protection structures within the regulated area of a watercourse	1 000 kℓ/day	Erf RE/1, Woodlands	-34° 0' 42.5658" 24° 9' 32.223"
Emergency stormwater overflow within the extent of a watercourse	Emergency stormwater overflow discharge erosion protection structures within the regulated area of a watercourse	1 000 kℓ/day	Erf RE/1, Woodlands	-34° 0' 43.866" 24° 9' 31.6542"
Section 21 (f) – discharging waste or water containing waste into a water resource through a pipe, canal. sewer. sea outfall or other conduit:				
Discharge of treated effluents within the extent of a watercourse	Treated effluent discharge within the regulated area of a watercourse	1 000 kℓ/day	Erf RE/1, Woodlands	-34° 0' 42.5658" 24° 9' 32.223"
Emergency stormwater overflow within the extent of a watercourse	Emergency stormwater overflow (possibly	1 000 kℓ/day	Erf RE/1, Woodlands	-34° 0' 43.866" 24° 9' 31.6542"

	contaminated) within the regulated area of a watercourse			

7. DESCRIPTION OF THE ENVIRONMENT

There are five non-perennial rivers mapped within 50 to 300 m around the proposed upgrade area, 2 flowing in a southern direction and 3 in an eastern direction (Figure 2).

The area receives a substantial amount of rainfall on average (Table 3). Rainfall intensity in the area is classified as Very High and the inherent erosion potential of soils is also Very High. The project area is located within the southeastern coastal belt (Ecoregion Level II, 20.02). The terrain is described as closed hills of moderate and high relief and moderately undulating plains. Altitude ranges between 0 – 1 300 m.a.m.s.l. See Table 3 below for the catchment features of K80D where the WWTW is located (Appendix 3).

Table 3: Summary of relevant catchment features for Woodlands

Feature	Description
Quaternary catchment	K80D
Mean Annual Runoff	414.98 mm
Mean Annual Precipitation	1 067 mm
Inherent erosion potential of soils (K-factor)	0. 72, Very High
Rainfall intensity	Very High
Ecoregion Level II	20.02, Southeastern coastal belt
Geomorphological Zone	None
NFEPA area	Sub-quaternary reaches 9124 and 9138, Fish FEPA.
Mapped Vegetation Type	FFs20: Tsitsikamma Sandstone Fynbos (LT)
Conservation	ESA1: Aquatic, ECBCP (2019).

None of the mapped non-perennial rivers are to be crossed by the new bulk sewer line. All of the non-perennial rivers are mapped tributaries of the Groot River approximately 900 m south of the WWTW. The three non-perennial rivers flowing east flow into the Klip River, which joins the Groot River 3.5 km southeast of the WWTW. No wetlands are mapped to occur in the immediate vicinity of the WWTW and associated infrastructure.

The site visit by the Aquatic specialist (Appendix 3) identified extensive wetland habitat to the west and south of Woodlands in an unconfined (broad) valley bottom (Figure 7). As the gradient steepens to the south, the wetland gives way to a flowing stream with riparian forest. It is this stream that at present, and in the future, will receive the discharged treated effluent from the upgraded WWTW.

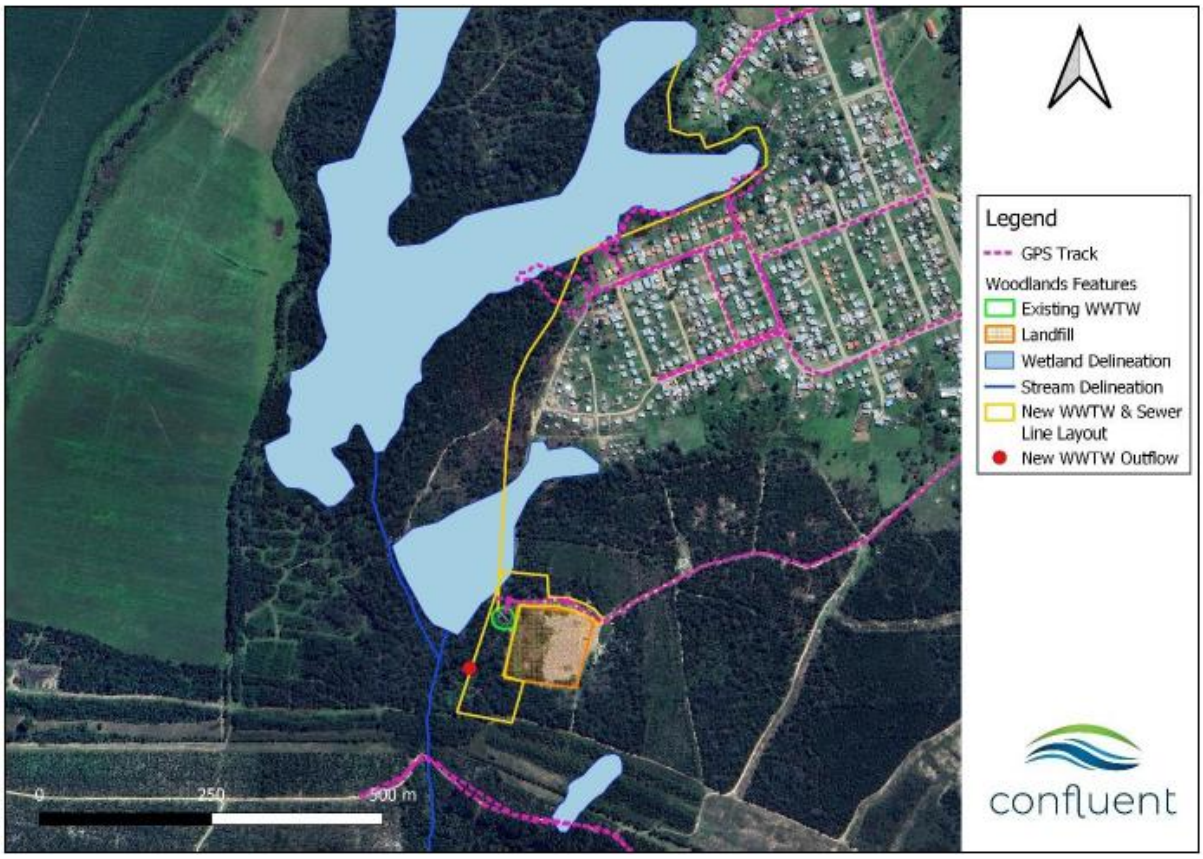

Figure 7: GPS track walked and driven during the site assessment and delineated wetland and stream. (Sewer line route shown is Option 2).

The vegetation type at the site is mapped as Tsitsikamma Sandstone Fynbos (FFs20: Least Threatened). Tsitsikamma Sandstone Fynbos, occurs along the Tsitsikamma Mountains in both the Western and Eastern Cape provinces, extending from Uniondale to Cape St Francis. (Appendix 3).

7.1 Fish Support Area

According to the National Freshwater Ecosystem Priority Atlas (NFEPA; Nel *et al*., 2011), the sub-quaternary reach in which the WWTW and associated infrastructure are to be upgraded (SQR 9124), is classified as a Fish Support Area. The management objective for fish support areas is as follows:

"Sub-quaternary catchments that are required to meet biodiversity targets for threatened and near threatened fish species indigenous to South Africa. Fish support areas also include SQRs that are important for the migration of threatened and near-threatened fish species. River reaches in Fish Support Areas need to be maintained in a condition that supports the associated populations of threatened fish species."

Fish Support Areas are designated in SQRs where endangered fish species occur, but the condition of rivers is lower than an A or B ecological category (Appendix *3*).

No groundwater users were identified within a 1km radius of the site. Literature indicates that soils in the vicinity of the site typically consists of deep, bleached and leached sandy soils with white to light yellow-brown colours (Appendix 7).

8. IMPACTS AND MITIGATION MEASURES

Current impacts associated with the WWTW include discharge of poorly treated effluent to the watercourse. The mitigation measure for this impact would include upgrading the plant and increasing the capacity thereof which is subject of this WUL application.

Although no site-specific fish sampling was undertaken as part of the fish support area in the Aquatic assessment, previous samples have been taken and indicate that at least one of the important fish species potentially present within these systems, *Pseudobarbus afer,* has been recorded in the Groot River (Chakona and Skelton, 2017), into which streams from SQR 9124 ultimately flow. The map provided by Chakona and Skelton (2017) indicates that a sample was taken downstream of the confluence of the Klip and Groot Rivers in 1982 (Appendix *3*).

Regardless of the latter, given this hydrological connectivity, the discharge of treated wastewater into or near these systems could pose a risk to downstream aquatic biodiversity, particularly if water quality, flow regime, or habitat structure is altered. The designation of these catchments as Fish Support Areas under NFEPA highlights the need for stringent water quality management and careful ecological consideration during the planning and operation of wastewater infrastructure.

According to the Geohydrology study (Appendix 7) the potential for contaminants to affect both the groundwater, and the surrounding environment, is a high risk of contamination without mitigation plans. The aquifer vulnerability is classified as moderate, indicating some susceptibility to contamination under certain conditions. However, the Aquifer Management Index (AMI) and Groundwater Quality Management Index (GQMI) identify the site as a high-risk area due to the presence of a "Minor to Major" aquifer system. This underscores the importance of preventative management to avoid degradation of this sensitive groundwater resource.

During the course of this project, the engineering team proposed an initial sewer line route (Option 1) which was refined based on the presence of wetlands delineated during this assessment (Option 2) and further improved to minimise the impact on wetlands (Option 3). All options (Option 1 to Option 3) are shown in Figure 6). Option 3 for the proposed sewer line route is considered the preferred option for this assessment given that the other two options have a higher footprint of disturbance through wetland habitat

See Table 4 below for Impacts and Mitigation measures during the design and layout, construction and operational phases of the project.

Table 4. Summary of impacts and mitigation measures.

Water Use Activitiy	Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
Design and Layout Phase				
Bulk Sewer Line Route	Wetland habitat loss	Vehicles, workers and materials active in wetland and buffer area	• Option 3 pipeline route is preferred and should be implemented. • The pipeline should daylight across the wetland crossing with as few supports in the wetland as is possible. Exposure of the pipeline would reduce impacts to the wetland for maintenance and improve the detection of leaks. • Pipeline supports should be designed and constructed to minimise the footprint of disturbance, both during the construction and the operational phase. • Pipeline joints should be minimised over and adjacent to the wetland as far as possible to reduce the likelihood of leaks directly into the wetland. • Specify the use of lockable polymer concrete manhole covers to reduce the risk of vandalism to the sewer line.	Minor
The Upgraded WWTW and Associated Outlets	Potential sewage overflow events	Impacts to the receiving stream's downstream users and creation of preferential flow paths	• Design of the WWTW has allowed for additional flows due to stormwater ingress during high rainfall events. Stormwater will be diverted to the stormwater pond southwest of the site from where it will be recirculated to the head of works for treatment. The stormwater pond is supported and recommended to mitigate the impact of stormwater ingress.	Moderate

Water Use Activitiy	Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
			• In case of very high inflows of stormwater, an emergency overflow from the stormwater pond must be constructed in such a way the water is delivered to the watercourse downslope without causing erosion to the slope, stream banks, or stream bed. A stepped gabion structure with stilling basin is recommended. • The outflow of treated wastewater must be constructed to ensure flows (anticipated at 0.6-1m/s) will not cause erosion of the slope, stream bank or stream bed into which it flows. Like the above a stepped gabion structure with stilling basin is recommended. • Outlets into the stream from the chlorine contact tank and the stormwater pond should not have a perpendicular entry to the stream that could cause erosion on the opposite bank. • The design should include bund walls around the biological reactor. • A pipeline should be installed between the outlet of the chlorine contact tank and the stormwater pond. This should be an emergency outlet that could utilise the storage provided by the stormwater pond on a temporary basis and to recirculate the sewage for treatment in the event of equipment failure in the WWTW. This would only function if capacity in the stormwater pond was available and would reduce or prevent serious pollution of the watercourse due to the discharge of partially treated or untreated sewage (in the event of an equipment failure).	

Water Use Activitiy	Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
Construction Phase				
Non-compliance with Conditions of the Environmental Authorisations	Further disturbance to the wetland and riparian buffer zone	Vegetation loss and soil disturbance in the wetland and riparian buffer adjacent to the river	• An Environmental Control Officer (ECO) should be appointed at the start and conclusion of the WWTW upgrade to provide feedback on compliance with authorisation conditions to various regulatory departments. • The ECO must ensure that all conditions of environmental authorisations are discussed and fully explained to the construction team. The construction team must have copies of the EAs on file in their site office. • The ECO should check in and report back on progress at a minimum once a month until the project concludes. • The ECO should ensure that photos are taken of all areas where work will be carried out before, during and after completion. These should be submitted as part of a report for commencement and completion of the work to be supplied to both the Department of Environmental Affairs and Water Affairs. • The ECO must use a clarity tube (available from GroundTruth) to measure water clarity at the downstream site indicated in Figure 14 prior to commencement of construction. Thereafter, measurements should be taken and recorded (in cm) at this point each time the ECO is on site. Natural variation in water clarity is acceptable within 10% of the baseline value. Anything higher may be reflective	Negligible

Water Use Activitiy	Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
			of high levels of disturbance which requires mitigation.	
Delineating a Minimal Footprint of Disturbance and No-Go Areas	Create more disturbance to the natural environment (and watercourses) than necessary.	Large numbers of workers using heavy machinery, with movement of materials over a large area are likely to create more disturbance to the natural environment (and watercourses) than necessary.	• Prior to commencement of construction, during the site establishment phase, the ECO must work closely with the construction team, resident engineer and site surveyor to establish and demarcate areas that workers, vehicles and materials cannot disturb or enter. A surveyor must be available and on site to assist in this demarcation through each phase of the project. • No-go areas must especially focus on wetland or stream habitat that is beyond 5m from the construction footprint of the infrastructure. These areas must be delineated using construction mesh fencing on wooden stakes and must be clearly sign-posted as No-go areas. • The importance of No-go areas must be clearly communicated to site workers and contractors through a site induction, which is required each time new workers enter the site. Implementation of fines for gross negligence and ignoring No-go areas may serve as a good deterrent. • Together with the ECO and construction team, identify suitable access, parking and turning areas for vehicles for each phase of the construction work. As far as possible, existing areas of disturbance, and existing tracks should be used for vehicle access. This must be clearly communicated to all drivers and demarcated using danger tape, reflectors or similar.	Minor

Water Use Activitiy	Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
			• Identify materials and equipment laydown areas away from wetlands and other watercourses as far as is practical. Consider that materials, temporary toilets, leaked fuel and litter can wash downslope during heavy rainfall and must therefore be bunded, secured, covered or surrounded by sandbags to prevent impacts to aquatic habitats. The ECO must inspect these areas for compliance. • Check weather reports for rainfall predictions on a weekly and daily basis. Postpone work during rainfall and ensure the site has been prepared to prevent wash off of materials etc. • As far as possible, work should be undertaken by hand using spades, pickaxes etc. However, it is acknowledged that work on this scale will require the use of heavy vehicles in some areas such as TLBs.	
Construction Workers in and Around Sensitive Aquatic Habitat	Management of human-generated waste and containment thereof	Pollution of water with petro-chemicals and other materials from the site	• Through each phase of construction have a designated area which is marked out for eating, resting, rubbish disposal, and sanitation (cleaning drinking, washing water and toilets). • Provide adequate bins for disposal of personal waste (e.g. lunch wrappers) as well as a waste area for larger waste materials (e.g. concrete rubble). • Provide an appropriate number of temporary toilets and ensure they are cleaned by a registered company on a regular basis. • All workers must be made aware that no rubbish may be disposed of in aquatic habitats under any circumstance.	Negligible

Water Use Activitiy	Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
			• Concrete mixing (dagha) should be done on boards away from the watercourse (Figure 17) as cement is a pollutant that must not be allowed to flow into the watercourse. Any waste cement should be allowed to dry and be disposed of in skips at the site. No waste cement should be discarded in aquatic habitats under any circumstance.	
Stormwater Runoff Causing Erosion, Sedimentation and Pollution During Construction	Sedimentation and pollution of water in aquatic habitats	Cleaning up sedimentation through a wetland or stream is very difficult and time consuming.	• Clearly demarcate the construction area and ensure that heavy machinery does not compact soil or disturb vegetation outside of these demarcated areas (Also refer to Impact 2). • Ensure stockpiled materials such as topsoil, subsoils, or any other mobile materials are bunded with sandbags to prevent their loss during rainfall. Topsoil must always be kept separate from other materials and protected from loss and contamination at all times. • Ensure that construction activities do not cause any preferential flow paths and concentrated surface runoff during rainfall events. • Ensure that vegetation clearing is conducted in parallel with the construction progress to minimise erosion and runoff. • Rainwater that must be pumped out of excavations (holes, trenches, foundations) after heavy rainfall cannot be discharged to stormwater drains or into a watercourse. A temporary coffer dam must be established using sandbags as the walls and bidim geotextile fabric as the liner. Water must be pumped	Negligible

Water Use Activitiy	Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
			into this and will seep through the bidim, leaving the majority of fine sediment behind in the fabric. • Reduce transport of sediment down slopes through use of structures such as silt fences, biodegradable coir logs and soilsaver biodegradable matting (Figure 18 of the Aquatic report). • Construct haybale check dams within concentrated flow paths to encourage water pooling and seepage through the haybale, while sediment remains in drains (Figure 19). • Protect stormwater drains which lead to aquatic habitats with sandbags to prevent silt-laden water from entering drains (Figure 19). • Revegetate exposed areas once construction has been completed with grass. In terrestrial areas, a mixture of oats (Avena sativa), buffalo grass (Stenotaphrum secondatum) and kweek (Cynodon dactylon) is preferable. The use of kikuyu grass is not supported as this is a classified alien plant and considered highly invasive in wetlands	
Working in and Adjacent to the Drainage Line for Construction of the WWTW and Associated Outlets	Discharge treated sewage from the chlorine contact tank and stormwater pond respectively.	Pollution and eutrophication of the watercourse leading to habitat degradation and impacts to biota	• If the outlet location is flexible within a few metres, then the route selection should strongly consider avoiding the removal of large, indigenous trees as far as possible. The reason is the significant role trees play in stabilising slopes and soil. • Work down steep slopes must be undertaken by hand with the minimal footprint of disturbance as far as possible.	Minor

Water Use Activitiy	Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
			• No vegetation, soil or rocks may be discarded into the stream. All material removed from the site should be carried up the slope. Topsoil must be retained for reuse following conclusion of the works. • Consider (in discussion with the ECO) whether an instream silt fence will be required to minimise siltation during construction (only works in very low flows). Alternatively, place haybales or silt fencing along the base of any earthworks to minimise sedimentation of the stream. • The use of gabions must follow best practice for installation including the use of bidim geotextile to prevent erosion behind gabions, the correct sizing of stones, and levelling of areas for gabions. • Gabion boxes should be constructed of poly-coated wire to reduce the likelihood of vandalism through cutting and theft. • Construction of any fencing along the western boundary of the WWTW should be positioned along the top of the slope and as far away from the watercourse and 1:100-year floodline as possible. Pedestrian gates should be included to allow for inspection and maintenance of the two outflows from the WWTW. The fence must not restrict movement of wildlife along the drainage line in any way.	
Operational Phase				
Pipeline Blockages, Sewage Spills,	Leaking sewage which both affects water quality and	Chronic leakage or discharge of poorly treated or untreated	• Ensure the ongoing use of lockable polymer concrete manhole covers to minimise acts of vandalism and dumping in sewer lines.	Minor

Water Use Activitiy	Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
and Operational Issues	necessitates maintenance	sewage that causes long-term damage to aquatic ecosystem health	• Add signage to manholes and pipelines informing passersby of the manhole ID and telephone number to call and report leaks. This should ideally be in isiXhosa and can be spray painted onto infrastructure to prevent theft of signs. • 6-8 months post-construction, an aquatic specialist must inspect all impacted aquatic habitats (sewer line crossing wetland and two outlets from WWTW) to ensure that: • Indigenous revegetation has occurred and at least 70% vegetation cover has been achieved through passive regrowth. • Check disturbed areas for evidence of dumping. • Assess the level of alien plant invasion. If substantial alien vegetation is present, then the municipality must provide staff or appoint a contractor to remove alien plants from disturbed areas of the wetland and / or stream. • Check outlets from the WWTW for erosion or signs that gabions may be slumping. • Repeat water sampling undertaken for this project at two sampling points testing for the same parameters. There should be a significant improvement in water quality downstream of the WWTW. • The aquatic specialist should provide a short report including recommendations to the municipality and Department of Water and Sanitation on this monitoring.	

Water Use Activitiy	Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
Risk of Increased Access to Aquatic Habitats for Dumping	Extensive dumping in and around the settlement, especially in wetland areas.	New servitude for the pipeline will result in easier access to certain areas of the wetland, which may increase the incidence of dumping in these sensitive areas.	• While beyond the scope of this project, the municipality is encouraged to improve service delivery for the disposal of solid waste in a formalised facility. Disposal of solid waste is currently an environmental and human health concern. Furthermore, existing areas of dumping should be cleaned up as a priority. • Certainty regarding the disposal for sludge and screenings must be provided by the municipality. Under no circumstances can either of the above be dumped in any watercourse. • Encourage the regeneration of thick indigenous vegetation along disturbed areas which will create a physical barrier to dumping (to be monitored by the aquatic ecologist – Impact 1). • Vehicle access to wetland areas can be restricted with installation of wooden poles or lockable bollards. However, this would not restrict access by people on foot or using wheelbarrows.	Minor

9. WATER DEMAND AND SUPPLY ANALYSIS

The WWTW is treating wastewater and there is therefore not a demand or supply analysis necessary. There is no water balance necessary as no water is stored or taken from a water resource.

10. WATER QUALITY

The aquatic specialist (Appendix 3), collected water samples during a site visit upstream of Woodlands in the wetland area and downstream of the WWTW at the point where honey suckers currently discharge sewage into the natural environment (Figure 8). The sample results indicate a major impact associated with the discharge of sewage which is affecting water quality in ways typically associated with pollution with sewage.

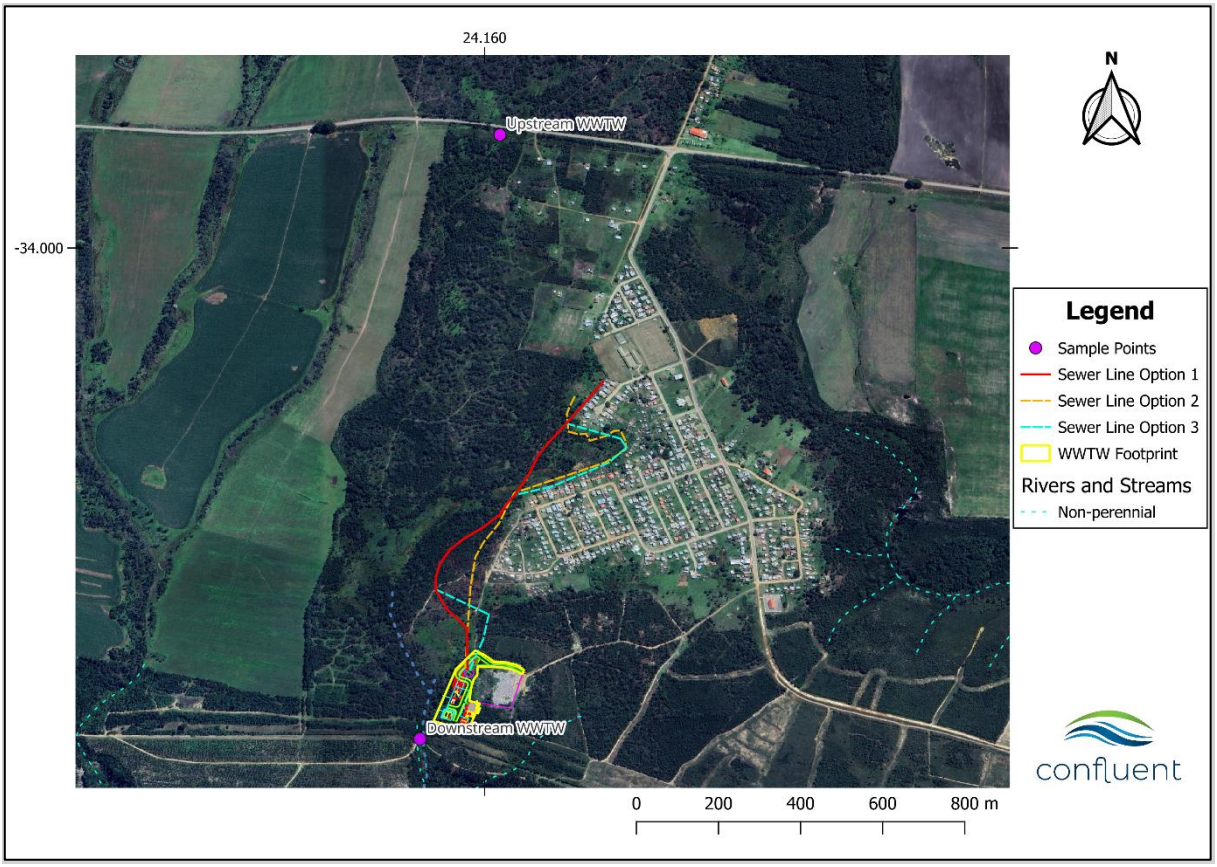

Figure 8: Map of the WWTW and proposed new bulk sewer line in relation to water quality sampling points.

The quality of treated effluent to be discharged will be improved, due to treatment of incoming domestic wastewater at the upgraded Woodlands WWTW. The specifications to which the wastewater will be treated at the plant before it is discharged to the watercourse, will be according to General wastewater limit values as per General Authorisation in terms of Section 39 of the National Water Act according to the Engineering report (Appendix 2). See Table 5 for General limit parameters.

Table 5: Wastewater General limits not to be exceeded when discharged to the watercourse

Substance / Parameter	General Limit
pH	5.5-9.5
Electrical Conductivity (EC)	5mS/m above intake of 150 mS/m
Chemical Oxygen Demand (COD)	<75 mg/ℓ
Nitrate as N	<15 mg/ℓ
Ortho phosphate as P	<10 mg/ℓ
Total ammonia as N	<6 mg/ℓ
Suspended Solids	<25 mg/ℓ
Faecal Coliforms	1 000 cfu/100mℓ
E.coli	1 000 cfu/100 mℓ

11. PUBLIC PARTICIPATION

The public participation process will be done completed in terms of Section 41 (4) of the National Water Act, Act no 36 of 1998. The 60-day public participation commenting period will be from 4 September to 4 November 2025. A report with comments and responses from interested and affected parties will be compiled to be submitted with the WULA application.

12. SECTION 27(1)

a. Existing Lawful Water Uses

The WWTW has an approved General Authorisation (GA) with reference number K27/2/2/K480/7/8, (WARMS28093786), dated 28 September 2017, for a Section 21(f) water use to discharge treated effluent with a volume of 1 722.8 m^3/a into the Groot River, see Appendix 6.

b. Need to redress the results of past racial and gender discrimination

The WULA is applied for by a Water Service Provider, the Koukamma Local Municipality. The wastewater treatment plant upgrade will ensure that sanitation services can be operated to applicable standard, the services supplied to an increasing number of residents in Woodlands areas, of low-cost housing inhabited by predominantly Historically Disadvantaged Individuals.

c. Efficient and beneficial use of water in the public interest

Approval of the WUL for upgrading the Woodlands WWTW will provide, primarily, social and hygiene benefits to the community.

The Integrated Development Plan (IDP) of Koukamma Local Municipality (2025/2026) has key objectives which aim to ensure alignment between national and provincial priorities, policies and strategies. It provides key objectives across various sectors, aiming to enhance service delivery, governance, environmental stability etc. One of these objectives relate to the provision of Basic Services as follows:

- Deliver essential services such as water, sanitation, electricity, and waste management.
- Ensure access to piped water, sanitation, and refuse removal.

Some of the key objectives of the district is related to ensure services to communities in a sustainable manner and promote a safe and healthy environment. These goals are the blueprint to achieve a better and more sustainable future for all. These challenges are related to poverty, climate, environmental degradation and prosperity for example.

The best treatment process would be the activated sludge method, since the other options that were considered cannot treat the incoming wastewater volume and concentration of ammonia and phosphate specifically to specification.

d. Socio-economic Impact

Koukamma Local Municipality has a Draft Spatial Development Framework (SDF) which is out for public comment (SDF, 2022). This SDF lists sanitation infrastructure projects, of which Woodlands is one of the WWTW upgrades. The SDF addresses upgrading and maintaining water, sanitation, electricity, roads and stormwater systems, as well as housing backlogs for future settlement growth.

These various planned upgrade projects aim to improve sanitation infrastructure across various settlements within the municipality, allowing for densification to be accommodated due to the proposed upgrades on WWTW's.

i) Of water use or uses if authorised.

The approval of the application will result in significant social benefits, which is in line with the SDF of Koukamma Local Municipality (2022). This is reflected by creating better living conditions for individuals in the catchment area, by allowing more houses to be built, while ensuring adequate sanitary circumstances are maintained with the increase in capacity of the wastewater treatment site. The upgrade is essential if the receiving environment is to be protected from discharges of poorly treated or untreated effluent into watercourses.

Various job opportunities will be created by the upgrade of the WWTW in the form of contracting staff in the form of labourers, technical, engineering, operating and maintenance staff.

A table to indicate the employment opportunities that will be created due to the WWTW upgrade and sewer line construction will be completed once the information has become available.

ii) Of the failure to Authorise Water Use or Uses

Should the WULA be declined, it will have detrimental impacts on Woodville residents and especially the environment, as raw sewage will continue to be dumped, untreated, into the environment. This upgrade will improve the protection of the surrounding environment's watercourses, since the increased water volume from the Woodlands township can be

treated to expected standards, preventing untreated water from being discharged into the natural environment, which degrades water quality, habitat and reduces biodiversity in turn.

Declining the application will limit the amount of residential development that can be planned and approved, without increased wastewater treatment capacity at Woodlands. It will also forfeit both the skilled and unskilled job opportunities the construction and operational phase of the plant will create for the local community, where unemployment rates are high.

e. Any Catchment Management Strategy Applicable to the Relevant Water Resource

The Integrated Development Plan (IDP) of Koukamma Local Municipality (2025/2026) has key objectives which covers various sectors and plans with the aim to ensure that they enhance service delivery, governance, infrastructure development, environmental sustainability, and economic growth.

Currently the water treatment works is not to standard, but with the proposed upgrade implemented the water can be treated to specification and therefore should pose less of a threat of pollution to water resources.

Furthermore, a groundwater management and monitoring programme must be implemented to ensure the groundwater resource is protected from possible wastewater pollution.

The Groundwater Impact assessment report (Appendix 7) recommends the following:

- Monitoring Network:
  Install at least three monitoring boreholes (one upgradient and two downgradient) to assess baseline and ongoing groundwater quality.
- Pre-Construction Installation:
  Monitoring boreholes must be installed prior to construction to establish pre-development conditions.
- Monitoring:
  Conduct quarterly groundwater and monthly effluent sampling, analysed by SANAS-accredited laboratories, to track changes and detect contaminants early

The water use license application process has been implemented to ensure that water use activities are authorised in a manner that achieves healthy water resources and allocate water for all forever.

f. Likely Effect of the Water Use to be Authorized on the Water Resource and on Other Water Users.

The WWTW upgrade will be beneficial for surface water and groundwater resources, in preventing untreated wastewater flowing from the plant. Treating increased volumes of

wastewater will be beneficial to the health of the local community and enhance sanitary living conditions.

g. Class and the Resource Quality Objectives (RQOs) of the Water Resource.

Resource Quality Objectives (RQO's) are defined as clear goals (numerical or descriptive statements) relating to the quality of a water resource and are set in accordance to the management class for the resource to ensure the water resource is protected.

The purpose of RQO's is to set clear objectives for the resource against which water use licenses and the related impacts can be evaluated and managed to achieve a balance between the need to protect and utilisation of the resource.

h. Investments Already Made and to be Made by the Water User in Respect of the Water Use in Question.

Investments in applying for a water use license as well as design applications of the upgraded plant and applying for environmental authorisations and associated specialist studies have been made to the value of ±R2 million.

i. Strategic Importance of the Water Use to be Authorised.

The SMEC Engineering report (Appendix *2*) based the design of the WWTW on the projected average dry weather flow (ADWF) of 462.37 kℓ/day, the peak dry weather flow (PDWF) of 869.45 kℓ/day and the peak wet weather flow (PWWF) of 1 041.122 kℓ/day for the low income housing, businesses and educational needs of the community.

The design took the service life of the plant into consideration. The civil, structural and building works were based on a 45-year service life. Mechanical and electrical equipment shall be suitable for a 24-hour day continuous operation and under discontinuous operation under all local climatic conditions and designed it that complete replacement will not be needed for at least 15-years after commissioning. Furthermore, mechanical and electrical equipment, with wearing parts having a design life of at least 5-years during continuous operation (Appendix *2*).

j. The Quality of Water in the Water Resource Which May be Required for The Reserve and For Meeting International Obligations

There could be a significant impact on the surface water as well as groundwater quality if the bigger volume of wastewater projected, cannot be treated should the plant not be upgraded. Although water will not be taken from water sources for this application, the impact the effluent output of the plant can have on watercourses can be detrimental to fauna and flora as well as groundwater. Upgrading of the plant to treat the bigger volume of untreated wastewater expected from residential growth will ensure that water can be treated to have the least possible effect on the environment.

k. Probably Duration of Any Undertaking for Which A Water Use is to be Authorised

The duration of the water use will be for the duration of the plant life.

13. DECLARATION BY THE APPLICANT WITH SIGNATURE CONFIRMING THAT THE INFORMATION SUBMITTED IS CORRECT.

14. APPENDICES

Appendix 1: Province of Eastern Cape Human Settlements, Sarah Baartman Region, Letter of Consent, 14 August 2025
Appendix 2: Engineering: Detail Design Report, SMEC Engineering, 29 July 2025.
Appendix 3: Aquatic Biodiversity Impact Assessment, Confluent Environmental, June 2025
Appendix 4: Process Flow Diagram (PFD) of WWTW process, 14 May 2025
Appendix 5: Public Participation report, Confluent
Appendix 6: : Approved General Authorisation, Department of Water and Sanitation, 27/2/2/K480/7/8
Appendix 7: Groundwater Impact Assessment, DHS Groundwater Consulting Services, 16 May 2025