



WATER SUPPLY INFRASTRUCTURE IMPROVEMENT PROJECT

GREATER PARAMARIBO, WANICA, PARA AND MOENGO

Environmental Management & Monitoring Plan (EMMP)



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EXECUTIVE SUMMARY

The **Surinaamsche Waterleiding Maatschappij (SWM)** is planning to upgrade and extend its potable water facilities in Paramaribo, Moengo and several villages in the surroundings of Moengo.

The Water Treatment Plant (WTP) at the **Van Hattemweg in Wanica** treats 1000 m³ of ground water per hour. The water is pumped from 11 boreholes along the Van Hattemweg and is pumped to the WTP. In the WTP the water is filtered through sand and shell filter basins and at the end of the process low quantities of chlorine are added to the water for disinfection.

The plant at Van Hattemweg needs to be rehabilitated due to the long lifetime the plant has been in operation. This project foresees the complete rehabilitation of the WTP.

The impact on the environment and the nuisance for people living next to the plant therefore will not change from the actual situation. The labour safety for the workers at the plant will improve because the small quantities of H₂S and CH₄ that are emitted at present within the building will now be discharged in a separate aeration tower so the workers will not be exposed to those emissions any more. Absolute quantities of the gases for the environment are insignificant.

The sand and shell filters need to be cleaned frequently by a back washing system where water in contra flow is led through the filters. The backwashing water is then led to a pond where after sedimentation the water is discharged to the environment. Since no chemicals are added this water contains no other components than natural elements such as manganese- and ferro oxides, not toxic or harmful to the environment.

In **Moengo** SWM produces drinking water from surface water, taken from the Cottica River. The WTP at Moengo also operates sand and shell filters followed by a process where sedimentation is enhanced by the addition of flocculants. These flocculants accelerate the sedimentation of unwanted solids in the water and are collected for dumping at a landfill. The components used for flocculation are not toxic.

The Plant at Moengo was built over 60 years ago and needs to be rehabilitated. Also in Moengo the new plant will operate very similar technologies as present. The capacity will be expanded from the actual 60m³ per hour to 200m³ per hour.

The water intake will be close to the plant, and will be moved upstream to create a safer distance from the Traymore Port facilities (either by the market, 500m upstream, or by the bridge, 100 m upstream).

The treated water is distributed by pumping and pipelines to the city of Moengo and to several remote villages.

The environmental impacts of the project are very limited and not different from the present situation.

For both Paramaribo and Moengo the construction and demolition phases of the project cause some temporary environmental and social impacts. Demolition and construction will be carried out in an environmental sound manner. The materials will be brought to assigned dump sites (Ornamibo and possibly the local site at Moengo, depending on possible rehabilitation works or closure of this site) and noise and vibrations will be limited to the minimum.

Water supply during the project phase will be guaranteed at Van Hattemweg through the installation of containerized temporary filter installations

At Moengo this will be managed through the existing WTP (60 m³/h) which will only be decommissioned after the construction and commissioning of the new WTP (200 m³/h).

Following the legal procedures as set by the National Environmental Authority (NMA) the project has gone through a concise Environmental and Social Impact Assessment in the form of an Environmental Management Plan. This report outlines the project activities and its possible impacts and mitigation measures.





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LIST OF ACRONYMES AND ABBREVIATIONS

AFD	French Development Agency (Agence Française de Développement)
DC	District Commissioner
DOG	Department of Public Health (Dienst Openbare Gezondheid)
DWV	Department of Water Supply, Ministry of NH (Dienst Watervoorziening)
EBS	Energiebedrijven Suriname
EIA	Environmental Impact Assessment
EM(M)P	Environmental Management (and Monitoring) Plan
ESIA	Environmental and Social impact Assessment
GoS	Government of Suriname
GPA	Ground Water protection Area according Drinking Water Act
HACAS	Hydrological Assessment of the Coastal Aquifers in Suriname
Ministry OW	Ministry of Public Works (Openbare Werken)
Ministry NH	Ministry of Natural Resources (Natuurlijke Hulpbronnen)
NIMOS	National Institute for Environmental Research of Suriname (Nationaal Instituut voor Milieu Onderzoek Suriname)
NMA	National Environmental Authority
RAMSAR	The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
RO-plant	Reverse osmosis WTP
WaSIIP	Water Supply Infrastructure Improvement Project for Greater Paramaribo, Wanica, Para and Moengo
WHO	World Health Organization
WTP	Water Treatment Plant



1 DESCRIPTION OF THE PROJECT

As Part of the *Water Supply Infrastructure Improvement Project for Greater Paramaribo, Wanica, Para and Moengo*, in May 2017, a contract was signed between N.V. Surinaamsche Waterleiding Maatschappij (SWM), the Client and main water service operator of Suriname, and BRL Ingénierie (BRLi) for the “*preparation of technical specifications, assistance with the tendering process, works supervision and capacity building activities*”, further on called ‘the project’.

The current scope of the project consists of the following:

- 1 Component 1: Rehabilitation of the existing 1,000 m³/h Water Treatment Plant (WTP) in Van Hatteweg (Wanica District) owned and operated by SWM;
- 2 Component 2: Construction of a new 200 m³/h compact Water Treatment Plant (WTP) in Moengo Town (Marowijne District) and ancillary works (water network reinforcements in Moengo Town and water supply improvement works in four (4) neighbouring villages). The new Moengo WTP will be owned and operated by SWM.

The report Environmental and Social Impacts Assessment, D 1-3- B (Annex 1), describes in detail the existing situation, the technologies applied, and the environmental and social impacts and risks associated with the foreseen changes in operation, the extensions and the building of the new installations.

All technical details and design of the foreseen works can be found in the revised report D1-2 (Scope and Technical Specifications – WaSIIP Project).

In line with the Screening Decision of NMA for these activities an EIA in the form of an update of the EMP as approved in 2018 by NIMOS is required, following the table of content, as indicated in the *Environmental Assessment Procedures Volume 1:Generic (2023), Annex 11-2.II for Stand Alone Environmental Management Plans (EMP)*.

This report outlines and summarizes the applied technologies, the relevant potential adverse impacts and environmental risks of the foreseen activities and it indicates the mitigation measures to respond to these potential impacts, as well as the monitoring, organization and responsibilities related to these risks and required training.

In comparison to the existing situation at Van Hatteweg, Moengo and the surrounding villages, there are no new technologies foreseen. Except from quantitative differences, from the operational phases therefore no new type of impacts will occur. Demolition and construction activities need to take place which lead to temporary new impacts.

Following a separate letter of the director of NMA dated March 7, 2025, the project is categorized as category B, track 2, requiring a limited ESIA in the form of an EMMP. After submission of the EMMP a stakeholder consultation is required. The CV of the environmental consultant must comply with the NMA requirements. The earlier EMMP following NIMOS letter of 3 Sept. 2018 includes among others:

- Description of the applied technologies for water treatment in the new plants;
- Description of the waste streams resulting from the processes and the measures taken to prevent these from having a negative environmental impact;
- Description of how generated waste from the old WTP (temporary stream of demolition and construction waste) will be managed.

This report further includes details about:

- The responsibilities within SWM for the management of each relevant environmental aspects;
- The way of monitoring of the aspects;
- Possible necessary mitigation measures.



This earlier EMMP report is now updated and adapted to the new project scope and conditions. All other aspects, as required by the *Environmental Assessment Procedures*, are described in this updated version of the EMP.



1.1 COMPONENT-1 VAN HATTEMWEG

1.1.1 DESCRIPTION OF THE EXISTING SITUATION

Treatment plant

- WTP at Van Hattemweg with a capacity of 1,000m³/h;
- 5 gravity sand filters and 2 shell filters are in use for oxygenation and removal of Iron, Manganese, H₂S and CH₄;
- Sand filters backwashed every 24h (1,300m³/day). Shell filters are backwashed once every 2 months (1,300m³ per 2 months), together 3-5% of the total water flow;
- The backwash water contains sludge mainly composed of Ferro- and Manganese oxides and is discharged into a sedimentation pond. Sludge removed from the ditch are deposited on land and the overflow waters from the pond run into surface water;
- Treated drinking water is stored in underground reservoirs and pumped into the transmission pipelines;
- There is a small chlorination unit in case of bacteriological contamination, installed in secondary containment;
- An obsolete genset with diesel tank is still present at the site. The genset was installed as a back-up for the energy production, but the system is not working any longer. The existing diesel tank is installed in a secondary containment pit.

Existing extraction wells

- 11 extraction wells are located along van Hattemweg (on average 400 m in between two wells);

1.1.2 PLANNED ACTIVITIES WITHIN COMPONENT-1

Treatment plant

- The renewal of the WTP at the Van Hattemweg Station. Reconstruction of the filter house with new installations, including the same technology, sand filters and shell filters. The small chlorination unit will remain in place as well as the backwash water ponds. The actual capacity of 1,000 m³/h will remain unchanged;
- The installation of an aeration tower to better control the emissions released during aeration.
- For the treatment steps the same existing technologies as now will be applied;
- No new auxiliary installations are foreseen (no additional diesel or chlorine units are needed).



1.2 COMPONENT-2 MOENGO AND SURROUNDING VILLAGES

1.2.1 EXISTING SITUATION

Treatment plant

- The Moengo WTP has a capacity of 60m³/h, located in the building of a power generation plant (diesel fuelled).
- Surface water intake is from the Cottica river right next to the plant.
- WTP has a flocculation coagulation decanter unit, followed by gravity sand filters.
- These filters are backwashed daily, using 5-6% of the drinking water production.
- The actual storage water tower of 560m³ is used for this backwashing.
- Produced drinking water is pumped into the Moengo distribution system.
- Existing number of connections (SWM clients) in beneficiary villages
 - Ricanaumofu: 148 household connections;
 - Abadukondre: 47 household connections;
 - Benati Mofu: 35 household connections;
 - Akele Kondre: 36 household connections.

1.2.2 PLANNED ACTIVITIES COMPONENT-2

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WTP Moengo

- Replacement of the existing 60m³/h Moengo surface water treatment plant by a new potable water treatment plant with a capacity 200 m³/h ;
- The same technologies will be applied as in the existing plant: coagulation/flocculation decanters, gravity sand filters and chlorination.
- A new pressurized sand filter will be installed;
- The new WTP will be 200 meters up-stream, also on the banks of the Cottica river;
- A new raw water intake from the Cottica River will be about 500 meters up-stream;
- A pipeline will be constructed from this raw water intake to the plant;
- The old WTP will be decommissioned (conditional tranche of works, depending on availability of funds);
- The existing water storage tower (560m³) will no longer be used. A pumping unit will be installed for filter backwashing. SWM has decided that the existing tower will be maintained as a landmark for Moengo.

Moengo Town

- Replace approximately 800m of existing DN100 by DN150 between Moengo and Wonoredjo;
- Rehabilitate approximately 500m of water network sections DN100 in Moengo;

Water distribution to villages



- Connect with DN100 PVC pipes the New Moengo WTP to the recently laid DN 100 transmission mains supplying the 4 villages, Mora Kondre (incl. Pati Kondre), Kraboe Olo, Pelgrim Kondre, and Ovia Olo;
- Improvement of existing water services in 4 villages: Ricanaumofu (about 6 kilometers north of Moengo) and Abadukondre, Benatimofu and Akalekondre (about 4 kilometers west of Moengo) by installing air valve and wash out chambers at respectively high and low points along the recently installed DN 100 transmission mains feeding the villages (to avoid air locks and facilitate water transfers and pipeline purges);
- Installation of one or two booster stations and four (4) water towers (25 m³ to 150 m³) at Mason Town, Ovia Olo, Ricanaumofu and Abadukondre, for improved pressure and supply;
- Supply remote villages Dantapoe and Patamaka with drinking water by water trucks (4 water trucks be purchased).



2 LEGAL AND INSTITUTIONAL FRAMEWORK

2.1 LEGAL FRAMEWORK

In March 2020, the 'Environmental Framework Act (EFA S.B. 2020 no. 97 (Dutch: Milieu Raamwet) was approved by the Parliament, published in the Gazette in May 2020 and amended in May 2024. The EFA aims to protect and elevate sustainable management of the environment in Suriname. The Act establishes the National Environment Authority (NMA) as a statutory body responsible for the implementation and enforcement of this law.

The EFA is still a Framework Act, defining procedures and responsibilities but not yet equipped with clear standards and permit requirements.

For the EFA to be operational, a set of subsidiary legislation will need to be promulgated, most of which is already in draft form (see below), but is unknown when this will become in force:

- The Duty of Care, whereby every citizen has a general duty of care regarding the environment, including refraining from acts or omissions that have adverse consequences for the environment.
- Environmental and Social Impact Assessment. Although the EIA process has been administered by NIMOS since 2005, with the promulgation of the EFA it becomes mandatory. EIA regulations have been drafted and will immediately take effect after its promulgation.
- Pollution and Standards. Environmental norms and standards will be developed under the EFA. This will be executed through implementation regulations. This includes the application of environmental permits and the rehabilitation of affected areas. The pollution regulations standardize the determination of contaminants, Maximum Allowable Concentration (MAC) values for the release of contaminants, and procedures for the rehabilitation of contaminated areas. Pollution regulations have already been drafted. SWM will have to apply for an environmental permit when these regulations are promulgated. Basic reference standards for discharges to surface water are used from World bank, see Annex 2.
- Waste and Hazardous Substances and Emergency Plans. The NMA will determine norms and procedures for handling of waste (collection, transportation, storage, and disposal) and may, among other things, prohibit the import or export of any waste. Furthermore, the NMA can prohibit hazardous substances or impose procedures for import, export, safe storage, handling, transport, use and disposal. These procedures are part of a permit for hazardous substances.
- Environmental Audits. The EFA provides for the establishment of guidelines and procedures for conducting an audit. These Guidelines had not been prepared as of this writing.

The Hindrance Act (Hinderwet) remains in force. This Act regulates the local issues of plants and process installation as it comes to direct nuisance in the form of noise, smell etc. for the population in the direct vicinity of plants or waterworks.

In addition, there are several government policies that concern sustainable development and biological resources.

Environmental Impact Assessment



The National Environmental Authority is responsible for monitoring Environmental and Social Impact Assessment (ESIA) processes. ESIA guidelines are in place, which have been updated in the Guidance Note NIMOS Environmental Assessment Process (2023)(Dutch: Richtlijnen voor Milieu Effecten Analyse, Algemene Richtlijnen, December 2023). These guidelines include a list of processes and industries for which EIA screening applies.

Per listed industry or process, three categories have been defined, mainly based on the size and production capacity of the planned activity. Article 22 of the EFA defines that NMA decides for which activities which level of Environmental Impact Analysis is required and which information needs to be provided for evaluation:

- Category A: a full EIA is required;
- Category B: to be decided by NMA whether full EIA or an EIA Statement is required and possibly additional documents;
- Category C: no further information needs to be provided for these activities.

The waterworks and treatment plants subject to this project are listed in these Guidelines under Category B, Path 2, meaning a concise Impact Assessment in the form of an EMP.

For discharge of waste water to surface waters the following WB standards are applicable:

2.2 INSTITUTIONAL FRAMEWORK

Regarding drinking water supply, infrastructural works and environment, the following competent authorities are of importance:

- Suriname Water Company, or N.V. *Surinaamsche Waterleiding Maatschappij (SWM)* is Suriname's national drinking water service operator, and responsible for drinking water and ground water policy. SWM is a limited liability firm with the Government of Suriname (GoS) as its only shareholder, and resides under the Ministry of Natural resources (see below). SWM facilities supply water to Paramaribo and most locations in the coastal area, as well as selected interior communities. SWM has a laboratory that monitors the physical, chemical and microbiological quality of the water and tests it against (inter)national quality standards based on measurements and observations.
- *Ministry of Natural Resources (Ministry NH)* and more in particular the Water Department (Directoraat Water), is responsible for drinking water policy and integral water management. The Water Department consists of the sub-directorate water (Onderdirectoraat Water -ODW) –which incorporates the Water Supply Service (Dienst Watervoorziening -DWV), en de section Integral Water Management (Integraal Water Beheer -IWB). The Water Supply Service (DWV) is jointly with SWM responsible for drinking water supply, whereby the DWV is specifically involved in the case of drinking water supply to interior communities. DWV also extends concessions for water extraction
- *Office for Public Health (BOG)*. This department of the Ministry of Health is a national institute for monitoring and promoting general public health. The BOG performs independent control of drinking water quality, and assesses health aspects. Control of the quality finds place through its Laboratory (Central Lab).
- *Ministry of Public Works (OW)*. This Ministry is responsible for infrastructural aspects including pipeline locations and associated excavation and construction works. The Ministry of OW has shared responsibility for surface water (with NH and the Ministry of Agriculture, Livestock farming and Fishing).



- *Ministry of Spatial Planning and the Environment (ROM)*. In July 2020, the institutional structure for environmental management changed with the change of Government. The structural change included the establishment of a Ministry for Spatial Planning and Environment (ROM). The Ministry of ROM aims to coordinate all environmental activities in the country. Legal positioning of the Ministry of ROM became a priority of the Government, and a formal working group was established for amending the Environmental Framework Act. The amendment proposes the Ministry to become primarily responsible for coordinating Environmental Policy while the NIMOS was transformed into the National Environmental Authority (NMA).
- *National Environmental Authority (NMA)*, launched at July 26, 2024, is Suriname's national environmental protection agency. The Ministry of Spatial Planning and Environment (ROM) is responsible for environmental policy, while NMA serves as their working arm. The NMA advises on environmental policies and legal issues for all Ministries and is responsible for EIA screening and the evaluation of EIA reports. The NMA is the successor of the National Institute for Environment and Development in Suriname (NIMOS) and has more legal powers than NIMOS had regarding permitting, inspection and enforcement. The NMA is currently in the process of setting up the permitting processes and inspection tasks. The permitting system is not yet operational. However, NMA is the authority that needs to be informed of new plans and their environmental and social effects as from the start of the project. Therefore, SWM has formally informed NMA about the foreseen project activities and has requested NMA to revise this report.
- *District Commissioners (DC)* of the involved districts Wanica, and Marowijne Southwest (see map on page 1). The DC is the highest authority in each District of Suriname. In relation to this project the DC is responsible for the issuing of permits under the Hindrance Act (Hinderwet).
- The Maritime Authority of Suriname is involved for placing the intakes in the river. The location will have to be approved by the MAS in order to prevent any obstruction for the river flow and fluvial traffic.



3 ENVIRONMENTAL MANAGEMENT ROLES AND PROCEDURES

Within SWM management roles and procedures for the control and mitigation of possible negative environmental and social impacts related to SWM's operations as well as activities during construction and demolition works are shown in Table 3-1:

Table 3-1- Overall responsibility for Environmental and Social Management and related Procedures

	Person/Entity in charge	Specific tasks	Applicable guidelines
Overall responsibility SWM Project and operational phase	SWM Project Manager SWM Project officer for HSEQ (Health Safety Environment and Quality)	<ul style="list-style-type: none"> ▪ Oversee and coordinate Project activities. ▪ Guarantee compliance with health & Safety and Environmental procedures ▪ Regular Inspections and corrective actions where needed. 	SWM company regulations (<i>Bedrijfsregels van SWM</i>)
Overall Responsibility Moengo	Regional Manager Marowijne Manager Moengo	<ul style="list-style-type: none"> ▪ First point of contact for Marowijne District ▪ Responsible for water production station Moengo ▪ Compliance with HSEQ regulations 	Safety book (<i>Veiligheidsboek</i>) Quality Policy (<i>kwaliteitsbeleid</i>)
Overall responsibility VHW	Head Production South Operational manager Van Hatteweg	Oversee optimal water supply for region South Water production for station VHW	
Distribution Moengo and villages	Chef Distribution Moengo	Distribution and delivery water to customers	
Social aspects VHW & Moengo	Director and secretariat Station managers HSEQ Manager	<ul style="list-style-type: none"> Policy and instructions on how to proceed Visit villages and traditional authorities Stakeholder management HSEQ 	SWM company regulations (<i>Bedrijfsregels van SWM</i>) Safety book (<i>Veiligheidsboek</i>)



	Person/Entity in charge	Specific tasks	Applicable guidelines
	Grievance Mechanism	Receive complaints and refer to station manager or Project manager for settlement	
Construction and demolition activities	Contractor	<ul style="list-style-type: none"> ▪ Health & Safety procedures during construction works ▪ Minimize negative impacts during construction works ▪ Regular Inspections 	<p>Suriname national laws</p> <p>Where no national standards exist: World Bank and WHO standards</p>

The following persons have responsibilities and tasks as indicated in **Error! Reference source not found.**:

Head office:

- General manager;
- HSEQ manager.

Van Hattemweg:

- Plant manager WTP and extraction locations;
- Consultant's Site Engineer: To be nominated at Works Contract Commencement.

Moengo office:

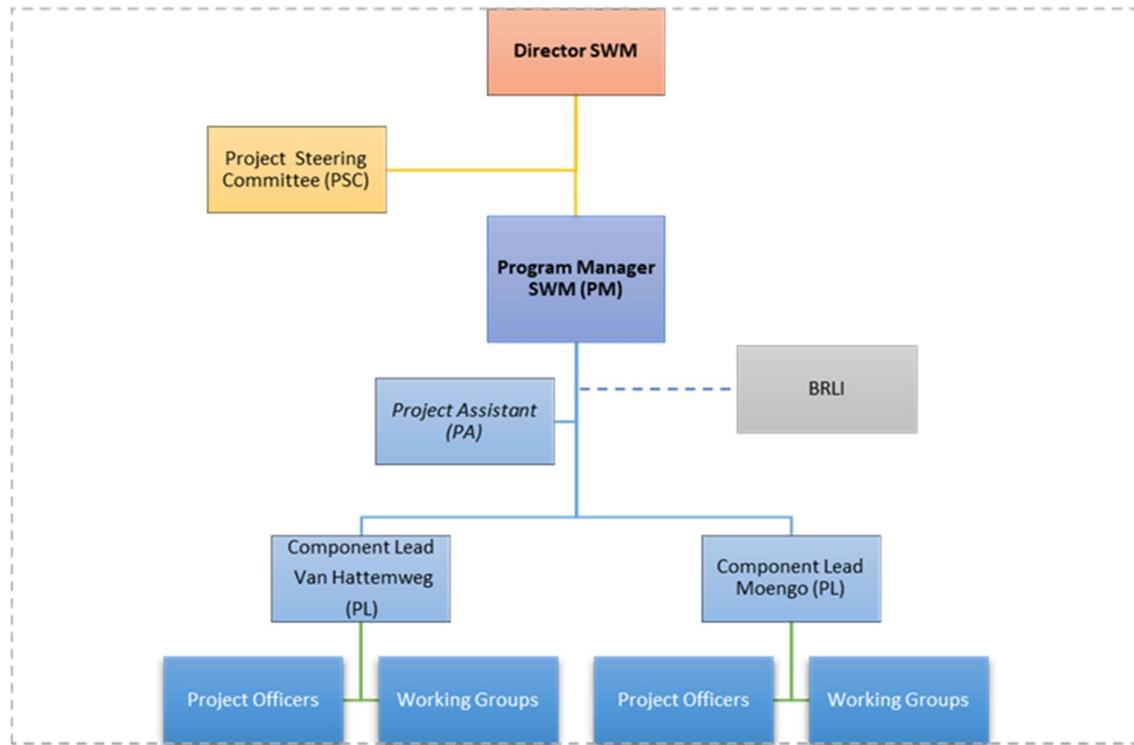
- Plant Manager WTP and water distribution system;
- Consultant's Site Engineer: To be nominated at Works Contract Commencement.

A flow diagram for the responsibilities during the project phase is shown in Figure 3-1 below.

See for further details the Impact management tables for components 1 and 2.



Figure 3-1 Flow diagram for the responsibilities during the project phase





4 ENVIRONMENTAL TRAINING

The following personnel has received or will receive specific training on environmental and social aspects in order to better manage and mitigate possible negative impacts of the project and future operations (Table 3-1).

Table 4-1 – Overview of personnel to be trained

Personnel	Training completed	Training needed	Remarks
SWM general management and PIU	Environmental Review Stakeholder Engagement	None	Regular workshops in response to changes.
VHW WTP site operator	Basic Safety Water Safety Plan (to guarantee water quality)	None	None
VHW chemicals operator (chlorine)	Work Instructions on chlorine use, Hygiene training	None	People from HSEQ
Moengo WTP operator (flocculants, Electrolytes)	Basic Safety (BVK, Basis Veiligheids Kunde) Water Safety Plan (to guarantee water quality)	Training HAZOP	For dealing with cyanide
Subcontractors construction and demolition	Basic Safety (BVK, Basis Veiligheids Kunde)	ESIA aspects for working in close collaboration with operators (SWM) on greenfield (Moengo) and brownfield (VHW) water production and distribution sites Training HAZOP	For dealing with cyanide
HSEQ staff	Basic Safety (BVK, Basis Veiligheids Kunde) Middelbaar veiligheidskunde (MVK), one year training	Training HAZOP	For dealing with cyanide



Training and info for Visitors	Specific to the visitor	Induction; basic safety and hygiene	For every visitor to the plant
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See table Impact management Component 1 and 2.



5 EMERGENCY CONTACTS AND PROCEDURES

For environmental social and health emergencies related to SWM operations, construction works, demolition works and transportation activities of drinking water or materials, the contact information as shown in Table 5-1 is applicable:

Table 5-1 – Emergency contacts

Location	Drinking water quality	Personnel accidents	Accidental chemical spills and discharges	Fire
Paramaribo	SWM Call center: 129 SWM customer service Paramaribo: 471414 WhatsApp: +597 8893434	In case of injury or death: Ambulance & Police Ph: 115, 117	NCCR Ph: 520840 SWM-HSEQ Ph: 471414 CUG Head/Employee: 8443609 / 8923506	Fire brigade Ph: 110 SWM-HSEQ Ph: 471414 CUG Head/Employee: 8443609 / 8923506
Moengo	SWM Call center: 129 SWM customer service for Moengo: +597 341296 WhatsApp: +597 8893434	In case of injury or death: Ambulance & Police Ph: 115, 117	NCCR Ph: 520840 SWM-HSEQ Ph: 471414 CUG Head/Employee: 8443609 / 8923506	Fire brigade Ph: 110 SWM-HSEQ Ph: 471414 CUG Head/Employee: 8443609 / 8923506
Villages	SWM customer service for Moengo: +597 341296 WhatsApp: +597 8893434	In case of injury or death: Ambulance & Police Ph: 115, 117	NCCR Ph: 520840 SWM-HSEQ Ph: 471414 CUG Head/Employee: 8443609 / 8923506	Fire brigade Ph: 110 SWM-HSEQ Ph: 471414 CUG Head/Employee: 8443609 / 8923506

Description of emergency procedures are included in the SWM Safety Plan.



6 AUDIT AND REVIEW

The procedures and training schedules (Table 6-1) related to environmental, social and safety aspects of the operation, construction/demolition works, and the distribution of drinking water will be periodically audited and reviewed according to the following schemes.

Table 6-1 – Procedures and Training schedules

	Environmental management	Labour and occupational safety	Drinking water quality
Type of scheme applicable	ISO 9001 (SWM, 2018) SWM company regulations (<i>Bedrijfsregels van SWM</i>) Safety book (<i>veiligheidsboek</i>) Quality Policy (<i>kwaliteitsbeleid</i>)	SWM company regulations (<i>Bedrijfsregels van SWM</i>) Safety book (<i>veiligheidsboek</i>) Quality Policy (<i>kwaliteitsbeleid</i>)	WHO regulations SWM target values
Unit or personnel involved	HSEQ		SWM Laboratory
External/internal audit	Inspections by HSEQ inspector		SWM internal auditors External: KIWA*
Frequency	At least annually, more in case of specific reason		Monthly
Approved by	Internally, by HSEQ officer		Head of SWM laboratory

* Kiwa is a Dutch company in the testing, inspection and certification (TIC) sector, providing testing, inspection, certification, consultancy and training services across various markets, including built environment, (cyber) security, renewable energy, food, feed & farm, water and health care.



7 ENVIRONMENTAL IMPACTS, RISK AND MITIGATION

7.1 OVERALL PRESENTATION

The impacts to the environment of project components 1 and 2 are mostly limited to the emission or discharge of small quantities of non-hazardous substances to the air, water and soil. The emitted or discharged components do not form a direct hazard to the surrounding environment, human health or surface water qualities. The substances in question are not regulated by National or local legislation and the proposed processes are internationally common practice.

Potential impacts and risks are especially related to malfunctioning of the installations or unforeseen situations. For the impacts and risks monitoring actions and responsibilities were defined, in order to register, control, prevent and mitigate the possible impacts.

Per project component (WTP Van Hattemweg, Wells Van Hattemweg and WTP and distribution Moengo) the following information is presented:

- environmental impacts in the existing situation and the new situation (not applicable, 'n.a.' is indicated in case no impact exists);
- the significance of each impact assessed as per the methodology described in section 7.2;
- required monitoring actions;
- foreseen mitigation measures;
- responsibilities within the SWM organization and necessary training to prevent impacts.

The potential impacts per location are subdivided per project phase:

- building phase;
- operational phase;
- closing down phase (if applicable).

The following impacts and aspects were taken into consideration for each phase:

- solid waste;
- receiving water quality/effluents;
- soil contamination;
- emissions to the air;
- ground water resources;
- noise and vibrations;
- soil erosion;
- clearing of vegetation;
- aesthetics/landscape;
- disruption of current land use;
- archaeological and Cultural resources;
- labour safety;
- labour force;
- resettlement;
- health;
- calamities, unforeseen events.



7.2 IMPACT ASSESSMENT METHODOLOGY

For key potential impacts the environmental and social assessment relied on the following methodology to determine the significance of each impact, based upon qualitative or quantitative assessment of the following:

- Magnitude
- Geographical scale
- Duration
- Probability of occurrence

The resulting impact was indicated by their significance class, which classes are defined as:

- **Major (significant) effect:** effect expected to be permanent or continuous and non-reversible on a national scale and/or have international significance.
- **Moderate (significant) effect:** long-term or continuous effect, but it is reversible and/or it has regional significance.
- **Minor (not significant) effect:** effect confined to the local area and/or of short duration, and it is reversible.
- **Negligible (not significant) effect:** effect not detectable.
- **Unknown effect:** insufficient data available to assess the significance of the effect.

In addition, impacts were classified as

- Positive: indicating whether the impact will have a positive (beneficial) effect; or
- Negative: indicating whether the impact will have a negative (adverse) effect on the environment, including affected people

The **significance** of an impact is defined as a combination of the **severity** of the impact occurring and the **probability** that the impact will occur. The significance of each identified impact was rated per the methodology set out below:

First the intensity/magnitude/size, scale and duration of the impact were determined according to Table 7-1, Table 7-2, Table 7-3).

Table 7-1 - Defining the intensity / magnitude / size of the negative impacts

RATING	DESCRIPTION OF RATING FOR		
	Natural environment	Socio-cultural	Health/safety
High (H)	Irreversible damage to highly valued species, habitats or ecosystems	Irreparable damage to highly valued items of cultural significance, or social functions or processes are severely altered	Event resulting in loss of life, serious injuries or chronic illness; hospitalization required
Medium (M)	Reversible damage to species, habitats or ecosystems	Repairable damage to items of cultural significance, or impairment of social functions and processes	Event resulting in moderate injuries or illness; may require hospitalization
Low (L)	Limited damage to biological or physical environment	Low-level damage to cultural items, or social functions and processes are negligibly altered (nuisance)	Event resulting in annoyance, minor injuries or illness, not requiring hospitalization



RATING	DESCRIPTION OF RATING FOR		
Negligible (N)	No relevant damage to biological or physical environment	No damage is done to cultural items and social functions and processes are not altered	Event is not experienced by receptors or only occasional minor annoyance

Table 7-2 - Defining the intensity / magnitude / size of the positive impacts

RATING	DESCRIPTION OF RATING FOR		
	Natural environment	Socio-cultural	Health/safety
High (H)	Direct benefits to species, habitats and resources with significant opportunities for sustainability	Benefits to local community and beyond	Health and safety will be significantly improved
Medium (M)	Moderate benefits to species, habitats and resources with some opportunities for sustainability	Benefits to many households or individuals	Health and safety will be improved
Low (L)	Minor benefits to species, habitats and resources with possible opportunities for sustainability	Benefits to few households or individuals	Health and safety will be slightly improved

Table 7-3 - Defining duration and scale of the impact

RATING	DEFINITION OF RATING
<i>Duration– the time frame for which the impact will be experienced</i>	
Short-term (ST)	Up to 1 year
Medium-term (MT)	1 to 10 years
Long-term (LT)	More than 10 years
<i>Scale– the area in which the impact will be experienced</i>	
Small (SS)	Localized spot
Medium (MS)	Part of study area
Large (LS)	Study area or beyond

Then, the **Severity Rating** of the impact was determined by combining the **magnitude** of the impact with **duration** and **scale** of the impact (Table 7-4) as set out below.

Table 7-4 - Determination of the Severity Rating of the impact

MAGNITUDE	HIGH	MEDIUM	LOW	NEGLECTIBLE
Duration and/or Scale				
LT-LS, LT-MS or MT-LS	High (H)	High (H)	Medium (M)	Negligible (N)
LT-SS, MT-MS, MT-SS, ST-MS or ST-LS	High (H)	Medium (M)	Low (L)	Negligible (N)
ST-SS	Medium (M)	Low (L)	Negligible (N)	Negligible (N)

The next step was to define the **probability** of an impact to occur, as defined below (Table 7-5).



Table 7-5 - Defining the probability of the impact

PROBABILITY– THE LIKELIHOOD OF THE IMPACT OCCURRING	
High (H)	Sure to happen, or happens often
Medium (M)	Could happen, and has happened in Suriname before
Low (L)	Possible, but only in extreme circumstances

Finally, the overall **significance** of the impact was determined as explained below (Table 7-6).

Table 7-6 - Determination of the overall Significance of the impact

SEVERITY	HIGH	MEDIUM	LOW	NEGLIGIBLE
Probability				
High	Major (MA)	Moderate (MO)	Minor (MI)	Negligible (N)
Medium	Major (MA)	Moderate (MO)	Minor (MI)	Negligible (N)
Low	Major (MA)	Minor (MI)	Negligible (N)	Negligible (N)



7.3 IMPACT ASSESSMENT

7.3.1 IMPACTS EXISTING SITUATION COMPONENT 1

Existing environmental impacts WTP Van Hattemweg:

- H₂S and CH₄ are emitted in small quantities inside the building. Poor ventilation leads to high concentrations for the workers and corrosion of steel constructions. No detection devices are present. Overall emissions outside the building are very low, no odour complaints received by neighbours;
- Chlorination unit free accessible, forming a risk from occupational health point of view;
- The sedimentation pond for backwash water and sludge is in poor condition, causing leakage to the subsoil;
- The overflow of the pond is discharged continuously into a small canal connected to other surface waters. Sludge containing Manganese and Ferro-oxides is removed from the pond and deposited on land and in the same area. The sand from the filters is renewed once a year and dumped on site. Manganese and Ferro-oxides are not considered harmful for the environment. The volumes are low and no hazardous components are present in this sand;

Existing Environmental Impacts Extraction wells Van Hattemweg

- About 2 kilometres SSW of the Van Hattemweg extraction locations there is an old spoil area of Suralco mining activities. The location is now in use as a residential area (since 1969). The deposited material in principle is not harmful because it consists of the natural top soils that were removed before mining started. SWM has been extracting water from the Van Hattemweg boreholes since a very long time reportedly without problems of contamination of its groundwater wells, although, sporadic pollutions have been revealed by past water quality analysis (aluminium, lead).
- The monitoring of the intake water is insufficient and not done on a regular basis;
- The existing wells are rather unprotected in public areas right next to the road with a risk of conflicting littering and waste dump;
- SWM has carried out analyses of the raw water. One test indicated a too high Pb level in one sample, but further testing did not confirm these high levels. The source of the lead contamination is not known and doubts exists whether actually lead was detected or that this was an imprecise analysis of the laboratory. Concentrations of lead in the first sample were detected above the WHO threshold of 10microgram/litre. Aluminium traces were another concern but detected levels were within the WHO limits. It is unknown where these traces of Pb and Al originate from. For aluminium it is possibly a natural phenomenon since the area is very rich in bauxite and aluminium. Former mining activities of Suralco near the Van Hattemweg might be another source. No soil investigation reports about the soil quality in the possible area of influence of the wells are available. Therefore it cannot be predicted whether these traces can be expected again in the future. Laboratories in Suriname are not well equipped for heavy metal detection and measuring. None of the labs is certified for ISO/IEC 17025:2005. FILAB is the entity that does most of the sampling and analysing for the mining sector.

7.3.2 IMPACTS NEW SITUATION COMPONENT 1

- The impacts on natural surroundings and aesthetics will be insignificant. The building will remain in the same location and will have similar dimensions. A small aeration tower will be built next to the main WTP building;
- During construction the possible negative effect of disruption in water supply will be reduced by appropriate phasing of the rehabilitation works and the installation of temporary containerized filter units. There might be some negative effects on the water supply during construction but those will be minimized as much as possible by this back up system.
- The **environmental impacts** of the renewed treatment processes will be very similar to those in the existing situation:



- H₂S and CH₄ emissions in total will remain the same but will be emitted outside of the WTP building, this way no longer forming a risk for workers in the building. The emission will be very limited in absolute quantities. The small amounts of CH₄ and H₂S which form a natural part of the groundwater (in terms of several micrograms per cubic meter) will be emitted to the environment, as is common practice worldwide;
- A new genset 1,000KVA will replace the old genset with the same capacity;
- The existing sludge and overflow water quantities will remain the same amount and quantities as in the present situation. Although there is no legal restriction for discharging this sludge and process water into the environment, SWM operates settling ponds to reduce the TSS. The reference discharge standards of WB are respected (see Annex 2) by sufficient retention time in the reservoirs (9h). Regular maintenance and sludge removal will guarantee the compliance with the TSS discharge standards.
- **The Social aspects** related to the renovation are insignificant since no changes are foreseen compared to the existing situation.

The table below summarizes the impacts and measures foreseen for Component 1.

Table 7-7 Impacts and measures foreseen for Component



COMPONENT 1: WTP VAN HATTEMWEG										
<i>Environmental Aspect/risk</i>	Existing situation	New situation	Intensity	Duration and/or scale	Severity	Probability	Significance	Monitoring	Mitigation/compensation	Responsibility/training
CONSTRUCTION PHASE										
Solid waste	n.a.	Formation of construction and demolition waste.	N	ST-SS	N	H	N	It will be verified that construction company collects all waste material and nothing will be left at the location or dumped illegally. Waste disposal will take place according legislation.	Construction and demolition waste will be collected and brought to recycling companies and the rest fraction to the landfill at Ornamibo.	Conditions in contract with subcontracted construction company. SWM requires sound environmental practices in the contract with the constructor and transporter. SWM environmental manager. SWM plant manager. Consultant's Site Engineer (supervisor)
Effluents/Receiving water quality	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Soil contamination	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Emissions to the air/Air quality	n.a.	Minor emissions from trucks and construction vehicles can be expected, as well as some dust emission due to ground levelling and excavation works.	N	ST-SS	N	H	N	n.a.	n.a.	n.a.
Ground water resources	n.a.	n.a.					n.a.	n.a.	n.a.	n.a.
Noise and vibrations	n.a.	Temporary noise of trucks and construction activities.	N	MT-SS	N	H	N	Time frames for construction works and truck movements will be controlled.	Truck movements and heavy construction activities will only take place during regular working hours.	Conditions will be laid down in contract with subcontracted construction company. SWM plant manager and Consultant's Site Engineer will check compliance.
Soil erosion	n.a.	Construction of pipelines along the road can cause minor erosion.	N	ST-SS	N	H	N	Correct covering will be checked after completion.	The excavations will be covered immediately and vegetation will grow fast in this climate.	Condition will be laid down in contract with construction company. Consultant's Site Engineer will check compliance.
Clearing of vegetation	Grass field on the premises of SWM	Building on premises.	N	LT-MS	N	H	N	n.a.	n.a.	n.a.
Labour Safety	n.a.	General occupational risks workers	N	MT-MS	N	H	N	It will be verified that the subcontracting company works only with skilled workers and that regular safety gear is available.	n.a.	Condition will be laid down in contract with subcontracted construction company. Workers must be trained by the subcontracting company.

COMPONENT 1: WTP VAN HATTEMWEG										
<i>Environmental Aspect/risk</i>	Existing situation	New situation	Intensity	Duration and/or scale	Severity	Probability	Significance	Monitoring	Mitigation/compensation	Responsibility/training
										SWM plant manager and Consultant's Site Engineer check compliance.
Aesthetics/landscape	Grass field on the premises of SWM	Building on the premises of SWM. No significant change in landscape except for small aeration tower.	N	LT-MS	N	H	N	n.a.	n.a.	n.a.
Disruption of current land use	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Labour Force	n.a.	Temporary extra work for construction sector.	M	ST-SS	M	H	MO	Positive Impact	Positive Impact	Positive Impact
Resettlement of population	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Archaeological and Cultural resources	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Health	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Calamities, unforeseen events	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
OPERATIONAL PHASE										
Solid waste	Sand and shell filters waste settles in the pond. The pond is dredged periodically and the material is deposited on site. Also the sand from the filters is replaced every year and is deposited on site. The sludge and the sand contain Manganese oxides and Ferro-oxides. These material are not harmful from an environmental point of view. Manganese and Ferro-oxides are natural chemical substances present in the ground water.	Same situation, the quantities will remain the same.	L	LT-SS	L	H	MI	The levels of sludge and well-functioning of the will be carried out by visual inspection. (daily)	The ditch will be cleaned from vegetation every months in order not to obstruct the flows. Sludge levels on the bottom of the pond will be maintained at acceptable levels to prevent excessive overflow. The Sludge will be deposited at Ornamibo dumpsite. The pond will be recovered at the bottom with HDPE to make it impermeable again and to prevent direct intrusion in the subsoil near the creek.	SWM plant manager. SWM Environmental manager responsible for control compliance. SWM plant manager. SWM Environmental manager responsible for control and compliance.



COMPONENT 1: WTP VAN HATTEMWEG										
<i>Environmental Aspect/risk</i>	Existing situation	New situation	Intensity	Duration and/or scale	Severity	Probability	Significance	Monitoring	Mitigation/compensation	Responsibility/training
Effluents/Receiving water quality	<p>Overflow liquid from the settling pond, containing Manganese, Ferrooxides. Respectively 1300 m3/day for the sand filters backwashing, 1300m³ per 2 months for the shell filters. This equals to 35% of the total water flow in the WTP. These natural materials are not considered harmful for the aquatic environment. TSS can be high.</p>	<p>Same situation with double quantities of backwash waters. TSS of the overflow water can be high. There are no legal limits for turbidity or TSS in the discharges.</p>	L	LT-SS	L	H	MI	<p>Measure TSS in overflow water (weekly).</p>	<p>Emptying of sludge pond will take place more frequently than in the actual situation to prevent the pond to fill up and overflow before complete settling has taken place.</p>	<p>SWM plant manager check compliance and takes action as soon as sludge level is high. SWM environmental manager supervises.</p>
Soil contamination	<p>Diesel tank. The tank is equipped with cathodic protection and constructed in secondary containment to prevent soil pollution in case of leakage or spill. Leakage of diesel to the soil is a serious contamination which will spread through the soil and might contaminate aquifers. Spillage at the time of filling the tank could cause soil pollution.</p>	<p>Same diesel tank will stay in function. No extra capacity needed. In case new diesel tank will be installed this will also be in secondary containment and with cathodic protection.</p>	H	LT-SS	H	L	MI	<p>Diesel tank condition will be controlled monthly to ensure impermeability and absence of corrosion.</p>	<p>The tank will be equipped with overfill detection to prevent spillage.</p>	<p>Provider of the tank takes care of proper and certified protection and installation. SWM plant manager checks compliance. SWM plant manager responsible for overfill and spill control</p>



COMPONENT 1: WTP VAN HATTEMWEG										
<i>Environmental Aspect/risk</i>	Existing situation	New situation	Intensity	Duration and/or scale	Severity	Probability	Significance	Monitoring	Mitigation/compensation	Responsibility/training
Emissions to the air/Air quality	H ₂ S and CH ₄ from WTP due to aeration are emitted within the building resulting in high concentrations for the workers and corrosion of steel construction. Free ventilation of these gases takes place into the atmosphere. The total amounts can be considered insignificant quantities for acidification and climate change effects. No odour complaints have been received from neighbours	Aeration step will be built outside the filter house as preliminary step. The emissions to the environment will remain the same, but will remain insignificant. Given the distance to neighbouring houses the dispersion is expected to be sufficient to prevent nuisance from the H ₂ S and CH ₄ smell as was the case in the past years.	N	LT-SS	N	M	N	n.a.	n.a.	n.a.
Ground water resources	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Noise and vibrations	Immediate neighbours currently experience noise pollution from venting of the filters when they are clogged, especially in the mornings.	If the rehabilitated system is less noisy, the project may resolve this small nuisance.	L	LT-SS	L	M	MI	Positive impact	Positive impact	N.a.
	Plant upgrade requires construction	Regular construction noise and vibrations due to construction activities	L	ST-SS	N	H	N	<ul style="list-style-type: none"> Number of project related complaints received by customer relations Complaints-log 	<ul style="list-style-type: none"> Grievance mechanism must be in place to ensure that complaints are addressed rapidly and adequately. No construction activities in early morning (prior to 8am) or late (after 18h), no construction activities on Sundays. Adhere to International standards with regard to noise pollution. 	SWM plant manager will cope with unforeseen complaints.
Soil erosion	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Clearing of vegetation	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Labour Health & Safety – SWM workers	Concentrations of H ₂ S and CH ₄ within the building are high causing unhealthy conditions	The new aeration system will be an openair system, the gas will be released in the atmosphere and no longer inside the building. There is no health risk for workers in the new installation.	M	LT-SS	M	M	MO	In the existing building; install automatic detectors and alarm system for too high concentrations of H ₂ S and CH ₄ .	For new situation not applicable.	SWM plant manager will install detectors immediately
	Chlorination unit free accessible							Monthly safety check of tank and fences.	Chlorination unit in well confined area. secondary containment installed.	SWM environmental and Safety manager.



COMPONENT 1: WTP VAN HATTEMWEG										
<i>Environmental Aspect/risk</i>	Existing situation	New situation	Intensity	Duration and/or scale	Severity	Probability	Significance	Monitoring	Mitigation/compensation	Responsibility/training
										Workers receive short training on how to handle chlorine products.
Labour Health & Safety – temporary construction workers	Construction workers are exposed to regular construction risks, including falling objects, and injuries related to handling tools and machinery	Working to create a safe work place. Goal of Zero accidents.	M	ST-SS	L	L	N	<ul style="list-style-type: none"> Health-Safety-Environment inspector appointed and available on site during construction works. HSE logs Vehicle check documents Insurance documents 	During construction: <ul style="list-style-type: none"> Ensure that all workers have and wear PPE. Discuss work safety during toolbox meetings and safety shares. Only properly certified contractors and workers for specific tasks. All vehicles and tools must have been checked and certified safe/in good condition. Contractors and workers must carry adequate insurance (health, liability, accidents) 	Responsible: HSE manager of SWM and HSE manager of contractor Training: all workers must have followed regular construction related HSE training.
Aesthetics/landscape	n.a.	One extra building on the premises of SWM.	N	LT-MS	N	H	N	n.a.	n.a.	n.a.
Disruption of current land use	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Labour Force	n.a.	No extra personnel foreseen for the extended activities on site.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Archaeological and Cultural resources	None have been identified	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Health	Drinking water is produced for human consumption	Drinking water is produced for human consumption	H	LT-MS	H	H	MA	Produced drinking water quality will be monitored daily . The following parameters are checked (pH, HCO ₃ , Turbidity, DO, Nitrite, Nitrate, Ammonium, Chloride, Aluminium, Iron, Manganese, LSI, TDS) every day	In case of too high concentrations production will be stopped immediately until concentrations can be guaranteed again. Same procedures as applicable in present situation	SWM plant manager is responsible for daily measurements.
Calamities, unforeseen events	Contamination of produced drinking water.	Contamination of produced drinking water.	H	ST-LS	H	L	MA	Bacteriological infected water is detected.	Chlorination of the drinking water will take place in case of detected bacteriological contamination.	SWM plant manager is responsible to take action in case measurements indicate the need for chlorination. SWM Environmental manager responsible for actions to take.

COMPONENT 1: WTP VAN HATTEMWEG										
<i>Environmental Aspect/risk</i>	Existing situation	New situation	Intensity	Duration and/or scale	Severity	Probability	Significance	Monitoring	Mitigation/compensation	Responsibility/training
								Other contaminants detected above permissible standards .	Emergency instructions, covering calamities such as spills of diesel, chlorine or other labour safety risks must be in place.	
CLOSE DOWN OF FACILITIES										
<i>N.a.</i>	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.



7.3.3 IMPACTS EXISTING SITUATION COMPONENT 2

Existing environmental impacts WTP

- The backwash waters contain sludge with traces of coagulation-flocculation materials: $AlSO_4$ polymers, natural sediments and organic material from the river together with manganese- and Ferro-oxides removed from the drinking water.
- The sludge is discharged without treatment into the river. This is common practice, and no adverse impacts are expected for the aquatic ecosystem. However, in the future situation it is recommended to dry the sludge and deposit on land.
- A small chlorination unit is present in the WTP building. This unit is not very safe from an occupational health point of view.

Environmental and health aspects of the present water intake

- Some oily contamination in soil and in the river near the actual intake point was detected in the past, probably resulting from accidental spills at the power station. The original water intake was led by pipe from the river downstream the power plant to the WTP. After oil leakage was detected, a bypass was installed around the power plant to prevent intrusion in the pipes downstream the building. Also, the water intake in the river was lowered, so no longer water from the surface (with floating oil) was pumped in. The oil contamination was not detected anymore after these measures were implemented.
- About 5 kilometres south of the plant and about 3 kilometres east of the Cottica river is a small uncontrolled waste dump. Given the distance from the WTP and the distance to the Cottica river there is no reason to assume that leakage from this dump might negatively impact the water qualities at the intake.
- Run off from former Suralco activities and harbour activities where Arsenic materials were shipped are located downstream of the water intake point and do not affect the quality of the raw water. In the event of calamities with Cyanide spills in combination with a reverse flow in the river, direct communication with SWM takes place to stop water intake on time as part of the existing control measures. Other calamities such as the presence of faecal matter from livestock or leaking septic tanks will form a risk for the water intake which must be mitigated by existing and improved warning systems. This will not change in the new situation. BRLi has taken one grab sample of raw water. No harmful elements were detected above the WHO threshold levels but the current knowledge of Cottica River's water quality should be supplemented with SWM's water quality analysis monitoring campaign.
- Tidal effects in the Cottica river exist and the river flow changes due to these influences, however, no salt intrusion takes place.
- At neighbouring Traymore harbour facilities cyanides for Newmont are unloaded from vessels. Before this used to be transported by truck from Paramaribo to Newmont. This discharging at the harbour is a risk to take into account. Cyanide is heavily toxic material and spills into the river should never reach the water intake of SWM.

Existing Water distribution to the villages

- Ricanaumfo, Abadukondre, Benati Mofo and Akale Kondre were connected to the SWM grid in 2020. Apart from a few exceptions, households do not receive SWM water directly in the home, but they have a single tap on their plot, in front of the house. Households continue to rely on rain water and river and creek water for household uses such as bathing and washing dishes and clothes to reduce their SWM water bills. In addition, especially for women, going to the creek or river to perform household chores has strong cultural significance.



- Kraboe Olo, Mora Kondre (incl. Pati Kondre), and Pelgrim Kondre, though connected to the SWM grid in 2020, do not receive piped borne water supply due to insufficient supply capacity at the existing Moengo WTP. Houses are supplied by means of rain water harvesting and, primarily in the dry season, creek and river water. Rainwater harvesting systems are often of questioning quality and not in line with basic health requirements. In Ovia Olo (also connected to the SWM grid in 2020 but which does not receive piped borne water) virtually all households have a well-designed system to collect water from Zinc roofs into HDPE tanks. In all villages it was reported that the SWM water truck rarely visits the villages.
- The school of Pelgrim Kondre relies on rain water harvesting.

7.3.4 IMPACTS NEW SITUATION COMPONENT 2

Impacts of the new WTP and water intake

- The construction works of the new plant will have temporary and no significant environmental impacts. Standard practices for excavating and disposal of construction waste will be followed (separation, recycling, controlled dumping).
- Some truck movements and extra noise will occur during construction and operation, together with some dust formation, but this will be temporarily and of no significant magnitude. Given the size of the works this will be insignificant from an environmental point of view and only for a short period. There are no direct neighbours.
- The amount of sludge discharge to the river will rise proportionally with the extended production volume. The composition of the sludge will remain unchanged, not leading to any significant environmental impacts to the River and no legal standards restrict the discharge to the river. The reference discharge standards of WB are respected (see Annex 2) by sufficient retention time in the reservoirs (4.5). Regular maintenance and sludge removal will guarantee the compliance with the TSS discharge standards.
- For a new installation the most environmentally friendly practices should be applied. Depositing of the sludge on land in a dumpsite or sanitary landfill is therefore recommended.
- In case of demolishing the old plant and tower, the recyclables must be separated from the rest fractions. Rest fractions must be brought to the dumpsite near Moengo.
- The premises of SWM need to be extended for the construction of the new plant. A road that presently crosses the new area needs to be closed and a new road around the premises needs to be constructed. Direct access to the river bank needs to be obtained. This will involve some insignificant temporary construction noise and dust production.
- The extended water intake for the new plant will have no negative effects on the flow of the Cottica river which is a large river and the intake will be insignificant as compared to the total flow.
- The new intake point will be around 500 meters up streams for which a pipeline needs to be laid under the existing unpaved road next to the river. Only temporary construction impacts are to be expected.
- No social impacts are to be expected, no reallocation of people is needed.

Impacts of new distribution to Moengo and nearby Cottica Ndyuka villages

Environmental

- The most serious environmental/health risk associated with distribution networks is the maintenance of adequate pressure to protect water quality in the system in order to prevent any intrusion of possible contaminants, e.g. from septic tanks.
- The proposed Project activities are not expected to have negative impacts on the environment, as long as standard practices for excavation and covering will be followed and produced waste will be collected and deposited at the dumpsite. The only foreseen environmental impacts are related to minor construction works and some occasional truck movements. There are no specific protected areas or locations of particular high natural interest along the planned pipeline sections.



- The produced water will be distributed to the town of Moengo through the existing pipeline systems. This will have no further environmental impacts. There will be minimal pipeline rehabilitation works in the town of Moengo along existing roadways (800m of DN150 between Moengo and Wonoredjo in replacement of an existing DN100 main and renewal of 500m of existing old DN100 mains). Works will be carried out at non peak traffic hours with an approved traffic management plan and with minimal disruption to commuters and neighbours.

Social

- Four villages – Mora Kondre (incl. Pati Kondre), Kraboe Olo, Pelgrim Kondre, and Ovia Olo – as well as the nearby Kampus – Koenersi Kampu, Maikel Kampu, Leewanie Kampu – are connected to the SWM grid through existing pipelines (but house connections not yet done) though they do not receive water supply due to insufficient supply capacity. As part of the project, air valves and wash outs will be constructed along these existing pipelines to avoid air locks and allow regular purges. In addition, water towers (between 25m³ and 150 m³ capacity each) of approximately 25m in height will be constructed at Ricanaumofu, Benatimofu, Mason Town and Ovia Olo to ensure supply continuity, and 2 booster stations will be placed at strategic locations along the pipeline leading to the villages in the south.
- The villages Ricanaumofu, Abadukondre, Benati Mofo and Akale Kondre, are already connected to the SWM grid and receive irregular water supply. Supply to these villages will be improved by constructing water towers and by the construction of air valves and wash outs along the existing pipelines (see above).
- The most serious social risk is social unrest in local communities due to unmet expectations, which can result in protests (e.g. road blocks), aggression, and/or negative publicity. Social unrest may arise as a result of the following conditions:
 - Some villages near the target areas, such as Dantapoe, Kasaba Ondro, and Patamacca, are not included in the Project. Residents of these villages may feel unfairly treated by SWM. While the Project design includes water truck deliveries to these areas, trucked water is significantly more expensive than piped water. Additionally, past trucked water deliveries have been infrequent.
 - Residents of the connected villages north and west of Moengo (Ricanaumofu, Abadukondre, Benati Mofo, and Akale Kondre) have reported concerns about SWM water quality. They claim the water sometimes contains visible particles, appears brownish or chalk-white, and occasionally has foam. If water quality does not improve, and newly connected communities experience similar issues, they may perceive that they are receiving lower-quality service compared to urban areas.
 - Residents in the connected villages have also reported unusually high water bills, despite using minimal amounts of SWM water. Without a clear explanation for these charges, there is a risk that villagers may feel they are being treated unfairly.
 - The southern villages will be connected through community water taps instead of per-household water taps. They will receive the SWM water for free. This disparity may become a source of discontent.
- No involuntary resettlement is foreseen.

The table below summarizes the impacts and measures foreseen for Component 2

Table 7-8 Impacts and measures foreseen for Component 2

COMPONENT 3: WTP AND DISTRIBUTION SYSTEM MOENGO										
Environmental Aspect/risk	Existing situation	New situation	Intensity	Duration and/or scale	Severity	Probability	Significance	Monitoring	Mitigation/compensation	Responsibility/training
CONSTRUCTION PHASE										
Social: unmet expectations	Residents of the southern communities (Mora Kondre, Kraboe Olo, Pelgrim Kondre, and Ovia Olo) were previously promised a connection to the SWM grid, but it never materialized. As a result, they may be sceptical of the project and/or frustrated by past unmet expectations. People in Ricanaumofu, Abadukondre, Benati mofo and Akale Kondre are receiving SWM water of variable quality. This condition may generate discontent with SWM, and a perception of being disadvantaged.	With good communication and tangible achievements, people will gain trust in the project.	M	LT-MS	M	H	MO	Positive impact: trust in the Project and in SWM.	Communication must be accessible to all communities, using formats and languages they understand. The project communication team must carefully manage expectations, especially for villages that are not included in the Project. The PIU must establish a grievance mechanism and a clear point of contact for residents with questions or concerns. Measures should be in place to ensure political changes do not impact the Project's outcomes. Community-based water monitoring can help build trust between communities and SWM while reinforcing a positive image of SWM.	Communication team BRLi and SWM must work together for effective Stakeholder Engagement during Project construction. Contractor Stakeholder Engagement Plan must explicitly incorporate local communities. In the operational phase, SWM must be in regular contact with village representatives to monitor water quality, pressure, and use.
Solid waste	n.a.	Construction waste will be generated at WTP.	N	ST-SS	N	H	N	It will be verified that construction company collects all waste material and nothing will be left at the location or dumped illegally. Waste disposal will take place according legislation.	All construction waste will be separated in recyclables and rest fractions which will be brought to the dumpsite.	Laid down in contract with subcontracted construction company. SWM plant manager and Consultant's Site Engineer. supervise and inspect.
Effluents/Receiving water quality	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Soil contamination	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Emissions to the air/Air quality	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Ground water resources	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Noise and vibrations	n.a.	Temporary noise and vibrations due to construction activities.	N	MT-SS	N	H	N	Working hours and noise will be monitored daily .	Works will take place during regular working hours only. In Pelgrim kondre, where the school is situated, the contractor should consider working in holidays, weekends and/or after school hours (after 13h). Clear communication about to-be-expected noise pollution with affected local stakeholders.	Laid down in contract with subcontracted construction company, SWM plant manager and Consultant's Site Engineer checks for compliance.
Soil erosion	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Clearing of vegetation	n.a.	The new location does not have significant vegetation. SLo the construction of the new pipe to the water intake is under an existing road.	N	LT-MS	N	H	N	n.a.	n.a.	n.a.



COMPONENT 3: WTP AND DISTRIBUTION SYSTEM MOENGO										
<i>Environmental Aspect/risk</i>	Existing situation	New situation	Intensity	Duration and/or scale	Severity	Probability	Significance	Monitoring	Mitigation/compensation	Responsibility/training
Labour Safety	n.a.	Regular safety risks exist for construction and demolition workers.	N	MT-MS	N	H	N	n.a.	Workers should be equipped with adequate safety equipment.	Laid down in contract with construction company that construction personnel is supposed to be trained in safe working practices. Subcontracted construction firm is responsible. SWM plant manager and Consultant's Site Engineer check compliance..
Aesthetics/landscape	n.a.	The demolition of the plant next to the river will improve the scenery next to the river. The new plant is less visible from the bridge and riverside.	L	LT-MS	M	H	MO	Positive Impact	Positive Impact	Positive Impact
Labour Force	n.a.	Construction will involve a number of temporary working places for the local construction sector.	M	MT-MS	M	H	MO	Positive Impact	Positive Impact	Positive Impact
Resettlement of population	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Archaeological and Cultural resources	The water tower can be seen as a landmark with historic value.	The water tower is dismantled	L	LT-MS	M	H	MO	n.a.	Consultations should take place about the cultural value of the tower and form basis for decision.	SWM plant manager. Municipality of Moengo.
Health	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Calamities, unforeseen events	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
OPERATIONAL PHASE										
Improved health and wellbeing	Four villages are receiving water, but this water is not always of good quality (Racanaumofu, Abadukondre, Benati Mofo, Akale Kondre). Several other villages were promised a connection to the SWM grid but this never materialized.	Access to high-quality water will improve for the four villages north and west of Moengo. The villages south of Moengo—Mora Kondre (including Pati Kondre), Kraboe Olo, Pelgrim Kondre, and Ovia Olo—will be connected to the SWM grid. It is foreseen that Dantapoe, Kasaba Ondro, and Patamaka will be supplied by water truck. This improvement will have significant health benefits, reducing cases of	H	LT-MS	H	H	MA	Positive Impact	Positive Impact	Positive Impact



COMPONENT 3: WTP AND DISTRIBUTION SYSTEM MOENGO										
<i>Environmental Aspect/risk</i>	Existing situation	New situation	Intensity	Duration and/or scale	Severity	Probability	Significance	Monitoring	Mitigation/compensation	Responsibility/training
		diarrhea, stomach aches, and other waterborne illnesses, particularly among children. Additionally, having water available closer to home will ease the burden on the elderly, eliminating the need to walk to the river or creek for bathing and household chores.								
Social unrest due to feelings of being unfairly treated and unmet expectations	Four villages north and west of Moengo are receiving water, but this water is not always of good quality (Racanaumofu, Abadukondre, Benati Mofo, Akale Kondre). Several other villages were promised a connection to the SWM grid but this never materialized.	Dantapoe, Kasaba Ondro, and Patamaka will not be connected to the SWM grid, which may lead to discontent and potentially spark protests. Additionally, while southern villages will receive free SWM water through community taps, northwestern villages will be required to pay. This disparity could cause frustration and unrest among residents. If water quality in the northern and western villages does not improve, dissatisfaction may grow, increasing the risk of protests.	H	ST-SS	M	M	MO	Evaluation of concerns related to water supply in the Cottica Ndyuka villages in Grievance Redress Mechanism. Customer relations reports. Direct contact of PIU with Project villages to remain well-informed about tensions.	Communication must be accessible to all communities, in a format and language they understand. Project communication team must be very careful to not create false expectations, for example for the villages that are not part of this Project. PIU must have a grievance Mechanism and point of contact for people who have questions or concerns about the Project. Ensure that political changes will not affect Project outcome. For the first year of operation, hire one person in each Project community, who can collect questions, concerns, and experiences of the community, and communicate them to SWM. This will facilitate monitoring. Use a Grievance Redress Mechanism to ensure that ALL questions and concerns from community members are taken seriously, and resolved or properly addressed within 10 days.	
Solid waste	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Effluents/Receiving water quality	Discharge to Cottica river of sludge containing AlSO ₄ polymers, natural sediments and organic material from the river together with manganese and Ferro-oxides removed from the drinking water.	The amount will rise proportionally. The composition will be unchanged. No legal limits are available.	L	LT-SS	L	H	MI	Monitoring of concentration and turbidity weekly	Dumping of this sludge at Moengo's dumpsite. Especially to reduce TSS.	SWM plant manager. SWM environmental manager are responsible for the collection and transport of the sludge to the dumpsite.
Soil contamination	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Emissions to the air/Air quality	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Ground water resources	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Noise and vibrations	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Soil erosion	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Clearing of vegetation	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.



COMPONENT 3: WTP AND DISTRIBUTION SYSTEM MOENGO										
<i>Environmental Aspect/risk</i>	Existing situation	New situation	Intensity	Duration and/or scale	Severity	Probability	Significance	Monitoring	Mitigation/compensation	Responsibility/training
Labour Safety	n.a.	The small chlorine tank is not well protected and free accessible.	M	LT-SS	M	M	MO	Tank condition and fencing will be checked weekly .	The chlorine tank will be placed in a closed area.	SWM plant manager. Workers receive short safety training in working with chlorine.
Aesthetics/landscape	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Disruption of current Land uses	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Labour Force	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Archaeological and Cultural resources	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Health	n.a.	The pressure in the pipelines must be sufficient to prevent intrusion of water from outside.	H	ST-LS	H	L	MA	Pressure will be monitored through pressure gauge.	In case pressure falls, distribution will be stopped temporarily and pipes will be disinfected and flushed with clean water if intrusion of contaminated water was detected.	SWM plant manager
Calamities, unforeseen events	n.a.	Intake of contaminated water is a risk for the drinking water consumption. Cyanide spills at the Traymore harbour location	H	ST-LS	H	L	MA	Monitoring will include the parameters advised in table 4.2 of report D12 as well as heavy metals and will be carried out every 2 weeks Samples will be taken and checked at SWM and/or private laboratories. Continuous monitoring and alarm system will be installed.	An emergency plan is in place to stop water intake temporarily.	SWM plant manager. SWM environmental manager.
CLOSE DOWN OF FACILITIES										
Solid waste	n.a.	In case of decommissioning of plant and tower. Demolition waste will be generated.	L	ST-MS	L	H	MI	n.a.	All demolition waste will be separated in recyclables and rest fractions which will be brought to the dumpsite	Conditions laid down in contract with subcontracted construction company. SWM plant manager and Consultant's Site Engineer check compliance.
Soil contamination	n.a.	During demolition unforeseen soil contamination could be detected. Especially old diesel spills.	M	ST-SS	L	H	MI	Soil samples need to be taken and analysed.	If the soil is contaminated, the soil should be excavated and brought to an impermeable surface on the dump, or isolated so no further spreading can take place.	Laid down in contract with subcontracted construction company. SWM plant manager and Consultant's Site Engineer check compliance.
Soil erosion	n.a.	In case of demolition of the plant there is a risk for erosion on the left spot.	L	ST-SS	N	M	N	n.a.	Vegetation or grass should be planted to cover the surface asap.	Laid down in contract with subcontracted construction company. SWM plant manager and Consultant's Site Engineer check compliance.



COMPONENT 3: WTP AND DISTRIBUTION SYSTEM MOENGO										
<i>Environmental Aspect/risk</i>	Existing situation	New situation	Intensity	Duration and/or scale	Severity	Probability	Significance	Monitoring	Mitigation/compensation	Responsibility/training
<i>Labour force</i>	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.



8 ENVIRONMENTAL MANAGEMENT MEASURES

To properly manage the environmental and social impacts of the project construction and operational phase the mitigation measures as indicated in the forgoing tables will be implemented.

Most of these measures are standard operational measures which will be implemented in a continuous manner during operation.

Most important in this respect are:

8.1 VAN HATTEMWEG WTP

Chlorine at VHW

Proper handling and storage of the chlorine at the Van Hattemweg. Renewal of the chlorine tank will take place by specialised personnel only.

Backwash water

The pond for backwash water will be inspected regularly (weekly). It will be dredged periodically and the material deposited. The pond will also be inspected for clogging or leakage. The inlets and outlets of the ponds will be cleaned from vegetation every month in order not to obstruct the flows. Vegetation in the ponds is important to enhance sedimentation of solids. Sludge levels on the bottom of the pond will be maintained at acceptable levels to prevent excessive overflow. The Sludge will be deposited at Ornamibo dumpsite. The pond will be recovered at the bottom with a geomembrane to make it impermeable once again and to prevent direct intrusion in the subsoil near the creek.

Overflow water from the pond is discharged into the surface waters. The waters contain natural materials from the groundwater such as manganese- and ferro-oxides which do not do any harm to the environment or health. The solids, expressed in TSS will be measured weekly in order to ensure compliance with the reference concentrations as indicated in Annex-2.

Water supply guarantees during construction phase

The population making use of the drinking water produced at the WTP VHW will suffer some irregularities in water supply during the construction phase of the project (rehabilitation of the existing WTP). To minimise these effects, sequence of rehabilitation works will be carefully scheduled and containerised filter units will temporarily supplement the production of the existing WTP. These temporary installations will have a capacity that is limited to between 25% (sand filters) and 50% (shell filters) of the existing capacity. Supply disruptions during intervention on critical WTP components should not occur for periods exceeding 6h to 10h (each intervention).

Noise and vibrations

Noise and vibration levels during construction and demolition works are inevitable. The works will only take place during regular office hours on week days.

During future operations the noise levels will be the same as in the present situation. Regular construction works will be carried out within the compound of the existing WTP and at the location of the existing boreholes. The works will be covered again with natural soil to reduce impacts of erosion and to allow the natural vegetation to grow again.



8.2 MOENGO WTP

Water supply guarantees during construction phase

The population making use of the drinking water produced at the existing WTP in Moengo will not suffer additional irregularities in water supply during the construction phase of the project as the existing WTP plant (60m³/h) supplemented by the existing Wonoredjo wells (37 m³/h) will only be decommissioned after the successful commissioning of the new 200 m³/h WTP.

Monitoring of water intake

Especially in relation to the Traymore activities the water intake will be reallocated to about 500 meters further up stream. Since the River shows reverse flow direction twice a day, even at this point spills of the harbour might reach the intake point. The 500 meters distance and a buffer tank system will give SWM sufficient reaction time to prevent toxic chemicals to each the drinking water system. Continuous monitoring equipment will be installed next to the intake for pollutants such as cyanides, hydrocarbons, etc.

Noise and vibrations

Noise and vibration levels during construction and demolition works are inevitable. The works will only take place during regular office hours on week days.

During future operations the noise levels will be the same as in the present situation. Regular construction works will be carried out along the existing roads where new pipelines will be installed. The works will be covered again with natural soil to reduce impacts of erosion and to allow the natural vegetation to grow again.

Demolition and construction waste

Waste from demolition and construction works will be collected and sent to the assigned dumpsites.

Booster stations and water towers

One or two booster stations will be constructed along the existing DN100 pipeline leading to the villages situated south of Moengo. The footprint of each booster station will be limited (50m² approximately) and located on the road verge, within the road reserve. The booster station will be enclosed in a building with noise control/attenuation features.

The four water towers (capacity 25m³ to 150 m³ each, height approximately 25m) will also be constructed in the villages mentioned above allowing to provide continued water supply to villagers during piped borne supply interruptions (e.g. leak repair, WTP downtime etc). These water towers will be built at strategic locations where land is available, and no population resettlement or lengthy land acquisition are required

Management of social impacts

Adequate management of social impacts relies on the below measures:

SWM, with assistance of the communication team, will ensure that communication with the communities will be in a format and language they understand. Face-to-face conversations, a brochure in non-technical language, and the stakeholder meeting will serve to reach all relevant stakeholders. In all communication, it is essential that create false expectations will not be raised.

The SWM has its own customer contact procedures. For this Project, the SWM -PIU will use a more elaborate Grievance Redress Mechanism. Through this GRM, all questions and concerns from community members must be either resolved or properly addressed within 10 days. SWM also will establish a point of contact for people who have questions or concerns about the project.



9 ENVIRONMENTAL MONITORING PLAN

Table 9-1 – Environmental monitoring

	Aspect to be monitored	Specific tasks	Frequency
Van Hattem Weg WTP Environmental	Sludge discharge from ponds	TSS concentration, compliance with discharge standards.	Monthly
	Sludge management	Correct disposal at Ornamibo	Monthly
	Guarantee compliance with health & Safety procedures	Check of closure buildings, against intrusion of birds, bats	Monthly
	Chlorine unit safety	Secondary containment, maintenance. Safety PPE.	Monthly
	Wells clearance on site SWM	Field check for contamination around wells	Monthly
	Soil around diesel genset	Maintenance Sampling for diesel contamination	Yearly
Van Hattem Weg WTP Social	Noise and vibrations	Measurements of dB in surroundings and labour areas	Weekly during construction works. During operation in response to complaints.
Moengo WTP Environmental	Water intake	Monitoring for intake water quality	Cyanides: continuous Oil and grease: daily
Moengo WTP Social	Noise and vibrations	Measurements of dB in surroundings and labour areas	Weekly during construction works. During operation in response to complaints.
	Water distribution and quality	Correct distribution to household, pressure, quality	For first year after Project completion: monthly monitoring. In addition and after: in response to complaints.



Village connections	Water pressure to prevent intrusion	Measurements of pressure	For first year after Project completion: monthly monitoring. In addition and after: in response to complaints.
Environmental		Sampling, complaints responding	
Social	Water quality	Measuring, complaints responding	
	Water pressure at households		
Construction and demolition activities	Temporary aspects	Noise and vibrations Truck movements Waste disposal Vegetation and replanting	When needed in response to specific activities.

Further details are included in the impact management tables for Components 1 and 2



10 GRIEVANCE MANAGEMENT

For complaints about environmental risk or social issues related to the SWM operations, construction or demolition works and transportation and distribution of SWM drinking water SWM will appoint and accordingly train a staff member to serve as the Customer Care Officer for this specific Project. This officer needs to be well trained and ware of the project details, its social and environmental aspects and the name and contact details need to be communicated to the villages and population of Moengo. The person should be able to communicate in Sranantongo (and if possible but also in Ndyuka).

The SWM is working with its own customer contact procedure, which is schematically portrayed in the image below. For the present Project, it is advised that the current customer contact procedure will be slightly adjusted to better meet standard requirements for Grievance Redress. For example, it is important that time frames are provided for the various steps in the Grievance Redress process. In order to improve stakeholder access to an easily accessible and transparent Grievance Redress Mechanism, it is advised that SWM will follow procedural steps as listed in Table 9-1.

Figure 10-1 Customer contact procedure SWM

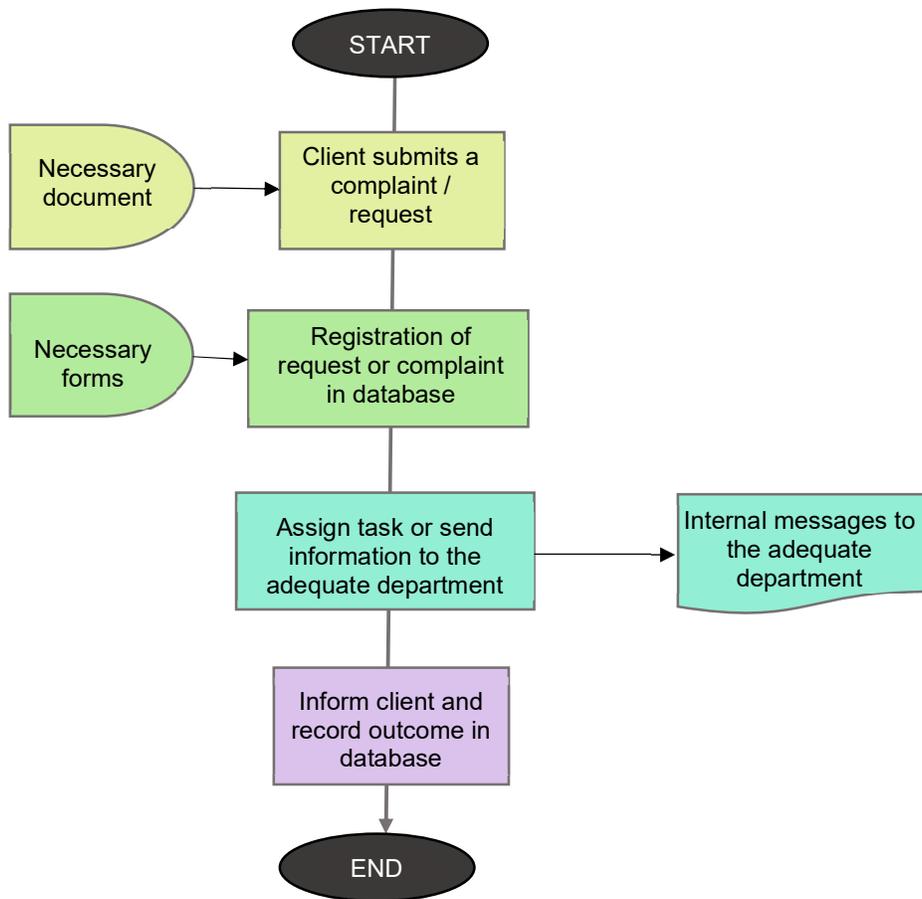




Table 10-1. Summary of generic design of a GRM for SWM:

Step	Specifications
1. Clear and transparent system to report grievances	PAPs and other stakeholders can contact the Project team by phone, e-mail, or in person visits to the SWM in Paramaribo or Moengo. Community representatives may also make a report on behalf of a villager. Contact information: Customer Care Officer SWM Telephone: 129 or +597 471414 (Paramaribo) or +597 231314 (Moengo) WhatsApp / SMS: +597 8893434 Email: klantenservice@swm.sr
2. Acknowledge receipt	Main Customer Care officer for the Project will acknowledge receipt of the grievance in a correspondence that outlines the grievance process and provides contact details for the responsible officer. ➤ Within 48 hours
3. Sort, evaluate and process	SWM determines whether a complaint is eligible for the grievance mechanism, its seriousness, and complexity. The merit of grievances will be judged objectively against clearly defined standards such as relevant environmental and social safeguards, legal requirements, and the Project Operations Manual, if available. A pre-designed form and database will be developed to facilitate grievance registry, sorting, ranking, and follow-up. ➤ For urgent issues including non-compliance, Gender Based Violence, and others, the PIU will inform the AFD within 48 hours.
4. Follow up and respond	The Customer Care officer or a designated staff member will acknowledge receipt of the grievance in a correspondence that outlines the grievance process and provides contact details for the responding officer. Complainants will then receive periodic updates on the status of their grievances. ➤ within 5 working days
5. Take action and resolve	➤ within 10 working days; If this is not possible, clear steps to address the grievance will be communicated to the complainant. <i>Specific procedures must be followed in case of:</i> • Complaints that remain unresolved after 10 days of submission will be referred to the Project Management level. • Complaints with a SEA/SH/GBV component • Complaints which constitute a major incident
6. Monitoring implementation of resolution	<i>Next steps if unsatisfied with the project GRM:</i> The complainant has the option of seeking redress through the national judicial system or the Office of the Ombudsman at their own cost
7. Close out and evaluate lessons learned	

Complaints which constitute a major incident, such as accidents which require medical attention, complaints related to Gender Based Violence, major pollution, or serious violations of the law, must be reported to the AFD.



11 CONCEPTUAL DECOMMISSIONING PLAN

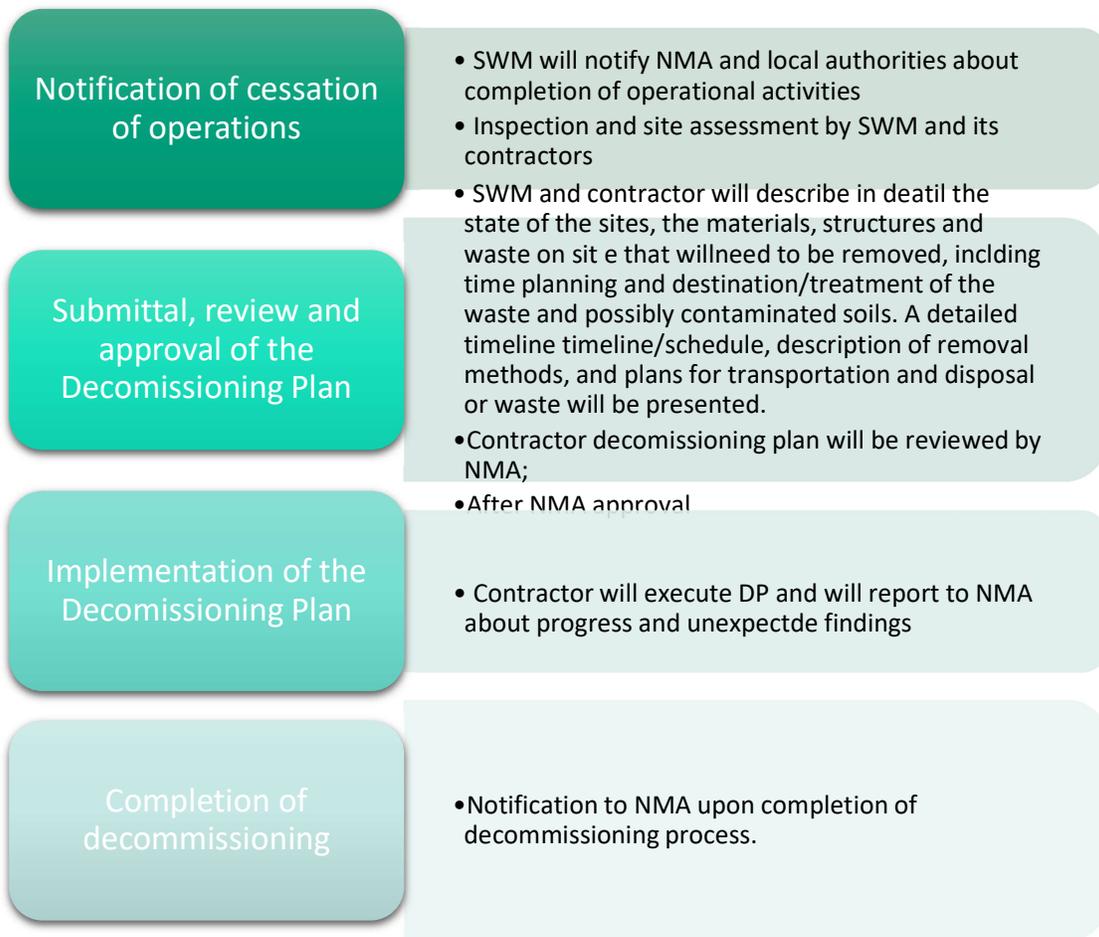
11.1 GENERAL

Decommissioning of plants and structures of SWM after their operation lifetime will follow four standard stages as shown in the Figure 11-1 below. These procedures ensure that all non-reusable structures and piping will be disposed of in an environmentally sound manner and in full compliance with Surinamese legislation.

The decommissioned sites will be cleared and left with a soil condition acceptable to the environmental and local authorities, without contaminants on site, cleared of all materials, structures. And waste.

It is estimated that all project components will have an operational lifetime of at least 25years. Decommissioning will therefore not apply within the near future. All decommissioning will take place in compliance with the Environmental and health regulations that will be in force at the time of decommissioning.

Figure 11-1. Schematic of conceptual decommissioning plan





11.2 WASTE

The waste management plan details the anticipated types of waste that will be produced, and ways in which this waste will be processed. Table 11-1 provides details on waste disposal and prevention of contamination as a result of the Project.

Table 11-1. Waste disposal and prevention of contamination

Type of waste/contamination	Disposal / clean up
Debris, construction, demolition waste	Will be sent to Ornamibo (and possibly Moengo) dumpsite
Contaminated soil (e.g. fuel)	Will be excavated and stored on an impermeable and covered area in order to prevent further contamination of the area. At present no installations are available for their adequate treatment, but a specific cell at the Moengo landfill is foreseen in the coming years. SWM should create its own safe location for the time being.
Fuel, lubricants, motor oils etc.	Tanks will be stored in an impermeable and covered area to prevent those materials to spread into the environment. At present no installations are available for their adequate treatment.
Chlorine	Spills of chlorine will evaporate and form mainly a danger for inhalation by humans. Safety precautions of workers near the chlorine tank are in place. For the environment no extra measures are foreseen.



12 REFERENCES

Information was gained based on various site visits and meetings with the SWM project team and operational staff at the locations VHW, Moengo and visits to the villages involved.

BRLi design and engineering reports:

- WaSIIP Project – ESIA Final Report D1-3 – BRLi - May 2018
- WaSIIP Project - MMMP Final Report - BRLi – October 2020
- WaSIIP Project Rescoping Mission - Final Report – BRLi - September 2023
- WaSIIP Project Restart – BRLi Mission Report - December 2024

Surinamese Environmental Legislation:

- Environmental Framework Act
- Guidance Note NIMOS Environmental Assessment Process (2023)
- Environmental Assessment Procedures, Volume I: Generic, NIMOS (2023)
- Standards for discharges to surface NIMOS, (WB reference standards 2008)



Annexe 1. Revised ESIA Report



Annexe 2. Standards for discharges to surface water (NIMOS/NMA)

Nationaal Instituut voor Milieu en Ontwikkeling in Suriname
National Institute for Environment and Development in Suriname

Fysische en chemische eigenschappen die gemonitord moeten worden voor lozen van afvalwater in oppervlakte wateren van Suriname.



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Primaire parameters:

pH	6-8
BOD ₅	<50 mg/l
COD	<250 mg/l
Temperatuurstijging	<3°C
DO	>5mg/L
TSS	<50mg/l
Oil and Grease:	<10mg/l
Solid waste	None Allowed!!
Conductivity	<1055-1500 μS/cm

Deze parameters kunnen op locatie worden bepaald en geven een relatief evenwichtig beeld van de conditie van het lozingswater. Ook kunnen deze parameters nauwkeurig worden vastgesteld binnen 7 dagen in een redelijk uitgerust laboratorium.

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Secundaire parameters in mg/l

Metalen:

Zware Metalen Totaal(max)	10mg/L
Arsenic	0.1
Cadmium	0.1
Chromium	0.1
Copper	0.5
Iron	3.5
Lead	0.1

Niet Metalen:

Nitrogen (N)	20
Phosphorus (P)	2
Potassium (K)	30
Alkalinity (as CaCO ₃)	50
Ammonia	10
Cyanide	0.1
Fluoride	20
Phenols	0.5

Fysische parameters:

Troebelheid	-
Helderheid	-
Geur	-
Viscositeit	-

Natuurlijk Hoge Concentraties

Magnesium	<80mg/l
Calcium	<80mg/l

Parameters die niet of moeilijk op locatie kunnen worden bepaald. Deze geven samen met de primaire parameters het juiste beeld van het lozingswater. Afhankelijk van de type industrie waar het lozingswater vandaan komt, wordt bepaald welke parameters van belang zijn.

Algemene lozingsnormen samengesteld uit Wereldbank normen, onder voorbehoud.
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