# Limited Environmental and Social Impact Assessment (ESIA) for the 2D Seismic Exploration Program and the Exploration Drilling Program in the Coronie Area

## Final Draft Report


**Report prepared for**

**Staatsolie Maatschappij Suriname N.V.**

Paramaribo, 12 October 2023

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# Abbreviations

| | |
|---|---|
| AOI | Area of Interest (Staatsolie) |
| BO | Government Inspector (Bestuursopzichter) |
| CCU | Corporate Communication Upstream |
| CLA | Corporate Legal Affairs |
| CEP | Caribbean Environment Program |
| CR | Community Relations |
| CSR | Corporate Social Responsibility |
| DC | District Commissariat |
| DS | Districts Secretary (Districts Secretaris) |
| EA | Environmental Assessment |
| EBA | Endemic Bird Area |
| EFA | Environmental Framework Act |
| EIA | Environmental Impact Assessment |
| EIS | Environmental Impact Statement |
| EMMP | Environmental Management and Monitoring Plan |
| ESIA | Environmental and Social Impact Assessment |
| EMP | Environmental Management Plan |
| EW | East West |
| GPS | Global Positioning System |
| HSE | Health, Safety and Environment. |
| HSEQ | Health Safety Environmental and Quality |
| HSSE | Health, Safety, Security and Environment |
| IBA | Important Bird Areas |
| IFC | International Finance Corporation |
| ILACO | ILACO Suriname N.V. |
| ITCZ | Inter-Tropical Convergence Zone |
| IUCN | International Union for Conservation of Nature |
| LBB | National Forestry Service (Dienst's Lands Bosbeheer) |
| LVV | Ministry of Agriculture, Animal Husbandry and Fisheries (Ministerie van Landbouw, Veeteelt en Visserij) |
| MAC | Maximum Allowable Concentration |
| MMSTB | Million Stock Tank Barrels |
| MOP | Meerjaren Ontwikkelings Plan- Multi Year Development Plan of Suriname |
| MUMA | Multiple Use Management Areas |
| NB | Nature Conservation Division (afdeling Natuurbeheer) |
| NBAP | National Biodiversity Action Plan |
| NBS | National Biodiversity Strategy |
| NCCR | National Coordination Centre for Disaster Management |
| NCD | Nature Conservation Division |

| | |
|---|---|
| N.E. | Northeast |
| NIMOS | National Institute for Environment & Development in Suriname |
| NMA | National Environment Authority |
| OW | Ministry of Public works (Ministerie van Openbare werken) |
| POC | Paradise Oil Company |
| PPE | Personal protective equipment |
| PPV | Peak Particle Velocity |
| PVC | Polyvinylchloride |
| QA/ QC | Quality Assurance/ Quality Control |
| ROM | Ministry of Spatial Planning and Environment (Ministerie van Ruimtelijke Ordening en Milieu) |
| S.B. | Staats Besluit |
| SEP | Stakeholder Engagement Plan |
| SHI | Staatsolie Hydrocarbon Institute N.V. |
| SSB | Surinaams Standaarden Bureau |
| Staatsolie | Staatsolie Maatschappij Suriname N.V. |
| S.W. | Southwest |
| SWM | Suriname Water Supply Company (Surinaamsche Waterleiding Maatschappij) |
| UNCBD | United Nations Convention on Biological Diversity |
| UNFCCC | United Nations Framework Convention on Climate Change |
| WB | World Bank |
| WBM | Water-Based drilling Mud |
| WHSRN | Western hemisphere shorebird Reserve Network |

# Executive Summary

This document presents the results of the limited Environmental and Social Impact Assessment for the 2D Seismic Exploration Program and the Exploration Drilling Program in the Coronie area.

This limited ESIA study has been conducted in accordance with national regulatory requirements (Milieu Raamwet S.B. 2020 no. 97/ Environmental Framework Act S.B. 2020 no. 97) and the guidelines of the National Institute for Environment and Development in Suriname (NIMOS, 2005 and NIMOS 2009), as well as international best practices.

The Staatsolie 2D Seismic Exploration Program and Exploration Drilling Program in the Coronie area have both been classified as Category B-path 2 projects by NIMOS. In consultation with NIMOS, it has been agreed that both projects can be consolidated into a single ESIA report. The ESIA study has been conducted according to the Scoping Report (ILACO, 24 July 2023) approved by NIMOS, which outlined the terms of reference for specialist studies, as well as the approach and methodologies. The ESIA study primarily involved a desk study, complemented by field surveys, measurements (water quality and noise), and stakeholder consultations.

**Conclusions drawn from this study include:**
**Environmental and social baseline**
From the environmental baseline assessment, the following can be stated:

- The plantation area of Coronie falls with a narrow strip along the coast, which has drier conditions. The average rainfall in Coronie is lower compared to Paramaribo.
- The air quality in the study area is good as there are hardly any stationary sources and only few other larger sources of air emissions. Air pollution sources within the area are emissions from local traffic, farm activities and some small facilities with engines (such as generators).
- The highest noise levels were measured in the rural areas along the Oost-Westverbinding due to traffic with relative high speed. Noise levels measured along the Oost-Westverbinding near residents, exceeded the WHO/IFC daytime guideline value of 55 dBA for residential areas. The measurement conducted within the residential area in Totness (not along the Oost-Westverbinding) had a noise level of 49.1 dBA, which is below this guideline. This measurement is considered representative for the Coronie residential areas.
- Within the project area both brackish and freshwater wetlands are found. Water from the Coronie (freshwater) swamp is mainly discharged to the east towards the Coppename River, south to the Wayambo River, west to the Nickerie River and north towards the Atlantic Ocean. The northern swampwater of the Coronie swamp is discharged through drainage structures along the Oost-Westverbinding (culverts, sluices, canals). The area north of the Oost-Westverbinding, between Burnside and Moy, drains through ditches and canals into the canal along the Coronie Dike. The canal along this dike has a sluice (at Totness) to discharge excess water towards the Atlantic Ocean. In the other areas, excess water drains towards the ocean predominantly through mass flow, some small creeks near the ocean and canals which have been dug towards the ocean.
- Based on water quality, four different environments can be identified within the project area, namely brackish to saline coastal swamps, the plantation area with freshwater conditions (brackish water may be present), freshwater swamp and ombrogenous swamp. During the measurements in the freshwater swamp and coastal swamp, no visible contamination and no unnatural odors were observed.
- In the area at proposed drilling location CEP01 and CEP02 parwa forest (black mangrove) is encountered and at location CEP03, freshwater swamp forest. The proposed seismic lines run through open coastal swamps and mangroves, open to closed freshwater ecosystems and the plantation area with agricultural lands and low to high secondary vegetation.

From the socio-economic baseline assessment, the following can be stated:

- The District Coronie is predominantly characterized by extensive brackish and freshwater swamps. Habitation is only present along the Oost-Westverbinding with human activities mainly found in the plantation area (Ingikondre-Burnside) and at Coppenamepunt.
- The various economic activities in the district include agriculture (rice cultivation, horticulture and livestock farming), beekeeping, fishery and mining (shell and sand).
- The main concerns that were raised during the stakeholder consultations include: environmental and property damage, risk of coastal area flooding due to project activities, disruptions to the livelihoods of individuals engaged in agriculture and beekeeping within the project areas and, insufficient communication of Staatsolie.

**Potential impacts and mitigation measures**

**The 2D Seismic Exploration Program**

From the assessment of potential impacts from the 2D Seismic Exploration Program, there is one (1) impact with major significance which can be reduced to moderate after implementation of the proposed mitigation measures. Furthermore, there are four (4) impacts with a moderate significance, which can be effectively reduced to minor after implementation of the proposed mitigation measures. The other impacts are minor or negligible and one (1) is a positive impact is identified.

The table below presents a summary of the main identified impacts and the residual impact for the 2D seismic exploration activities.

**2D Seismic Exploration Program**

| Component | Impact Description | Receptors | Significance | Residual impact |
|---|---|---|---|---|
| General | Loss of social license to operate due to project activities | General | Major | Moderate |
| | Income generation for local businesses and employment of local workers due to local purchasing of goods and services | Local community | Negligible | Minor |
| | Social conflicts and community health, safety and security | Local community | Moderate | Minor |
| Nature conservation | Seismic survey activities in the MUMA's could damage the integrity and conditions of these areas | Nature conservation | Moderate | Minor |
| Mobilization and seismic survey | Occupational health and safety (attacks from wildlife such as bees, snakes, general swamp safety e.g. hydration, vector borne diseases (mosquitos), sunburn and other environmental hazards such as unstable ground, waterborne diseases, extreme weather conditions) | Staatsolie personnel and contractors | Moderate | Minor |
| Decommissioning and restoration | Upon completion of project activities, there is remaining damage to the property, or waste present | Landowners and local community | Moderate | Minor |

For the Exploration Drilling Program, there is one (1) impact with major significance which can be reduced to moderate after implementation of the proposed mitigation measures. Further, there are seven (7) impacts with a moderate significance, which can be effectively reduced to minor after implementation of the proposed mitigation measures. The other impacts are minor or negligible and one

(1) is a positive impact is observed. The table below presents a summary of the main identified impacts and the residual impact for the exploration drilling activities.

**Exploration Drilling Program**

| Component | Impact Description | Receptors | Significance | Residual impact |
|---|---|---|---|---|
| General | Loss of social license to operate due to project activities | General | Major | Moderate |
| | Social conflicts incl. community health and safety and nuisance to receptors close to the drilling sites | Local community | Moderate | Minor |
| Employment and local economy | Income generation | Local community | Negligible | Minor |
| Surface water resources | Water pollution with spilled or leaked oil, grease or fuel, or drilling liquid and completion fluid during drilling operation | Aquatic life, water users and landowners | Moderate | Minor |
| | Blockage of waterways and changes in hydrology and drainage due to construction of access roads and preparation of drilling site | Local community | Moderate | Minor |
| Ecosystem | Damage to ecosystem, loss of high swamp forest and vegetation in the MUMA's | Vegetation and wildlife | Moderate | Minor |
| | Nature conservation: activities in the MUMA's could damage the integrity and conditions of these areas | Nature conservation | Moderate | Minor |
| Land use | Potential property damage incl. impact on livelihood | Local community and landowners | Moderate | Minor |
| Occupational health and safety | Attacks from wildlife such as bees, snakes, general swamp safety e.g. hydration, vector borne diseases (mosquitos), sunburn and other environmental hazards such as unstable ground, waterborne diseases, extreme weather conditions | Staatsolie personnel and contractors | Moderate | Minor |

**Environmental Management and Monitoring Plan**

The several mitigation measures, management and monitoring requirements, including responsibilities are included in an Environmental Management and Monitoring Plan (EMMP). The EMMP must be implemented as part of normal operations by effectively incorporating the key components into daily activities, such as including environmental issues in the decision-making process, carrying out operations in accordance with the standard procedures, and maintaining complete records.

# 1 Introduction

This document presents the findings of the Limited Environmental and Social Impact Assessment (ESIA) for the 2D Seismic Exploration Program and the Exploration Drilling Program in the Coronie Block.

## 1.1 General

One of Staatsolie Upstream Operation's strategic goals is to find new additional crude reserves to sustain the 6 million Stock Tank Barrels of oil (MMSTB) and feed the refinery after 2030. The goal of this project is to find at least 10 MMSTB of proved reserves by executing this program outside the proved boundaries of Staatsolie fields, the so-called heartland areas. In this regard in-depth geological, geophysical and some petro-physical studies have been carried out in the Coronie Block (visualized in **Figure 1**) to evaluate the hydrocarbon potential of the study area, but more data is required to acquire pertinent information trapping potential as well as the lateral extension of the identified leads.

As such, Staatsolie intends to carry out a 2D Seismic Exploration Program and a dryland Exploration Drilling Program in the Coronie Block. Five (5) seismic lines with a sum of ± 200 km will be surveyed for the seismic program and three (3) wells will be drilled for the exploration program.

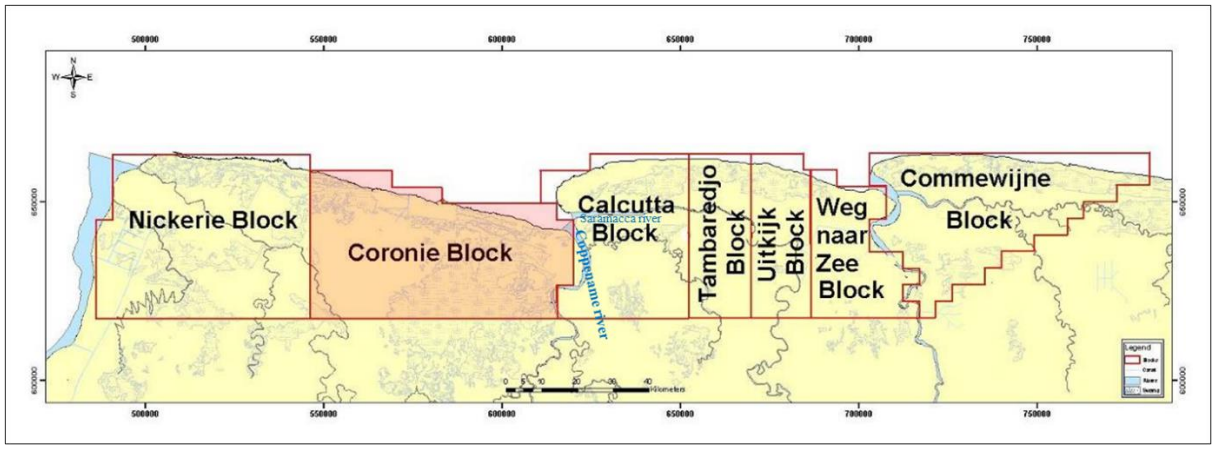


**Figure 1: Overview map of the onshore concession blocks showing the Coronie Block highlighted in red.**

This Limited ESIA study has been conducted in accordance with national regulatory requirements (the Milieu Raamwet S.B. 2020 no. 97/ Environmental Framework Act S.B. 2020 no. 97), the Generic Environmental Impact Assessment Guidelines of the National Institute for Environment and Development in Suriname (Nationaal Instituut voor Milieu en Ontwikkeling in Suriname - NIMOS) (NIMOS, 2009) and the Social Impact Assessment Guidelines of NIMOS, 2005. Additionally, it considers the Staatsolie Corporate Standards, including the Health Safety Environmental and Quality (HSEQ) Policy and Community Relations (CR) Policy, along with all relevant international standards, guidelines, and best practices from organizations such as the World Bank (WB) Group and the International Finance Corporation (IFC).

## 1.2 Project background and scope

The Staatsolie 2D Seismic Exploration Program and Exploration Drilling Program in the Coronie area have both been classified as Category B-path 2 projects by NIMOS, thus requiring limited ESIA's. In consultation with NIMOS, it has been agreed that both projects can be consolidated into a single ESIA report.

Previous ESIA studies conducted within the Coronie Block in 2008 and 2014, have been used for the current study, namely:

- Noordam & Teunissen, 2008. Preliminary Environmental Impact Assessment of the 2D seismic survey 2008 in the Coastal Plain in Suriname.
- Noordam & Teunissen, 2008. Preliminary Environmental Impact Assessment of Oil Exploration Activities in the Coronie Prospective Area in Suriname, update (December, 2008).
- Noordam Environmental Consultancy, 2014. Limited Environmental and Social Impact Assessment for the Coronie Dryland Exploration Drilling Project.

The purpose and scope of this study are as follows:

- Describe the existing environmental and socio-economic conditions which may affect or be affected by the seismic or exploration drilling program.
- Identify and engage with relevant stakeholders regarding the current project activities.
- Identify, evaluate, update and/or amend the potential environmental and socio-economic impacts, both positive and negative, of the proposed project, and as presented in earlier ESIA reports and if required, make additional assessments.
- Propose, review and/or update mitigation measures for avoiding or minimizing adverse effects and measures that promote or enhance potential benefits.
- Compile a Limited ESIA report containing the outcomes of above listed objectives and provide input for incorporation into the Environmental Management and Monitoring Plan (EMMP) of the project.
- Provide appropriate recommendations to ensure that appropriate measures for preventing or minimizing any adverse impacts during all the phases of project implementation are incorporated and establish an EMMP specifically tailored for the proposed project.

## 1.3 Project and study area

The project area of interest (AOI) for the 2D Seismic Exploration Program and Exploration Drilling Project is located in the Coronie Block, which is located east of the Nickerie Block, West of the Calcutta Block and is bordered by the Coppename River (**Figure 1**). The Coronie Block is divided into two parts (North and South) by the 'Oost-Westverbinding' which is a main public road connecting east and west Suriname (Noordam, 2014). The 2D seismic activities will be carried out in both parts of the concession area, mostly on dry land in the north and predominantly in swamp area in the south. The exploration drilling activities will be carried out in the north only, on dryland along the Oost-Westverbinding (see **Figure 2**).

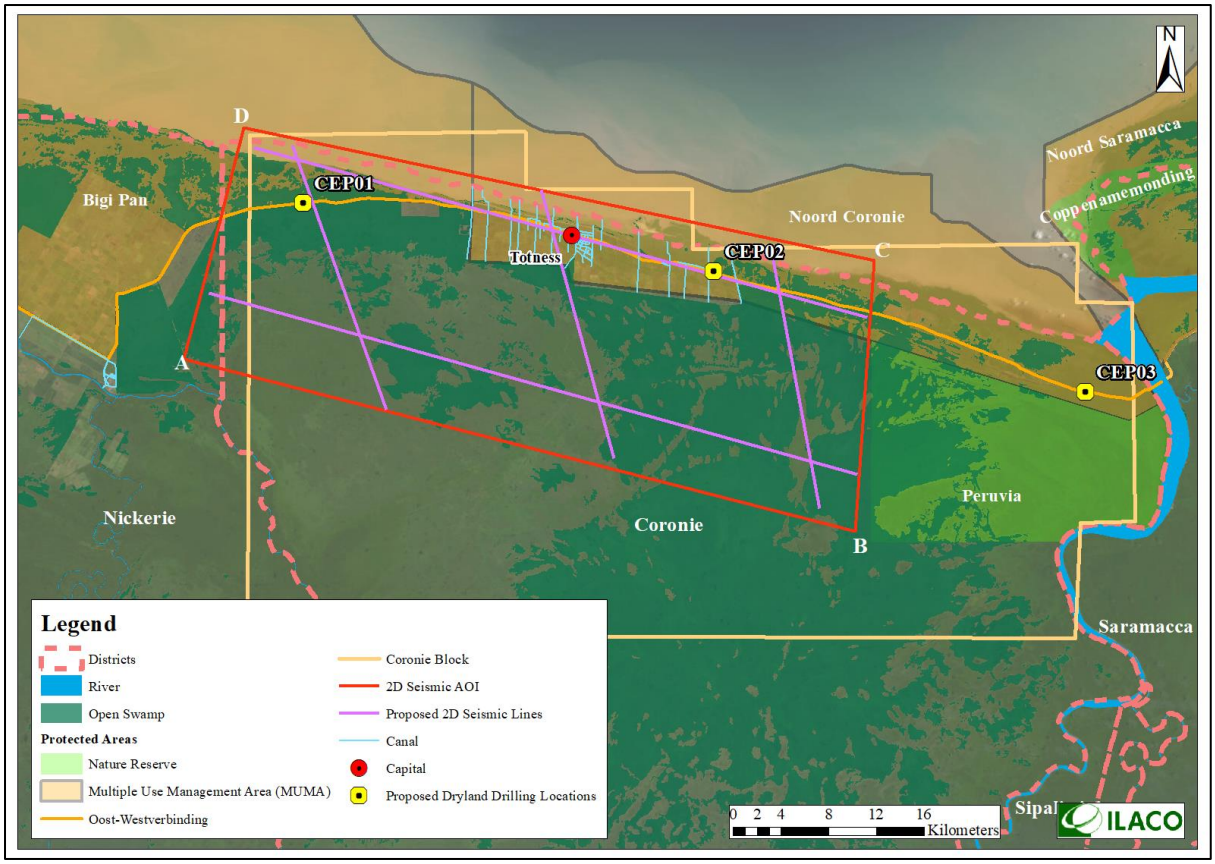


**Figure 2: Overview proposed 2D seismic lines and dry land drilling locations**

The ESIA study area for the current study includes the project area of interest (AOI/ the project footprint where the actual activities will take place), access routes, and their immediate surroundings where potential impacts may occur. For the environmental component's geology, soil, and ecology (including vegetation and wildlife, ecosystems, and habitat), the ESIA study area is identical to the project area, thus local. However, the effects on the components noise and water quality could extend beyond the boundaries of the project footprint. Also, the socio-economic environment is situated beyond the boundary of the project area. In summary, the ESIA study area can be considered nearly identical to the Coronie Block as shown in **Figure 2**

## 1.4 Methodology

The ESIA process conform to the NIMOS guidelines has been followed. There are four phases in the ESIA process, namely Screening, Scoping, Environmental Assessment and NIMOS review.

The Screening Phase of the Project was completed by Staatsolie and based on the screening report, the current project is classified as a Category B-path 2 project by NIMOS. As the previous ESIA's were conducted in 2008 and 2014 (older than 5 year), it was required by NIMOS to gather recent data for better representation of the baseline conditions.

After the screening, the Scoping phase was initiated, outlining the scope of the forthcoming ESIA process, the terms of reference for specialist studies, and the approach and methodologies to be employed in the ESIA process. A public scoping meeting took place on May 10, 2023, in the Coronie District. The scoping phase resulted in the final Scoping Report, submitted to NIMOS on July 27, 2023. By accepting the Scoping Report on July 31, 2023, NIMOS approved the impact assessment methodology and the methods used for gathering baseline data. The ESIA study was conducted primarily as a desk study, supplemented by field surveys, measurements (water quality and noise), and stakeholder consultations.

**Baseline study**
The environmental (biophysical) and socio-economic baseline studies have been conducted primarily as desk studies. This involved a review of existing ESIA studies from 2008 and 2014, as well as recent data from other studies (not older than five years). Additional data and information were collected during the execution of these baseline studies. For the biophysical environment, noise and water quality data were obtained through field measurements conducted during the long rainy season. In the social-economic study, consultation with key stakeholders and a resident survey were conducted.

**Impact assessment**
An assessment of the potential impacts has been conducted taking into account the project description of the seismic and drilling activities, the biophysical and social conditions. The methodology for the impact assessment is included in **Appendix 1**.

## 1.5 Team of Experts

ILACO Suriname N.V. (ILACO) has been awarded the contract to undertake the Limited ESIA for the Staatsolie 2D Seismic Exploration Program and the Exploration Drilling Program in the Coronie Block. The ESIA has been undertaken by a team of highly motivated experts with ample national and international experience and under conditions similar to the assignment. The team of experts is presented in the table below.

**Table 1: Overview team of experts**

| **ESIA Team** | |
|---|---|
| Shareen Koenjbiharie B.Sc. | Team Leader/ ESIA Specialist |
| Marie Fortune B.Sc. | Dept. Team Leader/ Project Engineer |
| Dirk Noordam M.Sc. | Sr. ESIA Specialist/ QA&QC |
| Arshna Naigi B.Sc. | Stakeholder & Communication Specialist |

# 2 Policy, Legal and Regulatory Framework

This section provides an overview of Suriname's environmental legislative and regulatory framework, with a specific focus on the proposed 2D Seismic Exploration Program and the Exploration Drilling Program. It encompasses Suriname's commitments as a signatory to international conventions and agreements, and emphasizes Staatsolie's Health, Safety, Environmental and Quality Policy and Communication Policy. Additionally, relevant international standards and procedures governing this type of activity are also addressed.

## 2.1 Policy

**Multi Year Development Plan of Suriname 2021 – 2026 (MOP):** The general objective of the development plan is to build and maintain a national economy that is free from foreign domination with the participation of the citizens, and from which citizens benefit. With regard to the onshore oil sector the MOP indicates ongoing on- and nearshore oil explorations as a strategic action point.

**Environmental Policy Note - Ministry of Spatial Planning and Environment (ROM), September 2020:** The Ministry of Spatial Planning and Environment was established in August 2020, after the elections. Its mission is to have a leading role in the development and implementation of policies to guarantee an environment that is spatially ordered and where health, well-being and sustainable development are central.

**Policy priorities**

- The main pillar of the Ministry of ROM's policy will be to bring both environmental policy and spatial planning policy closer to the general population. This is based on the realization that both spatial planning and environmental policy can only be successfully implemented if there is broad participation from society, driven by the conviction of each individual that this is not just about the well-being of one generation, but of the well-being and survival of humanity. Policy in these areas is still too much seen as an activity of academics and project professionals. In addition, the decentralization model as set out in the Environmental Framework Act will also be applied to spatial planning.
- A second important pillar of the policy will be to unlock mechanisms for the mobilization of development funds so that the benefits that Suriname's nature offers to the environment, combined with a dynamic policy to prevent any degradation of the environment, can be compensated with resources from more developed countries that have a huge carbon footprint due to industrialization.
- A third strategy in this respect is an intensive and higher-quality emphasis on Public Private Partnership, whether or not supported by international organizations that support this form of cooperation.

Within the policy note of ROM, emphasis is also placed on the environmental reform policy, wherein specific priority areas have been identified. These areas include:

- Waste management
- Regulation of industrial environmental pollution
- Operationalization of the Environmental Framework Act
- Provision of environmental information

**Biodiversity Strategy (2006-2020) and National Biodiversity Action Plan (2012-2016):** In 2006, the Government of Suriname adopted the Biodiversity Strategy (NBS), which outlines the country's vision and strategic directions for preserving and sustaining its diverse range of biological resources. The NBS aims to achieve the sustainable management of natural resources and promote the fair distribution of benefits derived from biodiversity-related services. Subsequently, in 2012, a National Biodiversity Action Plan (NBAP) was developed in accordance with the NBS. The NBAP seeks to translate the set objectives into tangible actions and assigns responsibility to specific entities for their implementation.

In 2022[1], the Ministry of ROM initiated an evaluation and possible update of Suriname's strategy for the sustainable management and conservation of biodiversity and the associated action plan. The finalization of the updated Strategy 2023-2030[2] is planned for October 2023.

## 2.2 National laws and regulations

The national laws and regulations that are relevant for this project are described in the section below, namely:

- Grondwet van de Republiek Suriname S.B. 1987 no.116 z.l.g bij S.B. 1992 no.38 (Constitution of the Republic of Suriname S.B. 1987 no. 116 as amended by S.B. 1992 no. 38);
- Milieu Raamwet S.B. 2020 no. 97 (Environmental Framework Act (EFA) S.B. 2020 no. 97);
- Petroleum-Related Legislation;
- Environmental-Related Legislation, and
- Occupational Health and Safety Legislation.

**Constitution of the Republic of Suriname**

The 'Grondwet van de Republiek Suriname S.B. 1987 no.116 z.l.g bij S.B. 1992 no.38 (Constitution of the Republic of Suriname S.B. 1987 no. 116 as amended by S.B. 1992 no. 38) serves as the primary law that governs all existing and forthcoming legislation in Suriname. Alongside various national acts, it contains provisions that are pertinent to environmental preservation and the management of natural resources, particularly concerning the petroleum sector.

The Constitution proclaims that natural riches and resources belong to the State, and the State has the right to take possession of these natural resources to use them for the benefit of Suriname's economic, social, and cultural development (Article 41). The State must also create and improve the necessary conditions to protect, nature, and preserve the ecological balance. Moreover, Article 6g emphasizes the State's social objective to foster conditions necessary for nature protection and ecological balance. Ensuring the well-being of workers, Article 28 affirms the entitlement of all workers to have safe and healthy working conditions, and everyone has a right to health (Article 36). Lastly, Article 42 stipulates that the law must safeguard that trade and industry practices align with national objectives and the public interest, particularly concerning public order, health, morality, and state security.

**Environmental Framework Act**

In March 2020, the 'Milieu Raamwet S.B. 2020 no. 97 (Environmental Framework Act (EFA) S.B. 2020 no. 97)' was approved by the Parliament and published in the Gazette in May 2020. 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. 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[3]. The amendment proposes the Ministry to become primarily responsible for coordinating Environmental Policy while the NIMOS is being transformed into the National Environmental Authority.

[1] https://gov.sr/rom-en-scf-gaan-samen-voor-behoud-biodiversiteit/

[2] Personal Communication with Ratna Kewal, Policy Officer Ministry ROM, 27 July 2023.

[3] The Draft law to amend the Environmental Framework Act is being addressed in the DNA

For the EFA to be operational, a set of subsidiary legislation needs to be promulgated, most of which is already in draft form (see below).

1. 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.
2. *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.
3. *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. Staatsolie will have to apply for an environmental permit when these regulations are promulgated.
4. *Waste and Hazardous Substances and Emergency Plans*. The NMA will determine norms and procedures for handling of waste (collection, transportation, storage, and transfer) 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. Staatsolie will have to register its storage, handling, and transport of hazardous substances and apply for a hazardous substance permit when regulations are promulgated. Furthermore, the NMA is authorized to require an emergency response plan for the storage, use, and transportation of contaminants, waste, or hazardous substances. Staatsolie will be required to have a plan in place for management of waste and hazardous substances (This plan can be integrated into an emergency plan or kept separately).
5. *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.

In anticipation of the approval of the above regulations, Staatsolie is committed to comply in line with these regulations. An overview of the regulations that will apply to the 2D seismic exploration and the exploration drilling activities in the Coronie area, are detailed in **Table 2**.

**Table 2: Overview applicable regulations**

| Regulations | Compliance |
|---|---|
| **Draft Implementation Regulations[4] under the Environmental Framework Act (S.B. 2020 no. 97)** | |
| **EIA Regulation**<br>The regulation gives an overview about the activities for which an EIA is or is not required. The list includes activities related to different kinds of projects and indicates to which category (A, B) they belong. According to the determined category, NIMOS (soon the NMA) shall decide whether the further execution of an EIA shall take place. The regulation further indicates that project activities that fall under Category C do not | Completion of the EIA process phases, viz. Screening, Scoping, Assessment, Review, Decision and monitoring and its requirements (see **Appendix 2**). |

[4] Once the NMA is formalized (NIMOS transformed into NMA), and the relevant regulations are promulgated, the EIA and other environmental licensing processes will become paid processes. Project proponents will have to pay when applying for the EIA process and other permits under the Environmental Law, etc.

| | |
|---|---|
| require an EIA, but are still obliged to apply for an environmental license.<br>The regulation provides a list with activities for which an EIA is required.<br>The regulation sets further provisions regarding the determination of the scope of the required EIA, specifications for the qualification of persons to conduct an EIA, minimum requirements for the Environmental Impact Statement (EIS) including the submission and assessment of the EIS. | |
| **Environmental Pollution**<br>This regulation lays down provisions concerning the prevention of environmental pollution by means of inter alia introducing a licensing system. For an effective monitoring of compliance with the provisions under or pursuant to the Environmental Act, the regulation also determines the pollutants, their values, quantities, and other technical details in connection with the measurability of environmental pollution. Regarding existing sources of pollution, it is obliged to register these sources at NIMOS. The regulations further provide provisions regarding spills and accidental releases. | 1. Registration of existing sources of pollution.<br>2. Apply for an environmental permit for the release of contaminants.<br>3. Comply with the specifications in the environmental permit provided by NIMOS.<br>4. In case of leakage or accidental release:<br>• Take immediate action to stop this leakage or release.<br>• Take measures to repair damage to the environment.<br>• Notify NIMOS of this event immediately and strictly follow instructions given by NIMOS. |
| **Hazardous Substances**<br>The implementation regulation lays down provisions concerning hazardous substances to prevent environmental pollution by means of inter alia introducing a licensing system. For an effective monitoring of compliance with the provisions under or pursuant to the Environmental Framework Act, the regulation also determines the hazardous substances as well as the provisions concerning inter alia the license for the registration of such substances and their transport, storage, use, treatment and disposal. | • Proof of Registration<br>• Apply for permit<br>• Comply with the specifications in the permit provided by NIMOS<br><br>With regard to transportation:<br>Bulk transport over land, water and in the air, are in accordance with good international industry practice and NIMOS can give instructions.<br>Transportation is only allowed by authorized persons and vehicles.<br>Notification obligation for transport to: Fire brigade; law enforcement; NIMOS; National Coordination Centre for Disaster Management (NCCR) or its district representative; Districts Commissioner<br><br>Disposal:<br>Apply environmentally friendly practices.<br>Recycling and reuse in accordance with NIMOS permit.<br><br>Emergency Response Plan:<br>NIMOS can give the obligation to draw up an emergency response plan related to contaminants, waste or hazardous substances.<br>NIMOS approves the emergency response plan.<br>Notification of NIMOS in case of contamination or accidental release of hazardous substance. |

| Act | Relevance |
|---|---|
| **Petroleum-Related Legislation** | |
| Petroleumwet 1990 S.B. 1991 no. 7 z.l.g. bij S.B. 2001 no. 58 (Petroleum Act 1990 S.B. 1981 no. 7 as amended by S.B. 2001 no. 58) | • Staatsolie is required to comply with the requirements of this Act. |
| Decreet Mijnbouw S.B. 1986 no. 28 z.l.g bij S.B. 2017 no. 41 (Mining Decree S.B. 1986 no. 28 as amended by S.B. 2017 no. 41 | • The general provisions of the Mining Decree apply unless otherwise stipulated in special legislation such as the Petroleum Act |
| Decreet E8B S.B. 1981 no. 59 houdende machtiging tot verlening aan de Staatsolie Maatschappij N.V. van een vergunning voor het doen van onderzoek naar en van een concessie voor de ontginning van koolwaterstofvoorkomens (Decree E8B S.B. 1981 no. 59 authorising the granting to Staatsolie Maatschappij N.V. of a license to conduct research into and concessions for the exploitation of hydrocarbon deposits) | • A Permit to Staatsolie to conduct research into hydrocarbon deposits and a concession for the exploitation of the hydrocarbon deposits.<br>• Staatsolie is required to comply with the rules for research and exploitation of hydrocarbons as stated in the Decree. |
| Besluit Mijnbouwinstallaties S.B. 1989 no.38 (State Order on Mining Installations S.B. 1989 No.38 | • Specific elements of this State Order<br>• (e.g., protection of the environment; traffic and transportation) will be applicable. |
| Presidentiele Resolutie van 11 juli 1993, No. 3051/93 ter verlening van de exploratie en exploitatierechten aan de Staatsolie Maatschappij betrekking hebbende op het deel van het zeegebied zoals aangegeven op de bijbehorende figuratieve kaart.<br>Presidential Resolution of 11 July 1993, no. 3051/93 granting exploration and exploitation rights to the State Oil Company with regard to the part of the sea area as indicated on the safe figurative map. | • Staatsolie must ensure that all reasonable measures are in accordance with the petroleum industry's good oilfield practices, including a responsible system of water drainage and disposal of waste oil. |
| **Environmental-Related Legislation** | |
| Natuurbeschermingswet 1954, G.B. 1954 no. 26 z.l.g. bij S.B 1992 no. 80 (Nature Conservation Act 1954, G.B. 1954 no. 26 as amended by S.B. 1992 no. 80) | • There is a potential for impacts on coastal ecosystems from accidental spills associated with the proposed seismic survey program. In this context, the Act is germane to the conservation and protection of important or designated areas. |
| Ministeriele Beschikking betreffende de instelling van het Bigi Pan bijzonder beheersgebied S.B. 2002 no.34 (Ministerial Order to designate Bigi Pan as special management area S.B. 2002 no.34);<br><br>Ministeriele Beschikking betreffende de instelling van het Noord Coronie beheersgebied S.B. 2002 no.87 (Ministerial Order to designate North Coronie as special management area S.B. 2002 no.87); and | • There is a potential for impacts on coastal ecosystems from accidental spills associated with the project. In this context, the Act is germane to the conservation and protection of important or designated areas.<br>• The proposed project will need to minimize impacts to marine resources. |
| Jachtwet 1954 G.B. 1954 no. 25 z.l.g. bij S.B. 1997 no. 33 (Game Act 1954, G.B. 1954 no. 26 as lastly amended by S.B. 1997 no. 33).<br><br>Jachtbesluit 2002 S.B.2002 no. 116 (Game State Order 2002 S.B. 2002 no. 116) | • Protection of species that can be affected by the project. |

| | |
|---|---|
| Wetboek van Strafrecht G.B. 1911 no.1 z.l.g bij S.B.2020 no. 42 (Penal Code G.B. 1911 no.1 as amended by S.B. 2020 no.42) | • All activities under the proposed project should avoid littering and water pollution but also air and soil. |
| Politie strafwet G.B. 1915 no. 77 z.l.g bij S.B. 1990 no. 24 (Police Criminal Act G.B. 1915 no. 77 as amended by S.B. 1990 no. 24) | |
| **Occupational Health & Safety Legislation** | |
| Arbeidswet G.B. 1963 no. 163 z.l.g. bij S.B. 2011 no. 71 (Labour Code G.B. 1963 no. 163 as amended by S.B. 2011 no.71) | • The labor regulations need to be complied with for the workers involved in the project. |
| Veiligheidswet 1947 G.B. 1947 no. 142, z.l.g. bij SB. 1980 no.116 (Occupational Safety and Health Act 1947 G.B. 1947 no. 142, as amended by SB. 1980 no.116) | • The project will be carried out in compliance with this Act concerning management and reporting of accidents. |
| Veiligheidsvoorschrift nr. 1, G.B. 1972 no. 95 (Safety regulation nr. 1, G.B. 1972 no. 95) | • To prevent or minimize injuries the proposed project should be carried out in compliance with the safety regulation. |
| Veiligheidsvoorschrift nr. 2, G.B. 1948 no. 104 (Safety regulation nr. 2, G.B. 1948 no. 104) | • Project activities must be carried out taking into consideration the regulations regarding hygiene. |
| Veiligheidsvoorschrift nr. 3, G.B. 1948 no. 183 (Safety regulation nr. 3, G.B. 1948 no. 183) | • To prevent or minimize injuries the project should be carried out in compliance with the safety regulation. |
| Veiligheidsvoorschrift nr. 4, G.B. 1948 no. 128; 1969, no 30 (Safety regulation nr. 4, G.B. 1948, no. 128; 1969, no. 30) | • To prevent or minimize injuries the project should be carried out in compliance with the safety regulation. |
| Veiligheidsvoorschrift nr. 7, S.B. 1981 no 72 (Safety regulation nr. 7, S.B. 1981 no. 72). | • In order to promote safe and comfortable working conditions, the project activities need to be implemented in compliance with this regulation. |
| Veiligheidsvoorschrift nr. 9, S.B. 1981 no. 74 (Safety regulation nr. 9, S.B. 1981 no. 74) (State Order harmful gases and vapors). | • This regulation is applicable if areas belonging to associated canteens, dressing rooms or sleeping quarters are being set up where noxious and irritating gasses are released. |
| Ongevallenwet G.B. 1947 z.l.g. bij S.B. 2007 no.26 (Industrial Accidents Act G.B. 1947 as amended by S.B. 2007 no.26) | • The provisions of this Act and requirements thereto are applicable to the projects in case accidents or occupational diseases related to the project activities occur. |

**Waste management**

Standard on Waste (developed by Surinaams Standaarden Bureau, SSB)

In the absence of legislation on waste management and awaiting the approval of the Draft Laws, the Ministry of Public Works, has requested the Surinaams Standaarden Bureau (Surinamese Standards Bureau; SSB) to develop a Standard on Waste. In response, the SSB initiated the process to set up the standard which contains (i) garbage collection and (ii) processing. Part 1 of the Standard has been finalized and was published on 23 January 2019.3 It covers household, medical, industrial, and bulky waste and provides a procedure for packaging, offer and pickup, including frequency of pickup. It is recommended that this standard is followed for waste management activities related to the project.

## 2.3 International conventions, agreements and guidelines

Suriname has become a signatory to various international agreements and conventions that focus on environmental management and occupational health and safety. These conventions typically necessitate governmental involvement in implementing legal and administrative measures. Below is a

comprehensive compilation of the relevant Conventions pertinent to the proposed 2D seismic exploration and the exploration drilling program.

- ***United Nations Convention on Biological Diversity (CBD)*** - In June 1992, Suriname officially signed the Convention on Biological Diversity (CBD) and later ratified it on 12 January 1996. The CBD's main objectives revolve around the preservation of biological diversity, sustainable utilization of its components, and the equitable sharing of benefits derived from these valuable resources.

- ***Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere (Western Hemisphere Convention)*** - In 1985, Suriname ratified the Western Hemisphere Convention. The primary objectives of this convention are twofold: to safeguard all species and genera of native fauna and flora from the threat of extinction and to preserve areas of exceptional beauty, remarkable geological formations, or those possessing aesthetic, historical, or scientific significance. The Coppename-monding Nature Reserve is a Western hemisphere shorebird Reserve Network (WHSRN) site, which is situated at least 18 km from the nearest drilling well. No impacts are expected for the nature reserve. The Bigi Pan MUMA, in which proposed drilling well CEPO1 and part of two (2) seismic lines is situated, is also a WHSRN site.

- ***Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat***- on 22 November 1985, Suriname became a party to the Convention on Wetlands, widely known as the Ramsar Convention. Functioning as an intergovernmental treaty, the Ramsar Convention establishes a comprehensive framework for national and international efforts towards the conservation and sustainable use of wetlands and their resources. Suriname has one site designated as a Wetland of International Importance – the Coppenamemonding wetland. This expansive wetland complex, covering an area of 12,000 hectares, lies along the Saramacca coastline and stands as an exemplary representation of natural or near-natural wetland habitats. The Coppename-monding Nature Reserve is a Ramsar site. However, this area is minimal 18 km from the nearest drilling well and no impacts are expected. The Bigi Pan MUMA, in which proposed drilling well CEPO1 and part of two (2) seismic lines is situated in a proposed Ramsar site.

- ***United Nations Framework Convention on Climate Change (UNFCCC)*** - On 14 October 1997, Suriname ratified the United Nations Framework Convention on Climate Change (UNFCCC). The primary objective of the UNFCCC is to stabilize greenhouse gas emissions in the atmosphere at a level that ensures dangerous human-induced interference with the climate system is avoided. This target must be achieved within a specific timeframe to allow ecosystems to naturally adapt to climate changes, safeguard food production, and promote sustainable economic development. The UNFCCC establishes international guidelines to limit greenhouse gas emissions and combat climate change. Combustion of fuel will contribute to greenhouse gases, which will need to be recorded and reported.

- ***Paris Agreement*** - In 2016, Suriname acceded to the Paris Agreement, an international accord linked to the UNFCCC (United Nations Framework Convention on Climate Change). The agreement commits its participating countries to promote the mitigation of greenhouse gas emissions while fostering sustainable development. Under the Paris Agreement, Suriname is obligated to regulate and control greenhouse gas emissions within its territory. To comply with the requirements of the Paris Agreement, the proposed project must implement measures aimed at reducing and reporting emissions from e.g., vehicles and equipment.

- ***The Stockholm Convention on Persistent Organic Pollutants; POP's Stockholm*** – This Convention deals with water and air pollution as well as waste management. Suriname ratified the Stockholm Convention in 2011. The proposed project activities will generate waste that

may be incinerated and can cause emissions of persistent organic pollutants. Inspection of waste management facilities to ensure compliance with incinerator standards will be necessary to eliminate persistent organic pollutants in accordance with this Convention.

- ***The Vienna Convention for the Protection of the Ozone Layer*** – Suriname acceded to the Vienna Convention for the Protection of the Ozone Layer in 1997, which relates to the protection of air quality and climate. The Convention sets international standards for protection of the ozone layer by phasing out the use of stratospheric ozone depleting chemicals, chiefly chlorofluorocarbons (CFCs), halons, and carbon tetrachloride, of relevance to some mining endeavors. The project will need to comply with requirements to reduce or eliminate ozone-depleting substances (e.g., certain types of refrigerants).

Suriname is also preparing to accede to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention) and its Protocols (oil spills, specially protected areas and wildlife and land-based sources of pollution). Suriname is also an official team member of the Caribbean Environment Program (CEP).

## 2.4 Institutional Framework

Several institutional stakeholders play a role in the context of environmental management in Suriname. In this section, only the primary institutions and their relevance to the project are presented. The functions of these stakeholders are summarized in **Table 3**.

**Table 3: Relevant actors and their relevance to the project**

| Relevant Stakeholder | Role/ Relevance to project |
|---|---|
| Ministerie van Ruimtelijke Ordening en Milieu, ROM<br><br>Ministry of Spatial Planning and Environment | The Ministry of Spatial Planning and Environment is responsible for proper spatial planning and must do this in consultation with relevant ministries and institutes and coordinate national policy for spatial planning.<br>In addition, the ministry is also charged with ensuring compliance with statutory regulations with regard to spatial planning and the environment, if necessary, in an interdepartmental context.<br>In accordance with its mission statement, the Ministry of Spatial planning and Environment is also responsible for coordinating and monitoring the implementation of national environmental policy, in collaboration with relevant ministries and agencies.<br>The Ministry is further responsible for developing and maintaining cooperation mechanisms and partnerships in order to meet national and international environmental obligations in an efficient and effective manner. |
| Nationaal Instituut voor Milieu en Ontwikkeling in Suriname<br><br>National Institute for Environment and Development in Suriname (NIMOS) in transition to become NMA | With the promulgation of the Milieu Raamwet S.B. 2020 no. 97 (Environmental Framework Act S.B. 2020 no. 97) the National Institute for Environment and Development (NIMOS) will be transformed into the National Environmental Authority (NMA).<br>The NMA will be responsible for administering the Environmental Impact Assessment process and Pollution Control. |
| Ministerie van Natuurlijke Hulpbronnen<br><br>Ministry of Natural Resources | Responsible for policy direction, legislation, issuance of permits, budget allocation and inter-ministerial coordination, and for all matters relating to natural resources (not fisheries).<br>Supporting agency to NIMOS in the approval process for a project associated with exploitation of natural resources. |

| | |
|---|---|
| Directoraat Visserij van het Ministerie van Landbouw, Veeteelt en Visserij<br><br>Fisheries Department of the Ministry of Agriculture Animal Husbandry and Fisheries | The Ministry of LVV is responsible for the maintenance of the waterways, roads and water structures on agricultural lands that are located between the East-West connection road and the swamp-retaining dam. |
| Ministerie van Grondbeleid en Bosbeheer<br><br>Ministry of Land Policy and Forest Management | The Ministry of Land Policy and Forest Management is responsible for nature management with regards to the protected areas. Not directly involved in project approval and management.<br><br>Can become a key stakeholder in situations where project activities can affect biodiversity. |
| Dienst 's Lands Bosbeheer en Afdeling Natuurbeheer<br><br>Suriname Forest Service (Landsbosbeheer, LBB) and Nature Conservation Division of the National Forest Service (NB) | The Suriname Forest Service is part of the Ministry of Land Policy and Forest Management and is responsible for management of nature reserves established under the Nature Conservation Act 1954. This task is being delegated to the Nature Conservation Division (NCD).<br>Not directly involved in project approval and management.<br>The NCD supports the Ministry of Land Policy and Forest Management in law enforcement and management with regards to conservation, nature reserves and wildlife.<br>The NCD is responsible for the day-to-day management of protected areas in Suriname.<br>The NCD is also responsible for wildlife protection.<br><br>Can become a key stakeholder in situations where project activities can affect protected species and areas in the coastal area. |
| Ministerie van Arbeid Werkgelegenheid & Jeugdzaken<br><br>Ministry of Labor, Employment and Youth Affairs | Development and safeguarding of the labor market.<br>Regulatory responsibility for specifying safety conditions for projects of this nature and for receiving and investigating safety-related incidents as necessary.<br>Regulation of permits required for labor or work by foreigners.<br>The Project will be accomplished in accordance with all applicable Surinamese health and safety regulations. |
| Ministerie van Volksgezondheid<br><br>Ministry of Public Health | Responsible for environmental health management, such as control of infectious disease, food and drinking water quality, sanitation, and disposal of industrial waste in collaboration with other relevant institutions. |
| Ministerie van Openbare Werken<br><br>Ministry of Public Works | Policy, planning and development of general architectural structure, and other civil engineering infrastructure in the public interest; Flood control and drainage; Technical provisions for traffic and public transport.<br><br>The Ministry of Public Works‟ responsibilities are the management of all main waterways, roads, bridges, sluices etc. north of the East West connection, from the sluices to the Atlantic Ocean. |
| Ministerie van Regionale Ontwikkeling en Sport<br><br>Ministry of Regional Development and Sport | One of the tasks on regional level is to develop administrative procedures to promote participation in decision-making at the level of districts. Furthermore, the DC gives authorization for transport if the road will be occupied more than usually. |
| Nationaal Coördinatie Centrum voor Rampenbeheersing | A division of the Ministry of Defense that develops national policies on disaster management through coordination and prevention of potential threats and disasters.<br>Supporting agency to NIMOS in the approval process for a project of this nature.<br>Can become a key stakeholder in situations involving accidental spills or other project-related emergencies. |

| | |
|---|---|
| National Coordination Centre for Disaster Management (NCCR) | |
| Staatsolie Maatschappij Suriname N.V<br><br>State Oil Company Suriname (Staatsolie Maatschappij Suriname N.V) | Develop Suriname's hydrocarbon potential over the full value chain, to generate electricity, and to develop renewable sustainable energy resources.<br>Assessment of hydrocarbon potential, promotion, contracting, and monitoring activities of other oil companies on behalf of the State. |
| Staatsolie Hydrocarbon Institute N.V. (SHI) | Since its establishment in December 1980, Staatsolie has acted as the state vehicle through which the government oil policy was executed and whereby foreign companies could only explore for and produce oil through service contracts with Staatsolie. The regulator's role was further developed through the establishment of the Petroleum Contracts division in 2000, followed by the establishment of SHI in 2020. SHI is an agent of the Government of the Republic of Suriname and performs a regulatory role for the exploration and drilling activity (exploration and production); |

## 2.5 International Standards and Guidelines

Currently, Suriname lacks national effluent or emission standards. However, Staatsolie will ensure adherence to relevant international standards and guidelines, as well as explicit environmental protection principles and criteria outlined in Suriname's legislation. Where national legislation, standards or guidelines are lacking, international standards like the IFC and World Bank standards are applied.

For the current project, the IFC Environmental, Health and Safety (EHS) Guidelines[5] developed for Onshore Oil and Gas Development are used in the absence of national legislation.

The EHS Guidelines for Onshore Oil and Gas Development include information relevant to the management of EHS issues. The environmental issues associated with onshore oil and gas projects include noise and vibration, air quality, solid waste, hazardous materials, and wastewater discharges. The associated occupational Health and Safety issues include fire and explosion, air quality, hazardous materials, well-blowout, etc., The EHS Guidelines recommend several prevention and control measures which, if applicable, are included in the Environmental Management and Monitoring Plan (EMMP) as part of this study.

**Noise guidelines**

In the absence of specific national guidelines for noise levels, the international standards WHO/IFC for community- based noise limits, also used by NIMOS, are applied. The noise levels should not exceed the levels presented in **Table 4**, or result in a maximum increase in background levels of 3 dB (A) at the nearest receptor location.

**Table 4: Noise Level Guidelines (World Bank/IFC guidelines)**

| **Receptor** | **Maximum Allowable Ambient Noise Levels 1-hour LAeq (dB(A))** | |
|---|---|---|
| | **Daytime 07:00-22:00** | **Nighttime 22:00-07:00** |
| Residential; institutional; educational | 55 | 45 |
| Industrial; commercial | 70 | 70 |
| Note: No LAeq values are conditioned for rural areas | | |

[5] https://www.ifc.org/content/dam/ifc/doc/2000/2007-onshore-oil-gas-development-ehs-guidelines-en.pdf

## 2.6 Staatsolie's Health, Safety, Environmental and Quality Policy

The Health, Safety, Environmental and Quality (HSEQ) Policy is a paramount framework that lies at the core of any responsible and forward-thinking organization. By instilling a collective sense of responsibility, this policy aligns the organization's objectives with the principles of health, safety, environmental sustainability, and quality assurance, thereby ensuring a harmonious and sustainable future for all stakeholders involved. This ESIA is intended to ensure Staatsolie's compliance with its Corporate Social Responsibility (CSR) and HSEQ policies and commitments and Suriname's environmental laws.

**Corporate Requirements**

Staatsolie has adopted procedures for protecting the environment which comply with international standards. An integrated Health, Safety, Environment and Quality (HSEQ) Policy and Management System is implemented across Staatsolie's operations to monitor effects on the health and safety of employees, contractors and affected communities, as well as impacts on the environment.

The Staatsolie's Health, Safety, Environmental and Quality Policy and its commitment to health and safety for its employees, contractors, community and environment is included in **Appendix 3**.

# 3 Project Description

## 3.1 Introduction

As described in Chapter 1, Staatsolie intends to carry out a 2D Seismic Exploration Program and Exploration Drilling Program in the Coronie Block.
In the past seismic activities have already been executed in the project area. In **Figure 3,** the regional 2D seismic lines of the previous seismic activities are expressed in blue. Further, between 1969 and 1970, drilling activities have been conducted in the project area by Shell Suriname E.P.M. Two (2) dryland exploration wells were drilled in the north of Coronie, respectively TN-1 and BNS-1. In addition, eight (8) wells (COR01 – COR08) were drilled in the swampy southern area of Coronie (see **Figure 3)** by Paradise Oil Company (POC), which was 100% subsidiary of Staatsolie.

## 3.2 Project Justification

In its effort to sustain its oil production, Staatsolie is continuously searching for additional oil reserves. Currently Staatsolie has a daily onshore production of 17,000 Barrels. In this capacity, the Coronie East Area has been identified as one of the remaining onshore areas of interest with potential for oil exploration by means of 2D seismic acquisition and exploration drilling.

To evaluate the hydrocarbon potential of the study area more data is required to acquire pertinent information trapping potential as well as the lateral extension of the identified leads.

## 3.3 The 2D Seismic Exploration Program

### 3.3.1 Purpose

The purpose of the 2D Seismic Exploration Program is to develop an integrated subsurface structural and sedimentological model with the available well and the acquired seismic data to better understand the erratically deposited fluvial to deltaic sands in the Coronie Block and its hydrocarbon potential.

The proposed 2D seismic survey has the following objectives:

- Confirm the presence of several Fault systems, trending SW-NE in the Coronie Block, and other structures such as subtle highs and lows.
- Review the structural configuration of the T Unit in the Coronie Block
- Investigate the presence of potential Paleocene and other reservoir bodies in the Coronie Block

### 3.3.2 Project site

The outline for the proposed 2D seismic survey in dryland and swamp area, is represented by an area of interest (AOI) with the points A to D. The coordinates are presented in the **Table 5**. The 2D seismic data will be gathered along five (5) seismic lines, indicated with the lines 1-2, 3-4 (E-W lines), 5-6, 7-8 and 9-10 (N-S lines). The AOI as well as the 2D seismic design is outlined in **Figure 3**.

**Table 5: Coordination AOI seismic survey**

| Point | X-Coordinate | Y-Coordinate |
|---|---|---|
| A | 542106.90 | 637585.85 |
| B | 598832.49 | 625087.52 |
| C | 598979.49 | 649186.74 |
| D | 544332.08 | 659164.31 |

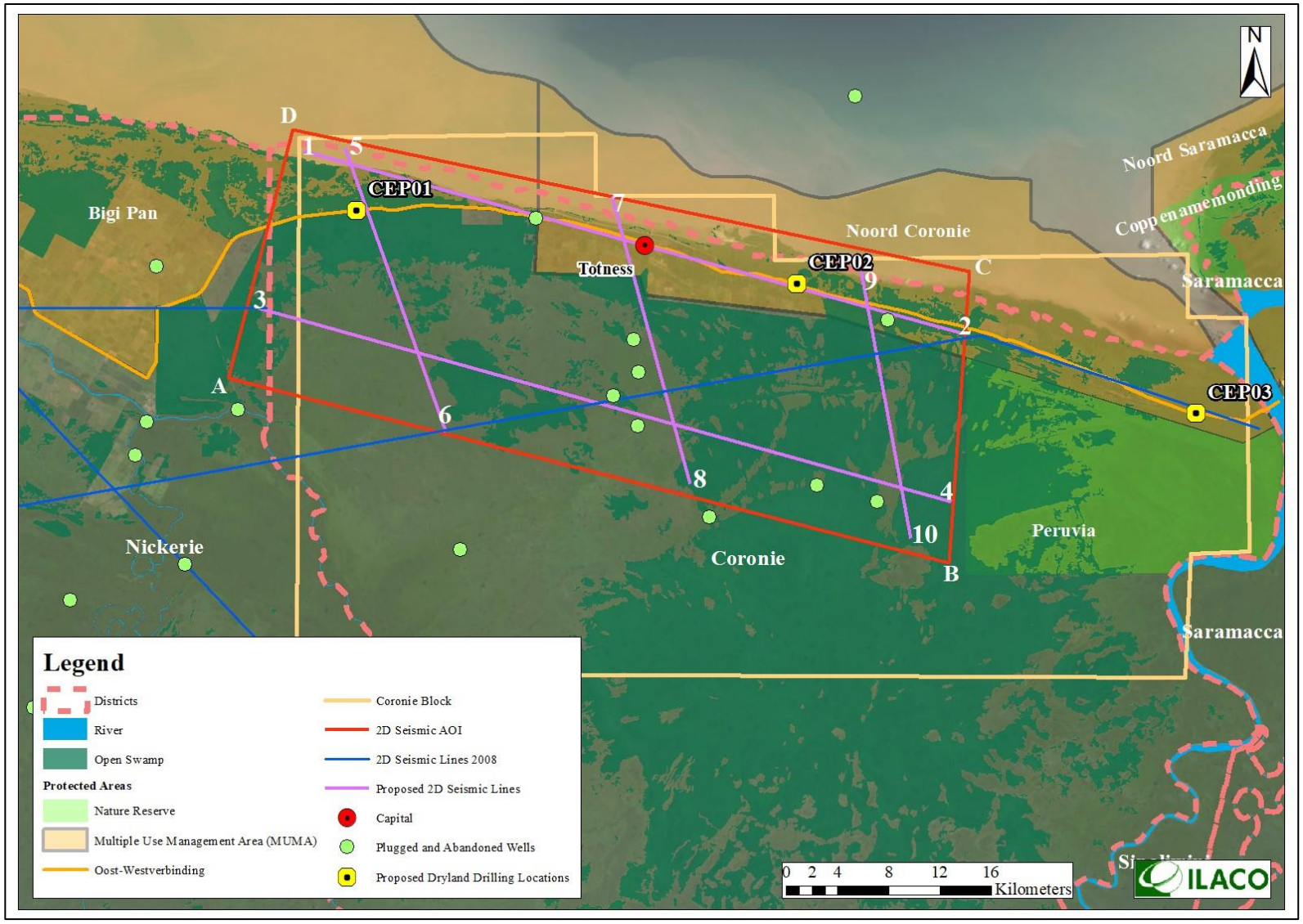


**Figure 3: Overview of the previous seismic and drilling location, current AOI and planned seismic lines**

It can be stated that the intended AOI is on mostly dry land in the north and predominantly in swamp area in the south. The area in the north (dryland) can be reached by vehicle, while the area in the south is overall marshy (swamp) and can only be reached by watercrafts such as boats or airboats through existing trail (**Figure 4**). Some lines will likely pass through forested environments.

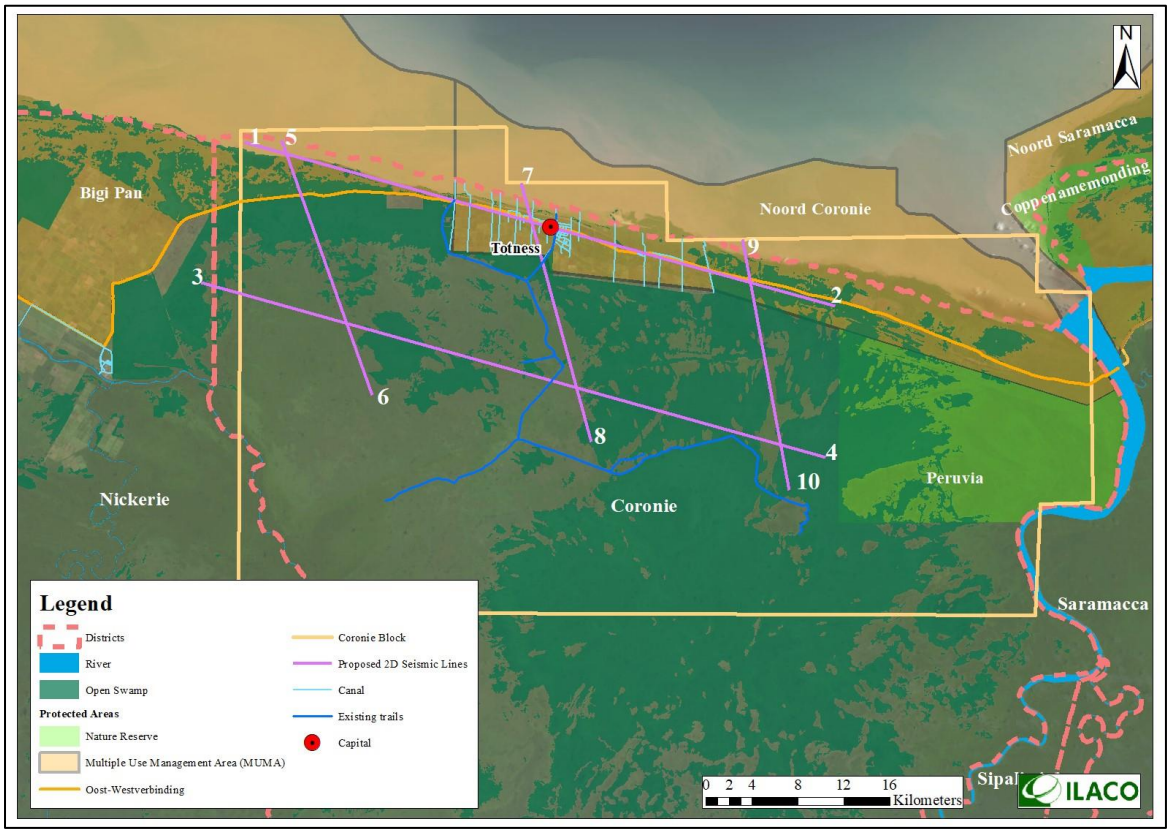


**Figure 4: Overview of the existing waterways within the project area**

### 3.3.3 Project planning

Gathering of seismic data requires mobilization to the project area, clearance of grid lines (North-South and West-East), drilling of shot holes, signal generation with explosives, recording and abandonment of lines.

For the execution of the seismic survey, the following will be conducted:

- The locations of the seismic survey will be accessed using existing infrastructure, such as the main road, as much as possible, and also existing waterways (indicated with the red lines in **Figure 5**) to lay out the source and receivers to acquire the intended seismic data. In case new access pathways are constructed, the vegetation clearance for the gridlines will be done as minimal as possible. Access routes and trails will be one to two meters (1-2 m) wide. In this project line cutting in the swamp by surveyors is inevitable to access areas where acquisition will take place.
- Small seismic explosives will be used to generate the seismic signal. Geophones and marsh phones can be used for receivers. However, other options are not excluded.
- The project will start in the swamp where Pick-up point 2 (PP2) is located (see **Figure 5**). From there the contractor will go through the existing waterways in zodiacs or wooden boats to the starting point on line 1. From there they will do the line cutting and acquisition in 2 groups. 1 group will go to the North and the other to the south. After line 1 is finished they will carry on to line 2 (EW line) also with 2 groups. The next route will be line 3 to the West and then line 4 (east). When they have finished the lines in the swamp, the seismic line 5, which is mostly on land, will follow. The only different equipment they will use or geophones instead of hydrophones (swamp equipment).

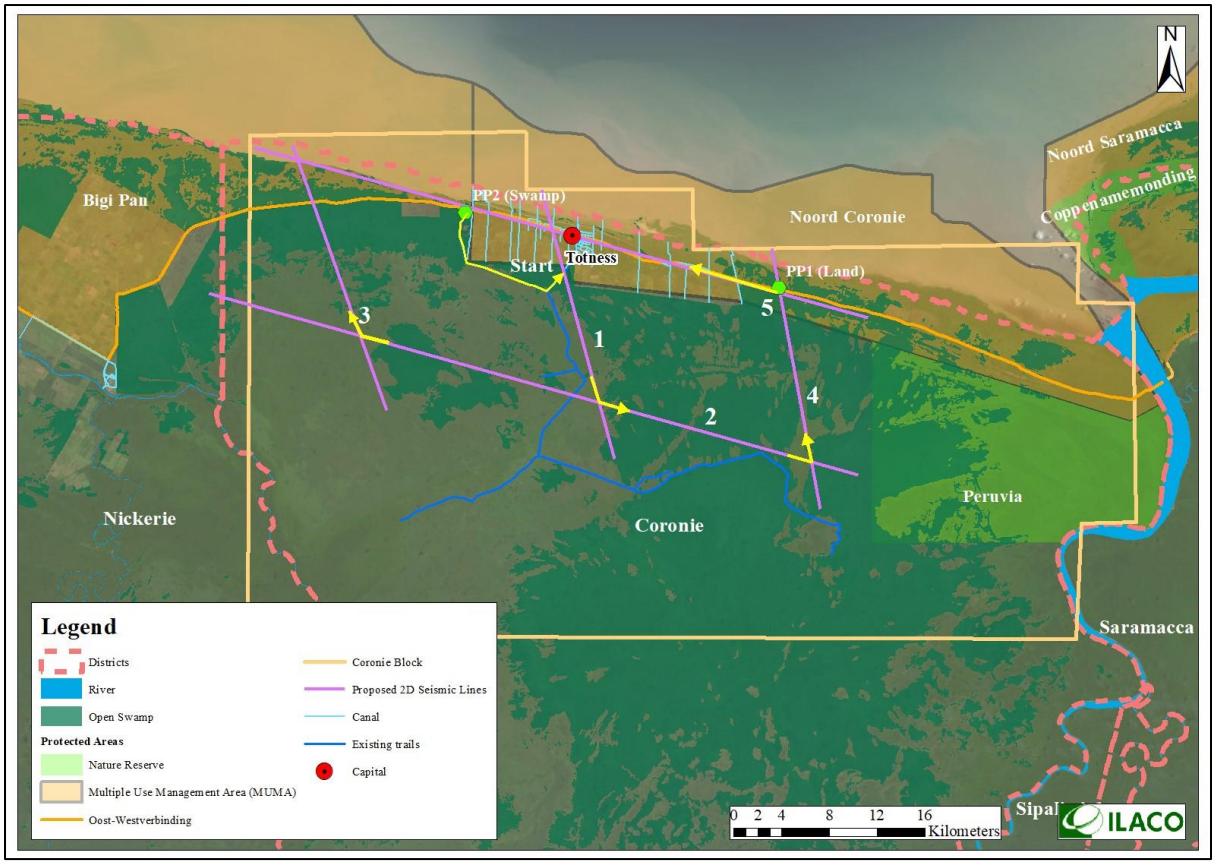


**Figure 5: Overview map of the workplan through the swamp (lines 1-4) and land (line 5).**

### 3.3.4 Project activities

The seismic survey comprises the following project activities that will incorporate any necessary measures and controls as deemed fit to manage any potential health, safety, environmental or community related impacts:

- Planning and preparation;
- Mobilization to the project area;
- Reconnaissance/ survey;
- Line clearing and marking;
- Drilling of shot holes and loading of the seismic explosive;
- Shooting and recording;
- Abandonment of lines;
- Inspection and closure; and
- Restoration.

A contractor will be hired for the execution of this project.

*Planning and preparation*

Considering the potential overlap of the project area with private land, it will be necessary to determine or confirm landownership in part of the seismic block during the planning and preparation phase. Following proper consultation with identified landowners, before the start of the project, a land use agreement (contract) will be signed with the landowners.

*Mobilization to the project area*

Before the start of the fieldwork, the Contractor will determine the best (safest, and fit for purpose) methodology and routes for importing and transporting equipment from Saramacca (storage facility of the contractor) to the project site.

*Transport and Trails*
The contractor will use their own equipment which will be placed in the swamp and retrieved after the data acquisition.

To execute the seismic program, existing overgrown trails will be cleared and approximately 200km of small new trails with a width of 2 m will be opened (if necessary) by machetes in the swamp.

Small wooden boats will be used in the swamp while placing the acquisition equipment. This is to guarantee the safety of the equipment but also for the personnel. The processing and recording unit will be placed nearby on a dryland spot. A logistic plan will be worked on after the contractor is hired.

*Reconnaissance/survey*
In preparation for the field program, a reconnaissance/survey will be carried out to identify access routes. Within the wetland area, the existing waterways will be used and within the polder area existing roads and dams will be used.

Actual line and shooting locations will take the following into account:
- Power, water and telephone lines;
- Radio, television and radar transmitters;
- Holes or pits;
- Fences;
- Animals or insects (such as bees);
- Hunting zones;
- Houses and other building constructions;
- Wells; and
- Other potential natural or manmade obstacles or hazards.

*Line clearing and marking*
Within the seismic area, a grid of lines will be cleared with North-South running shot (source) lines and East-West running receiver lines. Line clearance entails hand clearing of the natural vegetation along the lines. No large trees will be felled, only low growth and shrubbery cleared to allow walking along a narrow path. Machetes and small chainsaws will be used. To ensure that the clearance crew remains within the pre-plot versus post-plot tolerances, regular positional control will be provided via GPS methods. The shot points and receiver locations along the lines will be marked. Line clearance and shot/receiver point marking will be done at the same time.

*Drilling of shot holes and loading of the seismic explosive*
After the clearance crew has built up sufficient lead, the drilling crew moves along the cleared path and will drill the shot holes to a maximum depth of 20 meters (actual depth yet to be determined) and load them with explosives. The source point interval is 10, 20, 30 or 40 meters apart (yet to be determined). The drilling equipment (which is not heavy and can easily be dismantled) that will be utilized for this activity, will be portable motorized drilling units that can be transported by truck, airboat and/or man portable operations.

Specially trained crewmembers will handle and load the explosives. Loading will be done via PVC pipes and as soon as possible after drilling, to prevent the shot holes from collapsing. After that, the shot holes are closed again and clearly marked. The shooting source is 100 grams of seismic explosives that will be loaded into each shot hole. These explosives will be primed with seismic detonators.

*Shooting and recording*
The drilling crew will be followed by the recording crew to deploy the phones. The recording line equipment will be laid out by manpower, with marsh geophones placed at 4-meter intervals (actual interval yet to be determined). After sufficient spread has been deployed, the “shooting” crew will detonate the explosives. For safety reasons, in inhabited areas the shooting will be done as soon as

possible following drilling and placement of explosives. In easily accessible areas, the recording unit is mounted on a truck, while a portable recording cabin will be available for less accessible areas. Recording progress is estimated to be approximately 0.6 km per day.

The shooting will produce a noise of which the level is such that it is hardly audible at the surface and vibrations are only felt near the shooting location, producing a brief and faint trembling, comparable to one produced by the passage of a truck.

Shooting is not expected to result in any surface cratering, because the charge size is very small and the shot hole relatively deep. Should, for now unknown reasons (e.g., soil characteristics), cratering be expected, the holes can be drilled deeper.

*Decommissioning of lines and natural Restoration*
In the decommissioning phase of the project, the cables, receivers, and waste material from the sources will be removed and the surface will be left as clean as possible. The processing unit will also be removed. The project area will be abandoned and left without any obstacles. Afterwards a close out inspection will be carried out by representatives of HSSE, CCU department, the project manager and the respective landowners to validate proper clean-up and closure.

*Natural Restoration*
All the utilized waterways that have been opened will grow closed again in a natural way.

### 3.3.5 Time Planning

The plan is to acquire approximately 200 km 2D seismic data with the use of land and swamp acquisition method. The data acquisition will be performed in alignment with the available permits and the start of the 2D seismic acquisition is aimed at Q3 2023 and will last approximately 6 months. An overview of the planning is indicated in **Table 6**.

**Table 6: Planning of the 2D seismic Exploration Coronie Project is as follow:**

| **Phase 1** | | |
|---|---|---|
| **Activities** | **Timeline** | |
| Project planning and preparation (including consultations with landowners) | 2 weeks | Mid-December 2023 |
| Scouting and mobilization to the project area | 2 weeks | January 2024 |
| Reconnaissance/ survey | 3 weeks | February 2024 March 2024 |
| Line clearing and marking (North-South and West-East) | 4 weeks | March 2024 – April 2024 |
| Drilling of shot holes and loading of the seismic explosive | 1.5 Month | April 2024 – Mid- May 2024 |
| Shooting and recording | 4 weeks | Mid-May – Mid- June 2024 |
| Abandonment of lines, inspection and closure | 1 weeks | End -June 2024 |
| Restoration and finalization project | 2 weeks | Mid -July 2024 |

### 3.3.6 Equipment and manpower input

The table below provides an overview of the equipment that will be used for the various project activities. In addition, an overview of required personnel is presented.

**Table 7: Information on planned resources for this project**

| Equipment | # | Deployment | Activity | Personnel |
|---|---|---|---|---|
| **CONSTRUCTION & ACQUISITION** | | | | |
| Line cutting and surveying material | 2 | Daily-workdays | Personnel transport and monitoring/ machetes and transportation vehicles will be used | 15 |
| Lay out / deploy equipment | 1 | Daily-workdays | Personnel transport and monitoring, transportation of survey equipment and personnel | 15 |
| Recording | 1 | Daily-workdays | Deployment of recording equipment, recording and quality control | 2 |
| **DECOMISSIONING PHASE** | | | | |
| Inspection for abandonment | 2 | Final workday | Inspection of abandoned worksites and closure | 3 |

## 3.4 Exploration Drilling Program

### 3.4.1 Purpose

The purpose of the Exploration Drilling Program is to test the geological concepts identified during the geological technical evaluation. Furthermore, to develop an integrated subsurface structural and sedimentological model with the drilling results in order to better understand the erratically deposited fluvial to deltaic sands in the Coronie Block and its hydrocarbon potential.
Drilling the proposed well locations have the following objectives:

- To test the geological features identified by the conceptual model as well the structures such as subtle highs and lows.
- Review the hydrocarbon potential in the North.
- Investigating the presence of potential Paleocene and other reservoir bodies in the Coronie Block.

### 3.4.2 Project site

Staatsolie plans to carry out exploration activities (dryland drilling) in the Coronie area. The exploration drilling activities will be carried out only on land along the Oost-Westverbinding. The area can be reached by vehicle and is easily accessible. Three (3) wells are projected along the main road. The proposed well locations are expressed in **Table 8** and **Figure 6**.

**Table 8: Proposed well locations.**

| Coordinates proposed well locations Coronie | | | |
|---|---|---|---|
| **Location** | **Name** | **X-Coordinate** | **Y-Coordinate** |
| 1 | CEP01 | 550650 | 652800 |
| 2 | CEP02 | 584900 | 647200 |
| 3 | CEP03 | 615970 | 637303 |

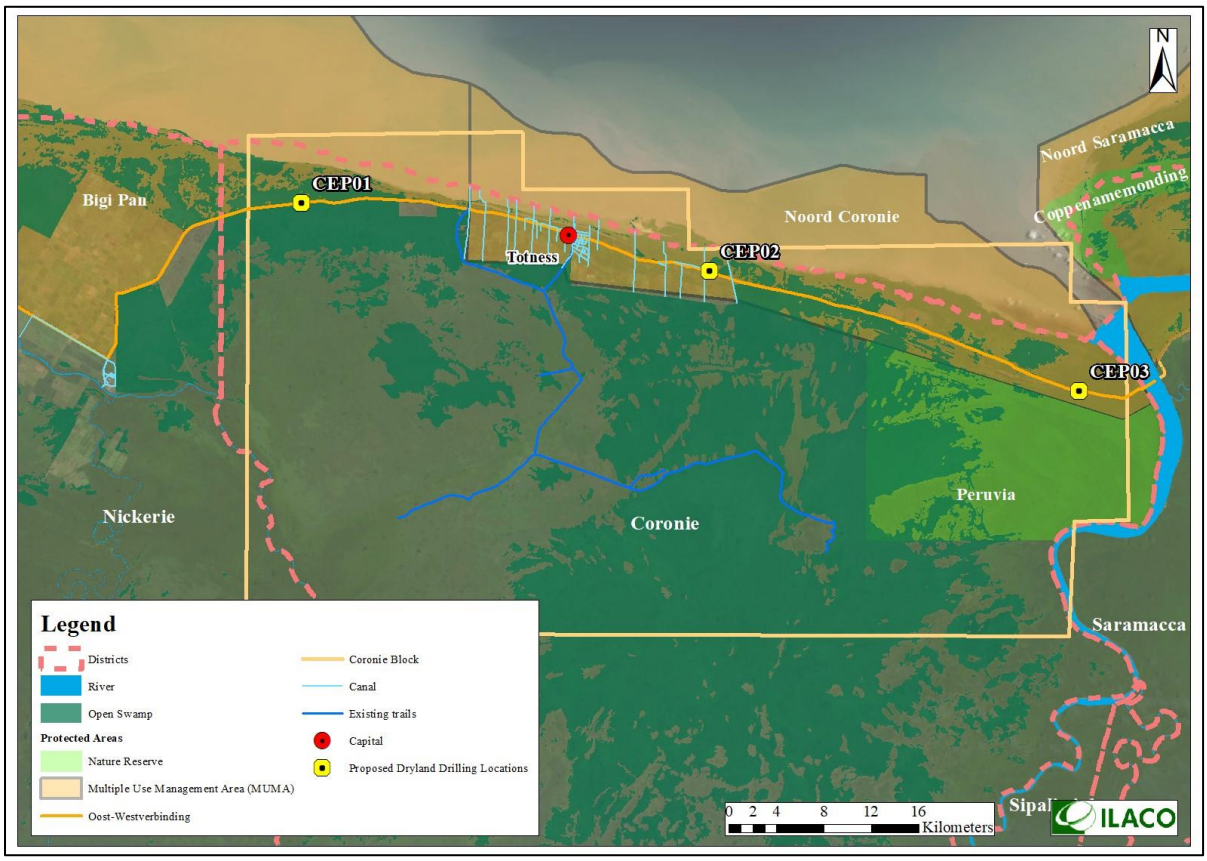


**Figure 6: Overview map of the Coronie Block, indicating the 3 dryland exploration drilling locations.**

The intended AOI for drilling comprises only accessible land in the North. Drilling site locations are close to the Oost-Westverbinding and can be reached through the construction of a short access road to the site. The exact locations have yet to be determined by a detailed reconnaissance of the proposed area.
A land mobile drilling rig will be utilized for this project. The Rig and auxiliary equipment will be moved to the first location. Prior to drilling at each location, a ~ 60x50 meter area will be prepared to accommodate the drilling and auxiliary equipment including temporary parking mobile vehicles and equipment. These ~60x50 meter drilling sites and the required access routes from the public road form the project area(s).

### 3.4.3 Planning

The plan is to drill 3 exploration wells along the main Oost-Westverbinding. The mobilization of the drilling rig and auxiliary equipment might be from Saramacca or Nickerie to Coronie to the drill sites. The drill sites will be constructed in consultation with local authorities, in particular the Districts Commissioner, LBB and the police. For the transport of equipment materials and personnel, public roads will be used. Exceptional transports will be escorted by the police. These transports will be planned in consultation with the authorities and will be timely communicated to relevant stakeholders to keep inconvenience for other road users to a minimum.

The Land-rig will first drill CEP01 in the west, then move to CEP02 and finally CEP03 in the east. In **Figure 7** the sequence of the drilling is depicted.

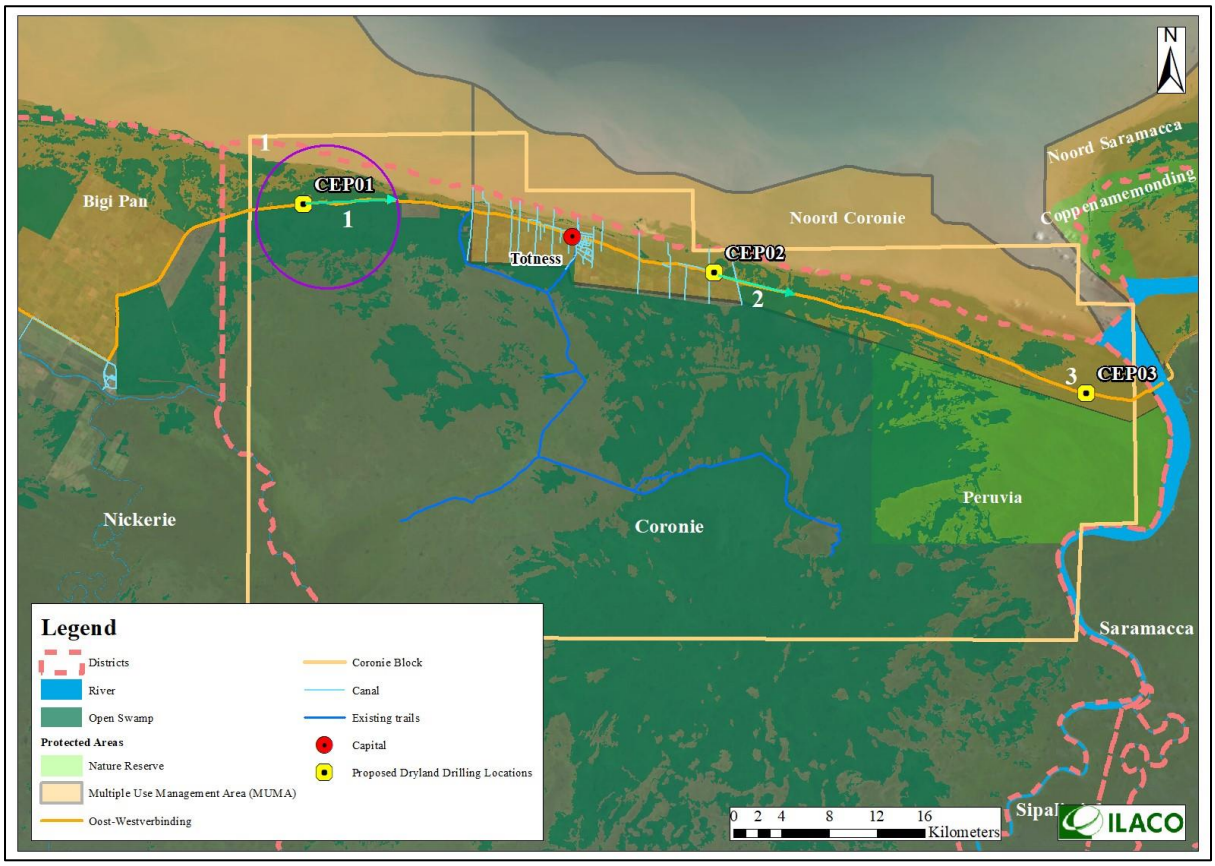


**Figure 7: Overview map of the workplan, indicated by the green arrows.**

The preparations and drilling activities will commence in Q2 of 2024 and will last approximately 6 months. An overview of the planning is indicated in **Table 9**.

**Table 9: Planning of the drilling activities in the Coronie North area is as follows:**

| Activities | Timeline | |
|---|---|---|
| **A. Construction phase:** | | |
| Preparations (well design, purchase material, Rig selection) | 10 months | November 2023 – July 2024 |
| Scouting of the area/identification of landowners, if any, eventually followed by land owner agreement | 1 day | July 2024 |
| Construction of access to the drilling sites | 6 weeks | July – Mid -August 2024 |
| Construction of the drilling sites | 6 weeks | Mid-August - September 2024 |
| **B. Operation phase:** | | |
| Mobilization (Rig move) to the project area | 4 weeks | April 2024 |
| Drilling, logging of locations, including move to next location | 6 weeks | May – Mid-June 2024 |
| **C. Decommissioning/ Closure phase:** | | |
| Decommissioning | 2 weeks | End- June 2024 |

### 3.4.4 Construction phase

During this phase, the 3 well locations will be prepared for drilling. Model drilling sites are shown in **Figure 8** and **Figure 9**. Both basically measure 51 x 33 meter. Other dimensions could be more appropriate in certain cases, like 60 x 50 meter in case parking place for vehicles is required, but the latter will be the maximum dimensions. The drilling site in Figure 5 is connected to the public road by a shorter or longer access road of 4 meter wide. The whole project site is surrounded by a ditch that is connected to a nearby waterway. For the current project, all drilling sites will be located as close as possible to the Oost-Westverbinding, meaning that access road will be absent, or at most short.

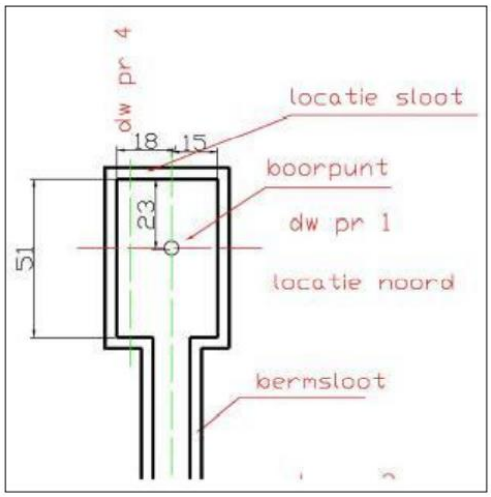


**Figure 8: Model dryland drilling site with access road**

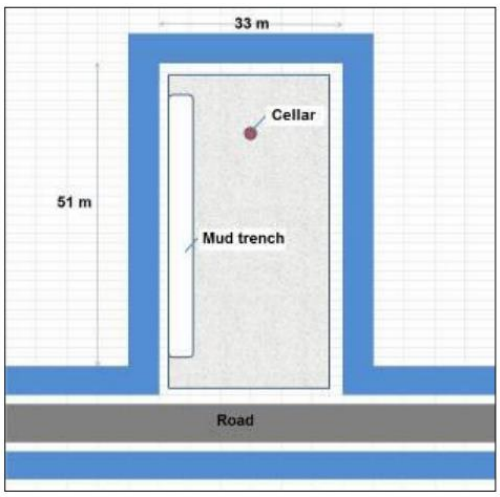


**Figure 9: Model dryland drilling site directly bordering the main road**

For construction, the following activities will be undertaken.

#### 3.4.4.1 Construction of access to the drilling site.

Starting from the Oost-Westverbinding, access will be provided to the drilling sites. Access of 4m wide is required for the drilling rig to enter the site. The type of access differs per location, but in general, a waterway has to be crossed, which may be either a ditch or a canal. The crossing will be made by means of culverts or by placing a container within the waterway, in order not to interrupt the waterflow. The type of crossing is determined by the characteristics of the waterway, with the use of culverts in the narrow waterways (ditches) and possible use of a container (or large culverts) in the wider waterways (canals). The culverts and containers will be covered by sand to provide a road surface. All access

provisions are in principle temporary and will be removed upon abandonment of the location unless other agreements have been made with landowners. Access may require some clearing of low secondary vegetation for the road trajectory in case the drilling site is not located directly south of the waterway and an access road is to be constructed. However, for most locations the drilling site will be right across the waterway. In case of an access road, this will be 4 meter wide and sufficient sand fill will be applied where necessary. For locations on ridges, this will be a shallow layer, but on clay soils, first a roadbed and berm need to be constructed from locally excavated clay. The roadside ditches will be constructed from the excavated clay. A cross section of an access road is provided in **Figure 10**.

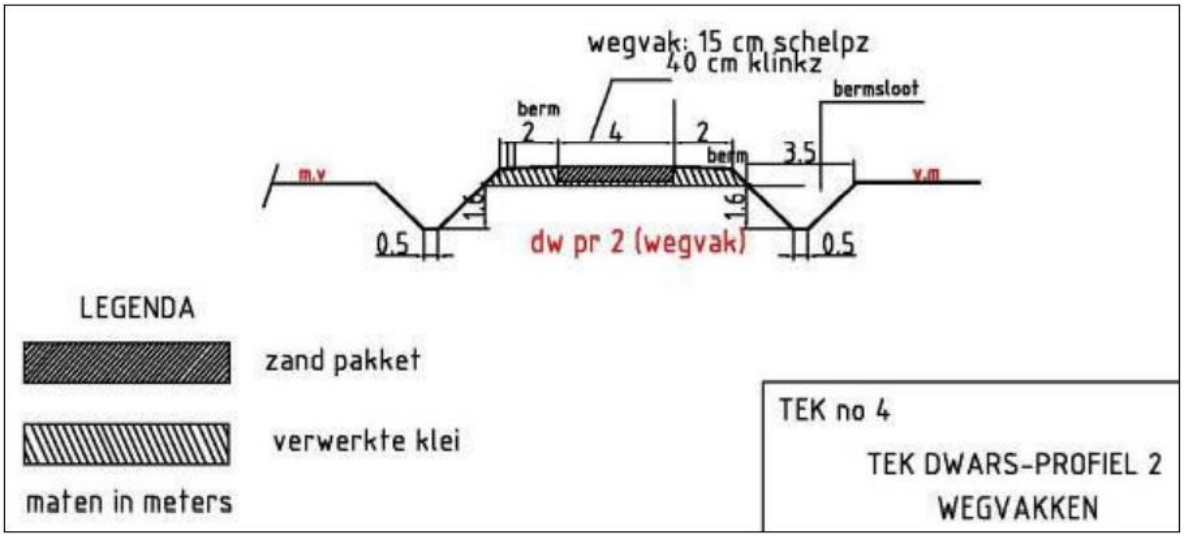


**Figure 10: Cross section through an access road.**

#### 3.4.4.2 Construction of drilling site

The drill location exists of a square of ~51x33 meter. However, in case no safe nearby parking place for vehicles is available, e.g. on the access road, or on a neighboring lot. The drilling site is extended to accommodate vehicles. Dimensions then will become 60x50 meter. The type of construction of a site depends upon the local soil conditions. On sand, less earth movement is required, while on clay the whole site must be heightened up to 50 cm above the highest swamp water level. In all cases, however, a ditch will be excavated surrounding the drill location and the soil material from the ditch will be used to build an outer dam. The ditch will be inside this outer dam. The perimeter ditch will be connected to the nearest drainage way to drain stormwater. In swamps on clay soils part of the excavated clay will also be used to raise the drilling site. Here another but smaller inner dam will be built, also surrounding the ditch. The purpose of the smaller dam is to hold the sand (~50 cm thickness) that will be used to finalize the location. A certified and experienced contractor will carry out the construction of all locations. On ridge soils far less fill sand is needed, the volume depending upon the existing conditions at the ridge. Depending on the arrangement of the rig with all auxiliary equipment, especially the directions of the flow of cuttings and mud, a pit will be excavated to collect all cuttings and water-based drilling mud from the well (**Figure 9**).

### 3.4.5 Operation phase

#### 3.4.5.1 Mobilization to the project area

Following proper consultation with identified landowners, before the start of the project, a land use agreement (contract) will be signed with the landowners.

Before the start of the fieldwork, the Contractor will determine the best (safest, and fit for purpose) methodology and routes for importing and transporting equipment to the project site.

#### 3.4.5.2 Drilling

The exploration wells will be drilled with a land drilling rig. The mobile rig auxiliary equipment is moved to the locations. Other trucks will move supplies such as the drill pipes, the mud treatment system, mobile offices, the generators and pumps, the logging unit and the cementing unit. The drilling activities will start by pressing a conductor pipe and after hooking up safety devices an intermediate hole will be drilled case off. Subsequently an 8-1/2 inches hole will be drilled to planned depth which is around 4,000 feet.

*Drilling fluid and cuttings processing*

Drilling fluid (also known as "mud") is pumped down the inside of the drill pipe and exits at the drill bit. For the Coronie Dryland exploration drilling, water-based drilling mud (WBM) will be used, mainly composed of water, bentonite (clay) and polymer. Particular functions of the drilling mud include cooling the bit, lifting cuttings to the surface, preventing destabilization of the walls of the well bore and overcoming the pressure of fluids inside the sediment so that these fluids do not enter the well hole. During drilling “cuttings” are generated consisting of clay, sand, and shell fragments. These "cuttings" will be brought to surface through the mud circulation system. The cuttings are separated from the mud in the mud treatment system and at regular depth intervals sampled. The drilling mud will be re-used as much as possible. Spent drilling mud, which is not harmful to the environment will be buried, either on-site or at Sarah Maria.

During the drilling phase, water will be required for drilling of wells. Initially approximately 40- 50 $m^3$/day is required, but when drilling progresses less water is needed because it will be recycled. Depending on availability, it may be trucked in from off-site or obtained from nearby surface water bodies.

*Logging*

After finalization of the drilling operations, the hole is logged with a variety of logging tools that are lowered into the open well hole. Measurements include electrical properties (resistivity and conductivity at various frequencies), sonic properties, and active and passive nuclear measurements. The logging equipment is placed on a truck, where also the logging is recorded. No emissions occur during the logging process. No special tools will be run during this phase of drilling.

### 3.4.6 Decommissioning phase

After finalization of logging, the well is plugged with cement and abandoned. No communication between stratigraphic zones will be possible and contamination of aquifers will thus not occur.

From the intermediate casing will be cut 15 feet below the surface and cement will be used to plug and abandon the hole. Cement will be transported in bulk to the rig site.

All facilities, equipment and materials will be removed from the site. This includes any sand that has been placed in the field and on dams, and all culverts or containers (used as culvert). However, most landowners have indicated that they like to see that the sand is left behind. When consent of the landowner is obtained, the cuttings and spent drilling mud will be buried on-site, which is a normal procedure for both wetland and dryland operations of Staatsolie. When no consent is obtained, the cuttings and spent drilling mud will be excavated and transported to Sarah Maria where it will be buried at a dedicated site after the drilling activity at the location has ended.

Dams constructed in the field will be leveled and dug ditches will be filled back. The field surface will be leveled so that the site is brought back, as much as feasible, to its pre-project state. Any spent completion fluid will be transported to the Sarah Maria facilities where it will be treated and disposed of. Any other waste will also be removed.

A soil quality assessment will be conducted for drilling sites from where the fill sand will be removed in case the landowner would not want to keep it. The latter has never been the case and no sand has ever

been removed from former drilling sites at privately owned lands. Anyway, if it would happen, such assessment is needed in order to determine if any soil pollution or deterioration has occurred. In that case, baseline soil sampling will be required, which should be conducted as soon as the exact drilling location is known, and prior to any activities at the site. Any contaminated soil will either be treated on-site or be removed from site for treatment elsewhere. In case of oil pollution, the polluted soil will be transported to Sarah Maria to be treated at the landfarm. In case of increased salt levels in the soil, the soil will be desalinized with fresh water by flooding and/or flushing of the drilling site.

As the last step of decommissioning of a site, a close out inspection will be held with (a representative of) the project owner, HSE, CR and the landowner. This closeout inspection will be held at least 2 weeks before the contract between Staatsolie and the landowner expires. If there are no issues arising from this inspection the landowner will sign for proper hand-over. If there are outstanding issues these should be attended and a second close-out inspection should be held upon finalization.

### 3.4.7 Equipment and manpower input

During the various project stages, different equipment and personnel will be involved. In addition to on-site personnel, the project will be visited by supervisors, technicians, HSE crew and other staff members from the Sarah Maria office in Saramacca. Security personnel will be present throughout the day and night during all phases of the project.

The table below provides an overview of the equipment that will be used for the various project activities. In addition, an overview of personnel is presented.

**Table 3: information on planned resources for this project**

| Equipment | # | Deployment | Activity | Personnel |
|---|---|---|---|---|
| **CONSTRUCTION PHASE** | | | | |
| Heavy equipment | 1 | Daily-workdays | Construction of drilling site | 3 |
| Material transportation | 1 | Daily-workdays | Construction of drilling site | 5 |
| | | | | |
| **OPERATION PHASE** | | | | |
| Rig move | 2 | Daily workday | Drilling activities | 10 |
| Logging unit | 2 | Several hours | Logging job | 2 |
| | | | | |
| **DECOMISSIONING PHASE** | | | | |
| Inspection for abandonment | 3 | Final workday | Inspection of abandoned worksites and closure | 3 |

## 3.5 Project Alternatives

The "no-go" alternative pertains to the scenario where the project is not implemented. On a positive note, this would entail no disruption to the local environment. However, past experiences with similar projects have shown that any impacts tend to be localized and temporary. Therefore, there are no significant anticipated medium or long-term environmental or social effects resulting from the absence of this project. When considered in the context of the current level of oil and gas development activities in the region, the environmental advantage of this scenario is deemed to be relatively small.
Conversely, opting not to pursue this project would mean that Suriname forfeits potential economic development opportunities. Without the seismic and exploration drilling program, future development and production of hydrocarbons in the area would not be feasible. While technical alternatives have been thoroughly assessed, no viable options have been identified.

# 4 Description of the Existing Environment

## 4.1 Regional Setting

Coronie is a district of Suriname located in western Suriname and situated on the Atlantic Ocean coast. The capital is Totness. To the west, Coronie borders the district of Nickerie and to the east the district of Saramacca, separated from it by the Coppename River. The southern boundary is formed by the Wayambo River, which separates Coronie from the district of Sipaliwini. Much of the district is uninhabited, being a swamp area. Habitation is only present along the Oost-Westverbinding, which connects Paramaribo with Nickerie. Human activities are mainly found in the plantation area (Ingikondre-Burnside) and at Coppenamepunt.

## 4.2 Physical environment

The below baseline descriptions are based on literature reviews, existing maps, photographs and images, field observations and interviews. Field measurements have been conducted for noise and water quality. The environmental setting described in this section provides baseline conditions from which an assessment of the potential effects of project development was determined. In addition, the baseline environmental information could be used as a benchmark by which future monitoring results will be compared.

### 4.2.1 Climate

The weather of Suriname is dictated mainly by the northeast and southeast trade wind system called the Inter-Tropical Convergence Zone (ITCZ).
The ITCZ follows the sun in its movement to the north to about 15˚ latitude north and to the south to about 10˚ latitude south of the Equator. The ITC zone passes over Suriname two times per year bringing heavy rainfall when it is overhead.
This result in four seasons based upon rainfall distribution:

| | |
|---|---|
| Long Rainy Season | End April - Mid August |
| Long Dry Season | Mid-August - Early December |
| Short Rainy Season | Early December - Early February |
| Short Dry Season | Early February - End April |

Most of Northern Suriname has a Tropical Rainforest Climate (Af-climate in Köppen's classification). The average rainfall exceeds 60 mm in the driest month(s). A narrow strip along the coast, which has drier conditions, forms an exception. Here a Monsoon (Am) or a Wet and Dry Climate (Aw) is found, characterized by at least one month with less than 60 mm. In addition, the average annual precipitation is (much) lower in this zone. The plantation area of the Coronie District is known for such dry conditions, with a mean rainfall of around 1,500 mm/year and average monthly rainfall below 60 mm in one or more of the dryer months. Going towards the east and to the south the average annual rainfall increases to over 2,250 mm (**Figure 12**). The dry character of Coronie is illustrated in **Figure 11**.

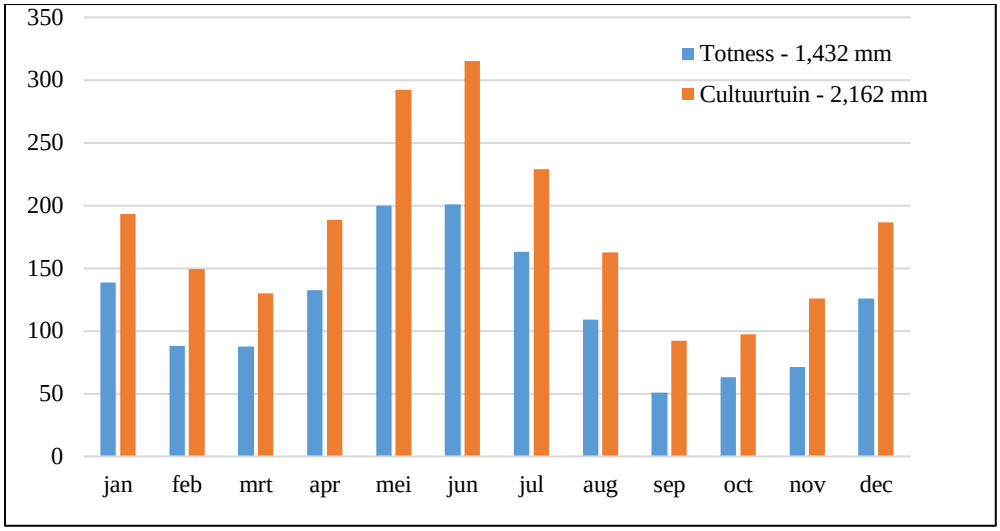


**Figure 11: Average monthly rainfall for Totness and Paramaribo (Cultuurtuin)**

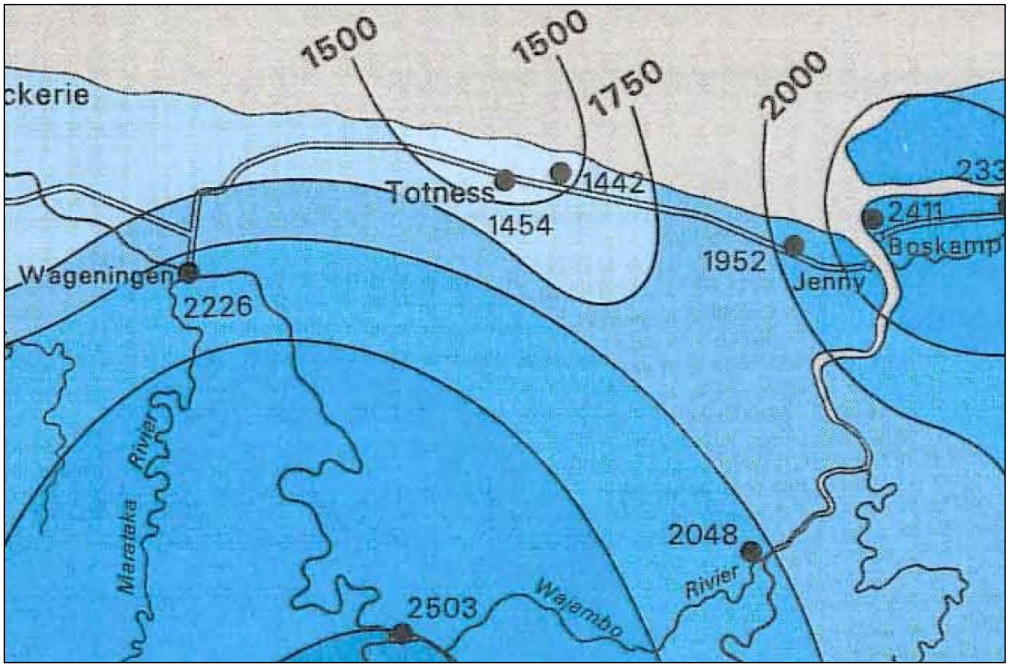


**Figure 12: Average annual rainfall over the period 1971-1980 (SPS/OAS).**

Like in most parts of Suriname, consistently high temperatures and a high humidity characterize the study area with the main variation being rainfall and the associated cloud cover. The mean annual air temperature at Paramaribo is 27.3 º C, with a daily range of 7-10 ºC and with an annual range of about 2ºC.

Northern Suriname has northeast to southeast wind directions, with the first dominating in the February-April and the latter during the July-September period. The other months show directions mostly ranging between northeast and southeast. Calm winds, i.e. winds with hourly average speeds less than 0.5 m/s, are very frequent. During the night and early morning, it is usually calm. During the day, the wind speed may increase to about 5 m/s, and in some seasons to 5-8 m/s, in particular in the February-April and the September-October periods. In the coastal zone, including the Coronie plantation area, wind speeds are usually higher than further inland. Wind speeds of 20-30 m/s have been occasionally recorded during thunderstorms, but only for a very short period (locally known as ‘sibibusi’), and sometimes causing some isolated low-severity incidents (material damage) from wind gusts. Suriname is free of hurricanes.

### 4.2.2 Air quality

Related to air quality, the study area is still good as there are hardly any stationary sources and only few other larger sources of air emissions.
Air pollution sources within the area are emissions from local traffic, farm activities and some small facilities with engines, like generators for power supply and pumps (e.g. water supply, drainage stations). Incidentally, confined grass or vegetation debris fires in dry periods may locally affect the air quality. However, any air pollution is minor, because traffic intensity is generally low and concentrated along the main road, while other activities are few and at a rather low level, with usually small-scale emissions. Moreover, the dominating north to southeast winds quickly disperses the emissions.
Thus overall, the air quality of the study area is good, while the air quality at the drilling locations can be characterized as good in the absence of significant emission sources (**Table 10**).

**Table 10: Air quality characteristics of the proposed drilling locations**

| Location | Description | Type of area | Emission source(s) | Impact intensity at drilling location |
|---|---|---|---|---|
| CEP01 | Along O-W verbinding, km 163 | Uninhabited swamp area | Road traffic | Low, limited traffic |
| CEP02 | Along O-W verbinding, km 128 | Rural; few houses | Road traffic; mechanized farm activities; weed burning | Low, limited traffic; incidental activities |
| CEP03 | Along O-W verbinding, km 95 | Uninhabited area (no residents within 1 km) | Road traffic | Low; limited traffic |

The planned seismic lines are mainly through uninhabited swamp areas. Only the northern line (line 1-2) and line 7-8 partly run through inhabited zones (**Figure 3**). The northern line passes through residential areas for approximately 1.5 km. Here, air quality will be affected by the higher traffic activity and human activities associated with households and businesses. Overall, however, in the absence of significant emission sources, air quality here is still expected to be good.

### 4.2.3 Noise

No specific noise legislation or guidelines currently exist for Suriname, so international guidelines were considered (WHO, World Bank/IFC) in this study. Noise is recognized as a potential pollutant or nuisance. Noise measurements were conducted at all drilling locations and at two selected locations near the northern seismic line (line 1-2) in residential areas. Only daytime measurements were made, because no nighttime project activities are foreseen. The noise data are presented in **Table 11** and the conclusions are summarized below. See **Appendix 4** for the detailed noise baseline report.
In below table, LAeq has been ranked from high to low. Highest LAeq is observed at N1 (rural with one house nearby) and N5 (natural), both locations along the Oost-Westverbinding outside the plantation area, with traffic at relatively high speed. Although the speed limit is 80 km/h, cars frequently drive at over 100 km/h.
Within the plantation area (rural with scattered houses), cars tend to drive somewhat slower, also because of the many speed bumps in this section of the Oost-Westverbinding (N2 and N4). LAeq is lower here, even though the number of vehicles at N2 is higher than at the two previously discussed locations. At all the locations with residents (N1, N2 and N4) the WHO/IFC daytime guideline value of 55 dBA for residential areas is exceeded, for N1 and N2 also when corrected for the distance of the houses to the road axis (see footnote).
N3 is not along the Oost-Westverbinding, but within a residential area in Totness. The WHO/IFC daytime guideline is not exceeded here, despite the relatively high number of vehicles. This can be

explained form the low speed (40 km/h) and the absence of heavy traffic. This measurement is considered representative for the Coronie residential areas.

**Table 11: Results of daytime noise measurements**

| ID # | Location | LAeq | L10 | L90 |
|---|---|---|---|---|
| N1 | Along the Oost-Westverbinding, near a resident approx. 1440 m away from drilling location **CEP03**. The measurement was conducted 7.4 m away from the axis of the road.<br>Traffic counts: 34 vehicles | 66.1[6] | 62.3 | 34.0 |
| N5 | Along the Oost-Westverbinding approx. 4300 m away from drilling location **CEP01**. The area surrounded with low to high vegetation. The measurement was conducted 7.4 m away from the axis of the road.<br>Traffic vehicles: 26 vehicles | 65.0 | 59.6 | 26.1 |
| N2 | Along the Oost-Westverbinding, in the driveway of a resident in Ingikondre approx. 170 m away from drilling location **CEP02**. The measurement was conducted 7.4 m away from the axis of the road.<br>Traffic counts: 45 vehicles | 63.1 | 62.3 | 41.9 |
| N4 | Along the Oost-Westverbinding, at the driveway of a resident in Burnside (KM 128). The measurement was conducted 7.4 m away from the axis of the road.<br>Traffic counts: 17 vehicles | 57.3 | 53.9 | 36.4 |
| N3 | In the driveway of a resident in Totness, along the Gouverneurstraat. The measurement was conducted 7.4 m away from the axis of the road.<br>Traffic counts: 27 vehicles | 49.1 | 50.4 | 37.6 |
| xx | Exceeds the WHO/IFC noise standard of 55 dBA for daytime in residential areas | | | |

### 4.2.4 Geology and geohydrology

The three proposed drilling locations and seismic lines are all located within the Young Coastal Plain, which is developed on Holocene deposits of the Coronie Formation. The Coastal Plain of Suriname is formed on sediments that have been deposited since the Late Cretaceous. These sediments are known as the Corantijn Group (**Figure 13**).

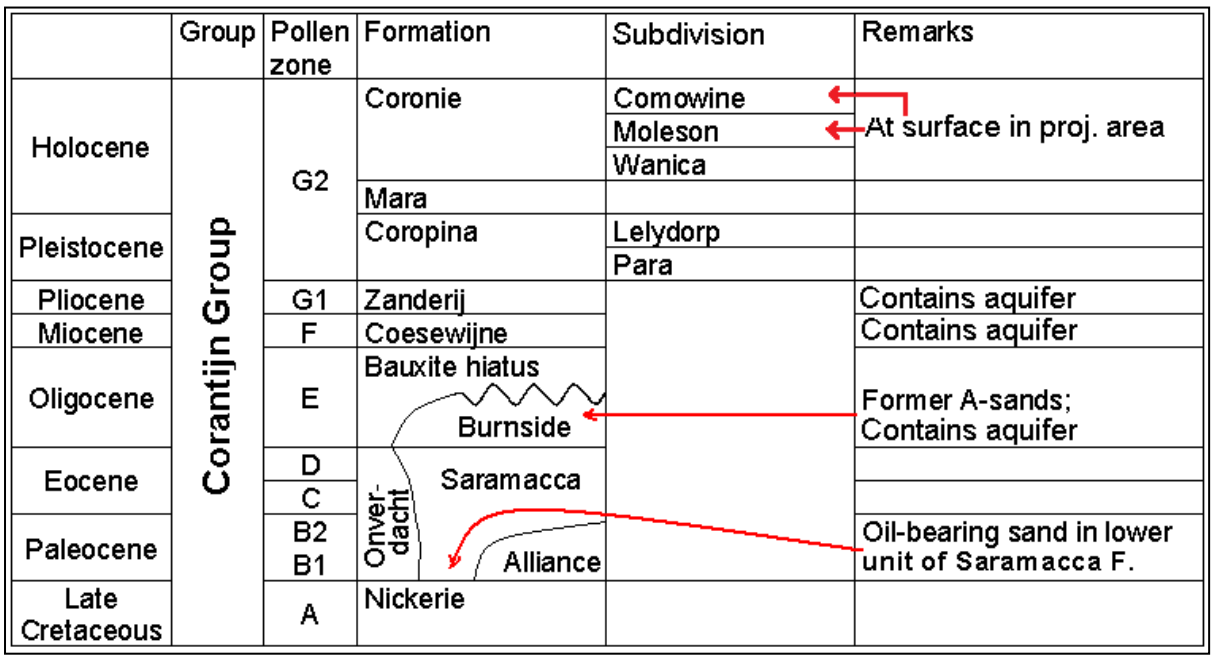


**Figure 13: Stratigraphy of the Corantijn Group**

[6] Note: measurements were made at a distance of 7.4 m from the road axis. When corrected for houses at a distance of 15 meters from the road axes, the LAeq levels are resp. 60.0, 57.0 and 51.2 dBA for N1, N2 and N4.

The drilling locations are found on clay sediments, most likely of the Comowine phase, which was deposited since the last 1,000 years. The seismic lines are found on clayey deposits of the Comowine phase, and on clayey, sandy, and shell deposits of the Moleson phase (2,500-1,300 years ago). Lines 3-4 and 9-10 end in the deep part of the Coronie Swamp, which is developed on deposits of the Mara Formation. This part of the swamp is characterized by deep water conditions (up to > 3 m) and thick layers of ombrogenous (rainwater fed) peat (see section on soils).

Drinking water in the coastal plain is withdrawn from three major aquifers within the Corantijn Group: A-Sand aquifer, Coesewijne aquifer and Zanderij aquifer, found in the formations of the same respective names (note: the A-Sand Formation has been renamed Burnside Formation; Wong, 1989). The Zanderij aquifer, at 50-210 m, is not being used for drinking water supply in Coronie, because the water of the zone of this aquifer in Coronie is brackish.
The drinking water station at Totness uses the A-Sand aquifer, which is at a depth of 152-166 m. The station produces good quality drinking water. This aquifer is likely to be present below the project area. In 2013, another drinking water station was opened in the Coppename area (km 100-101). This station also uses the A-Sand aquifer.

### 4.2.5 Land and Soil

The project area is located in the flat and very low-lying Young Coastal Plain in an area dominated by clayflats that form swamps, and with ridges in the northeastern. In the far south of the project area an extensive and deep swamp with thick peat layers is present. The physiography and soil conditions of the project area are presented in **Figure 14**. The information presented in this map has been adapted from the Reconnaissance soil map of Northern Suriname (Soil Survey Department, 1977).
An overview of the characteristics of physiographical units and a brief description of the soils is presented in **Table 12.**

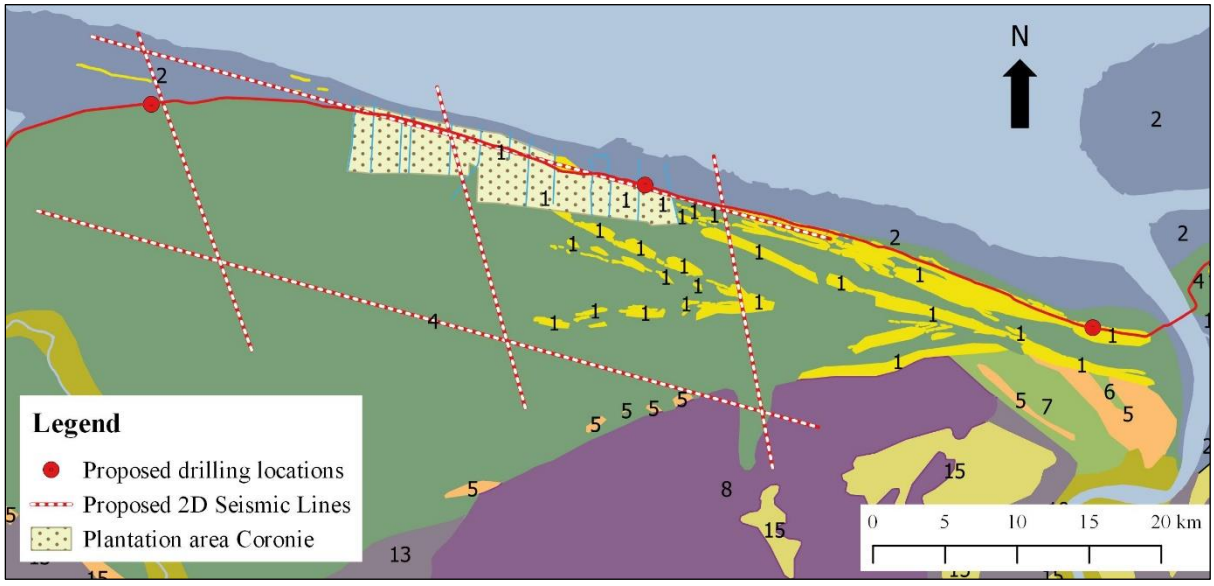


**Figure 14: Soil map of the wider study area (adapted from Reconnaissance Soil Map of North Suriname; scale 1:500 000). See Table 12 for the legend.**

**Table 12: Characterization of geology, physiography and soil of the project area**

| Geology | Physiography | Elevation (m + NSP) | Peat / Pegasse (cm) | Unit soil map | Soils | Swamp water depth (cm) |
|---|---|---|---|---|---|---|
| Coronie Formation: Comowine phase | Coastal swamps | 1-1.5 m | <20 cm | 2 | Unripe and practically unripe saline to brackish swamp clay soils. | 0-70 |
| Coronie Formation: Moleson phase | Ridges along O-W verbinding and in polder area | 1-3 m | None | 1 | Well (to poorly) drained shells, shell-grit, shell sand, medium and fine sand | Groundwater |
| | Polder area, with dryland and rice land | Around 1 m | none (removed) | | Imperfectly to poorly drained nearly ripe and ripe clay with brown and yellow mottles; usually puddled topsoil | Groundwater; in rainy season 0-20 |
| | Drowned ridges in Coronie Swamp | 1-2 m | < 20 cm | 1 | Poorly to very poorly drained shells, shell-grit, shell sand, medium and fine sand | 0-40 |
| | Swamp | About 1 m | 20-80+ cm | 4 | Very poorly drained half-ripe and ripe clay with brown and yellow mottles, locally over peat | 20- >150 |
| Mara Formation | Swamp | < 0 m | 100 - > 400 cm | 8 | Very poorly drained ombrogenous peat | 2- > 4 m |

*NOTE: The above is fully based on available maps and reports, most of which are desk studies, using aerial photo interpretation. Actual field data is very limited and outdated. Data presented by Noordam & Teunissen (2008) has been included.*

CEP02 and part of seismic line 1-2 are situated north of the Oost-Westverbinding, and thus within unit 2 (**Figure 14**). This unit comprises saline to brackish nearly unripe (soft) to half ripe clay soils. Also, CEP03 is located north of the Oost-Westverbinding, but in an area where ridges grade into a freshwater swamp with half ripe-to-ripe clays (unit 4; **Figure 14**). Most likely the drilling pad will be on clay soil. CEP01 is projected in a brackish water lagoon to the north of the Oost-Westverbinding. Saline to brackish nearly unripe (soft) to half ripe clay soils are found here (unit 2; **Figure 14**).
The majority of seismic lines is also found in the Coronie Swamp, south of the Oost-Westverbinding (unit 4; **Figure 14**). Peat layer become thicker when going further south. Small sections at the end of seismic lines 3-4 and 9-10 are projected within the deep swamp with ombrogenous peat (unit 8; **Figure 14**). Peat thickness of over 1-2 meter may be encountered here. The soft mineral clay soil is several meters below the water surface.
Within the plantation area (Burnside-Ingikondre) both sandy ridges and ripe to nearly ripe clays will be encountered in the area south of the Oost-Westverbinding. Clay soils dominate north of the road; these may be fresh to saline, depending on whether inundation with seawater has taken place and if so whether renewed sedimentation has occurred. The older soils are ripe (firm) and fresh to brackish, and recent deposits, often on top of older ones, are soft and saline.

### 4.2.6 Hydrology

The Surinamese coastal region has about 2,000 sq. km of brackish wetlands with mangrove forest, saltwater lagoons and herbaceous brackish swamps, and 12,000 sq. km of freshwater wetlands (Teunissen, 1993). In the project area both brackish and freshwater wetlands are found.
Most of the freshwater wetlands consist of swamplands with poorly to very poorly drained soils, which are inundated either permanently, or at least during the greater part of the year (Teunissen, 1993). The coastal wetlands have a tidal regime along the coast, but inland inundation is also found, but this is less deep and over a shorter period. During the rainy season a swamp is permanently draining towards its edges to rivers and the ocean, with preference for sections with creeks or culverts. With diminishing rainfall at the end of the rainy season the discharge also decreases, as the swamp water level gradually drops. At a certain water level, the drainage from the swamp will virtually stop and water will mostly be depleted by evapo-transpiration only.

The Coronie Swamp forms one of the largest swamp areas in Suriname, and the central part of it is characterized by a domed shape, thick ombrogenous (rainwater-fed) peat layers and deepwater conditions, especially in the central part. This dome is the result of the fact that the peat (‘pegasse’ retains water like a sponge, allowing the peat to continue to "grow" above the base level (‘peat-moor’). The domed shape results in a radial drainage pattern by which water is discharged from the center towards all edges.

Water from the swamp area is discharged to the east towards the Coppename River, south to the Wayambo River, west to the Nickerie River and north towards the Atlantic Ocean. Some local creeks, like the Peruvia, Pereko (or Pierre Creek), Akwansa and Kofimaka creeks, support this discharge, but the number of such creeks is limited, and most creeks are short. Natural blockage occurs where flow is forced to flow through a narrower drainage way, resulting in increased (perched, dammed up) upstream swamp levels. Such conditions occur naturally in the northeast of the swamp, where E-W ridges block the S-N flow, allowing throughflow at a limited number of locations only. Another major (manmade) obstruction of S-N flow to the Atlantic Ocean is formed by the Oost-Westverbinding The construction of this road has led to a considerable damming-up of swamp levels in the northern Coronie Swamp, which on its turn resulted in dramatic changes in the vegetation of the Coronie Swamp as well as in the estuarine zone to the north of it (Teunissen, 1993).
The water levels raise to such extent that the ridges within the swamp have “drowned” and now most or all of its land is being inundated in the rainy seasons. An indication of the swamp water depths is presented in the legend of **Figure 14.**
To the northeast swamp water is discharged through culverts below the Ingikondre-Jenny road section, while to the northwest, swamp water is discharged through the sluice at Burnside and through culverts below the Burnside-Wageningen road section. At the height of the plantation area (Ingikondre-Burnside), the swamp water can only be discharged through the freshwater canal (Zoetwaterkanaal) at Totness. **Figure 15** schematically presents the hydrology of the wider area with schematic flow patterns in the Coronie Swamp and the drainage structures along the Oost-Westverbinding (culverts, sluices, canals).

The Coronie plantation area forms a polder with a drainage system with ditches and canals. To the north, the plantation area is protected from the ocean by the Coronie Dike, which runs from Burnside to Moy. South-north canals drain excess water from the dryland through sluices towards the parallel canal of the dike, which has a sluice at Totness to discharge excess water towards the Atlantic Ocean. Each plantation has its own sluice placed at the Oost-Westverbinding (**Figure 15**). So, these sluices regulate the water management of the polders south of the main road. The area north of the main road discharges through ditches and canals that drain directly in the dike canal.
The natural zone north of the Oost-Westverbinding receives freshwater from the southern swamps through the culverts under the road. Excess water drains towards the ocean predominantly through mass flow and some small creeks near the ocean. Some canals have been dug towards the ocean to promote discharge of excess water from the southern swamps, but these need frequent maintenance to keep them open when mudflats are present. Overall, the drainage from the northern swamps is slow and in the rainy season water levels at both sides of the road show a minor difference, thus slowing down the

discharge of water from the southern swamp. Notwithstanding the presence of culverts under the Oost-Westverbinding and some canals towards the ocean, still the swamp water levels may become so high that in some prolonged periods with heavy rainfall, water can be seen flowing over the Oost-Westverbinding between Jenny and Ingikondre.

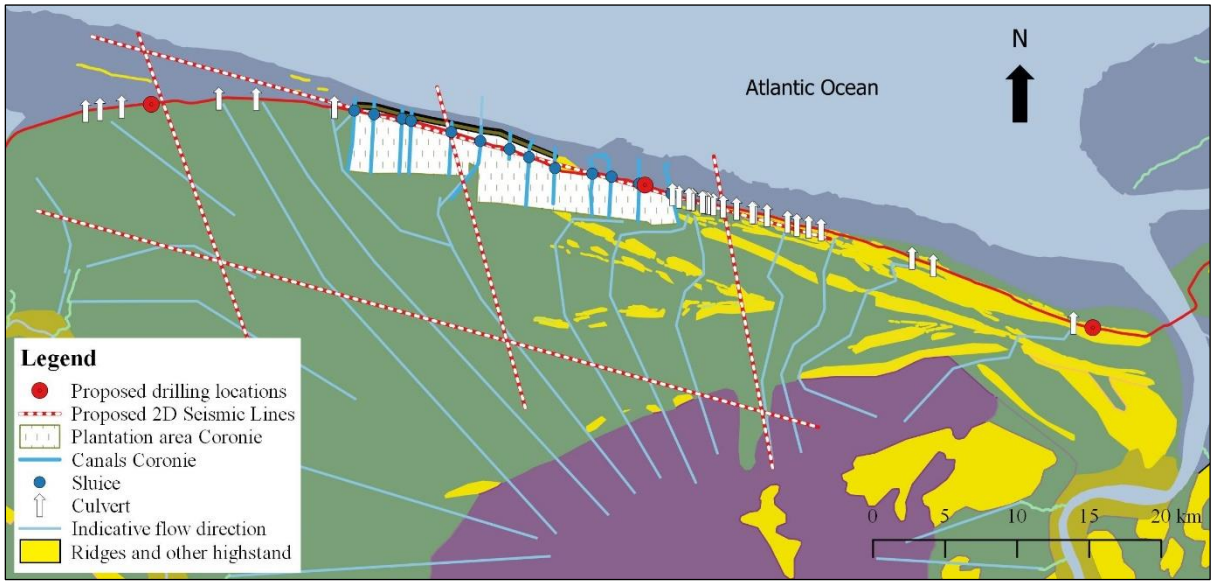


**Figure 15: Hydrology of the wider study area**

### 4.2.7 Water quality

With respect to water quality four different environments can be identified in the study area:

1. Brackish to saline coastal swamps (unit 2 of **Figure 14)**: Along the ocean sea water is brought in by the high tide and at spring tide this water may penetrate deeper inland, creating brackish to slightly brackish conditions locally up till the Oost-Westverbinding. The latter occurs more frequently during the dry season, when the freshwater flow from the southern swamp is reduced or absent. During the rainy season, the fresh water from the south dilutes the brackish water, in particular near the culverts. The pH in this zone is usually between 6 and 8.
2. The plantation area has freshwater conditions, but brackish water may be present in some sections to the north of the Oost-Westverbinding. The latter is the result of past intrusion of the sea and the presence of brackish to saline clay soils. The pH varies with salinity from near-neutral to acid.
3. Freshwater swamp (unit 4 of **Figure 14**): Salinity in these swamps is virtually absent; the water – in particular during the rainy season – resembles rainwater with EC below or slightly above 100 µS. The water is clear and brownish due to organic compound from the peat. This also influences pH, which is acid (5.2-5.8; Noordam & Teunissen, 2008). Close to shell ridges, pH and Electrical Conductivity (EC) will be higher due to the presence of, among others, calcium salts.
4. Ombrogenous swamp (unit 4 of **Figure 14**): This swamp is rain fed and the water quality is only affected by the release of organic compounds from the peat. The water is clear and brownish. An EC of 22-33 µS and a pH of 4.8-5.0 was measured here (Noordam & Teunissen, 2008).

All swamps generally have low oxygen content, with values changing over the day. Measurements north (coastal swamps) and south (freshwater swamps) of the Oost-Westverbinding (Burnside-Wageningen) in the period 1992-2000 indicate that most of the years the average DO is below 2 mg/L to the north and below 1 mg/L to the south (Bansie, 2001). Maxima are respectively <4 mg/L and <2 mg/L. Lower values are indicative for standing water, while higher values are recorded in areas with some flow and/or waves.

Nutrients are medium in the coastal swamps and the plantation area, low in the freshwater swamps and very low in the ombrogenous swamp (Noordam & Teunissen 2008 and Parahoe 2008).

In the absence of human activities, the water quality in the swamps is considered to reflect natural conditions.

On July 25, 2023, measurements have been conducted at five locations (**Figure 16**). Three locations are close to the proposed drilling locations and two are selected for the characterization of the freshwater swamp.

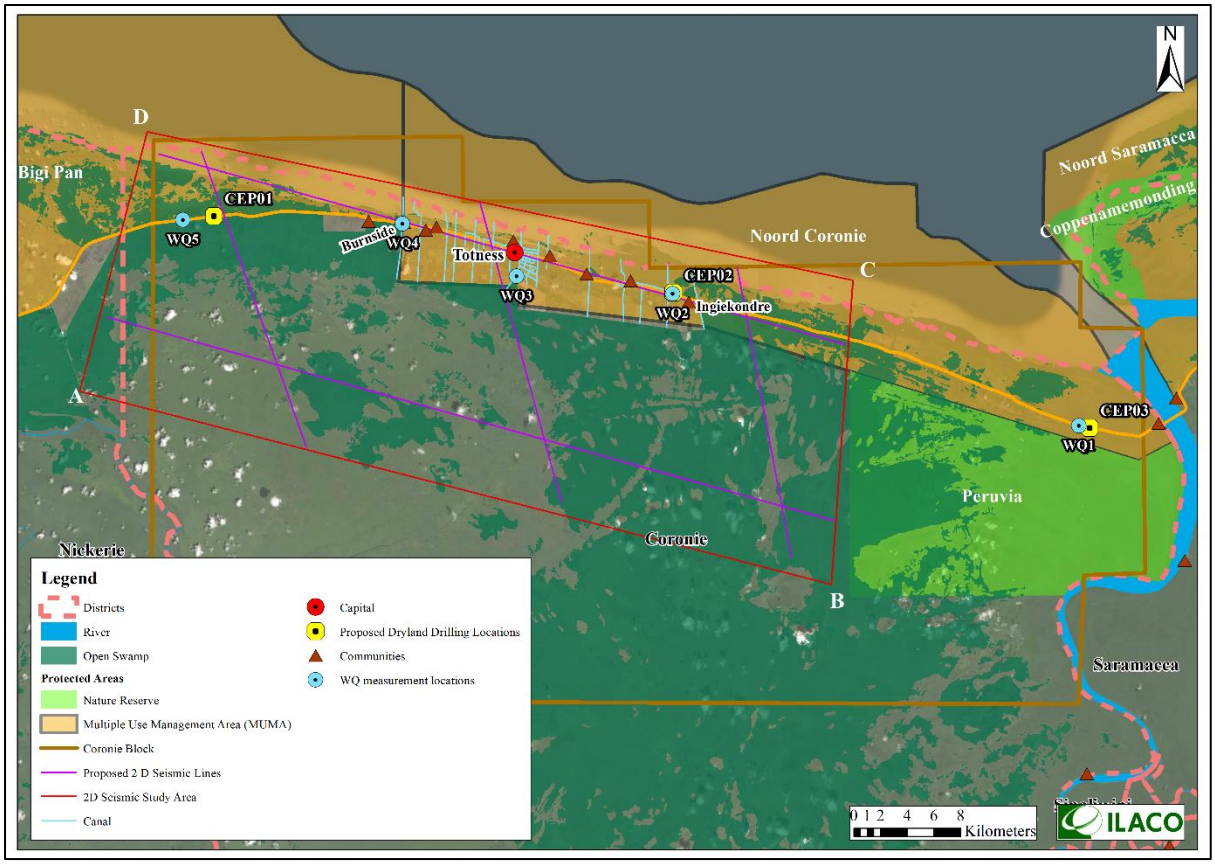


**Figure 16: Water quality measurement locations**

The measurement procedures and field observation are included in **Appendix 5**. A summary of the results is presented in **Table 13**. Measurement locations WQ3 and WQ4 represent the freshwater swamp. Findings for pH, EC, DO, clarity and color are mostly in line with above description (#3), but WQ 4 is less clear and has relatively high Dissolved Oxygen (DO) due to the moving water (sluice is open).
All other measurement locations are north of the Oost-Westverbinding:

- WQ1 (CEP03) is found in the freshwater section (soil unit 4; **Figure 14)**. A ridge is present nearby, causing some turbidity and a somewhat higher pH.
- WQ2 (CEP02) is in a coastal swamp as can be concluded from the presence of mangrove forest and the high Electrical Conductivity (EC) and pH.
- WQ5 (CEP01) was measured in a lagoon, apparently beyond the reach of the tide, because the EC is low (fresh water), be it somewhat higher than in the freshwater swamp. The wave action causes some turbidity.

None of the measurement locations showed visible contamination (litter, oil) and there were no unnatural odors.

**Table 13: Summary of water quality measurements 25 July 2023.**

| Location ID / Description | Temp (C°) | pH | DO (mg/l) | EC (µS/cm) | Turbidity (NTU) | Secchi (cm) | Color | Clarity | Other remarks (Odor, etc) |
|---|---|---|---|---|---|---|---|---|---|
| WQ1- Swamp north of the Oost-Westverbinding, 825 m west of **CEP03**. | 27.2 | 6.3 | 2.9 | 92 | 8.5 | 42 | Light brown | Slightly turbid | Precipitated and floating particles. No odor and no contamination observed. Fishes present. |
| WQ2- Swamp north of the Oost-Westverbinding, 75 m south of **CEP02**. | 29.1 | 7.9 | 0.5 | 28,270 | 18.1 | - | Dark brown | Turbid | Precipitated and floating particles. No odor and no contamination observed. Fishes observed. Mangrove Forest with some dead trees near location. |
| WQ3-Sluice-gate within the Coronie Swamp which drains water in the Zoetwater Kanaal. | 29.5 | 5.6 | 0.1 | 89 | 0.0 | 56 | Very light brown | Almost clear | Floating particles. No odor and no contamination observed. |
| WQ4- Lozing 68 (Burnside) Canal along the Oost-Westverbinding. S of sluice (open) | 27.9 | 5.3 | 4.2 | 94 | 36.7 | 22 | Light brown | Slightly turbid | Floating particles. No odor and no contamination observed. |
| WQ5- Swamp north of the Oost-Westverbinding, approx. 2 km west of **CEP01**. | 28.4 | 5.7 | 2.9 | 388 | 28.0 | - | Brown | Turbid | Precipitated and floating particles. Muddy odor. No contamination observed. |

## 4.3 Biological Environment

### 4.3.1 Vegetation

An overview of the ecosystems of the wider study area is presented in **Figure 17**. The information at these maps has been adapted from the Reconnaissance Map Surinam Lowland Ecosystems (Teunissen 1978; scale 1:200 000).

Compared with this map, which is based on 1971-1974 aerial photos, the more recent Google satellite imagery shows:

- Changes along the coast due to coastal processes of accretion and erosion,
- Some vegetation changes:
    - Mainly in the Coronie Swamp, where in recent times ridge forest drowned due to the raising swamp level caused by the construction of the Oost-Westverbinding between Burnside and Wageningen and of the Swamp Retaining Dykes south of the Coronie rice polders;
    - North of the Oost-Westverbinding some (parts of) lagoons have been overgrown with parwa, while new ones emerged;
    - South of the Oost-Westverbinding between Burnside and Wageningen some swamp wood disappeared due to vegetation and peat fires;
    - Farther to the south swamp forest developed from swamp wood and morisi palm forests due to vegetation succession that became possible due to the prolonged absence of fires.

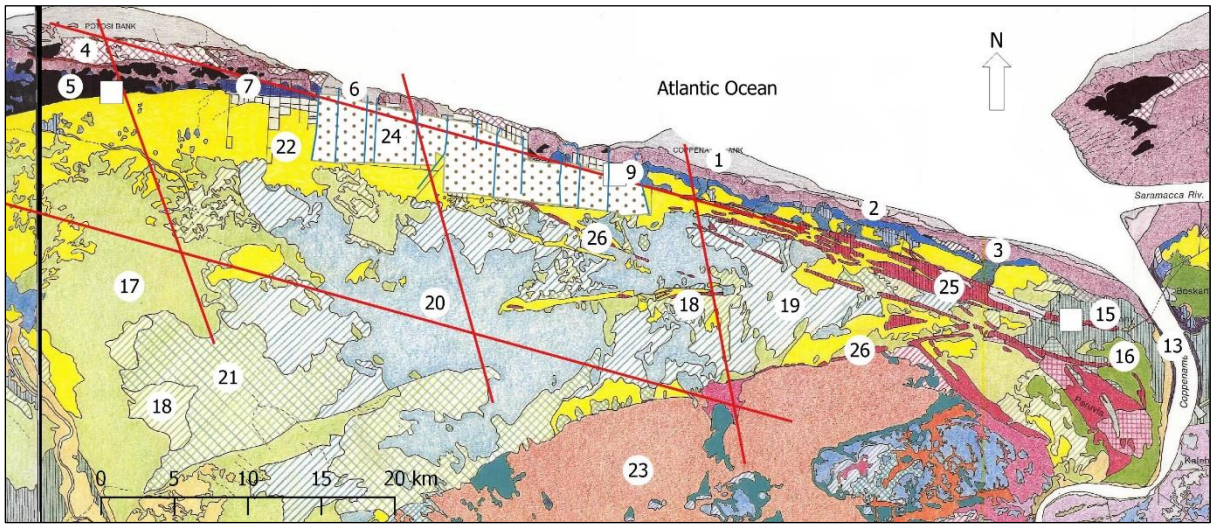


**Figure 17: Ecosystems of North Coronie**

**Table 14: Legend of ecosystems of North Coronie**

| No. | **SWAMPS (WETLANDS)** |
|---|---|
| **1** | **coastal mudflats:** often with film of yellow diatoms |
| **2** | **young coastal (black) mangrove:** early stages of black-mangrove (= "parwa") (*Avicennia germinans*) forest; near the Coppename River mouth preceded by mudgrass (= "sarasara grasi") (*Spartina brasiliensis*) vegetation |
| **3** | **mature coastal (black) mangrove:** mature black-mangrove (="parwa") forest with white-mangrove (="akira") (*Laguncularia racemosa*) trees along tidal creeks |
| **4** | **dying coastal (black) mangrove:** dying black-mangrove *Avicennia germinans*) forest |
| **5** | **deeper lagoons**: salt to brackish lagoons, locally with submerged vegetation of widgeon grass (="sewar") (*Ruppia maritima*) and/or water lilies (="pankuku-wiwiri") (*Nymphaea ampla)* |
| **6** | **shallow lagoons:** silted up (shallow) lagoons, covered with halophytic herb vegetation, dominated by sea purslane or "zeepostelein" (*Sesuvium portulacastrum*), saltwort or "krapegrasi" (*Batis maritima*) or Virginia grass (*Sporobolus virginicus*) |

| No. | **SWAMPS (WETLANDS)** |
|---|---|
| **7** | **salt and brackish grass swamps:** salt and brackish "short grass" swamps, dominated by spike rush or "drikanti" (*Eleocharis mutata*), or "fini-adrun"-sedge (*Cyperus articulatus*), locally fern swamps dominated by the giant salt fern or "tabaka-tiki" (*Acrostichum aureum*) |
| **8** | **open coastal (black) mangrove:** scattered black-mangrove (="parwa") (*Avicennia germinans*) trees brackish grass swamp |
| **9** | **brackish grass swamps:** brackish short and tall grass swamps, dominated by the short "fini-adrun"-sedge (*Cyperus articulatus*) or the tall "reed mace" (="cat tail", "langa-grasi", "papayagrasi") (*Typha angustifolia*) |
| **10** | **"brantimaka" swamp scrub:** brackish to freshwater swamp scrub, dominated by "brantimaka" (*Machaerium lunatum)* |
| **11** | **"kofimama" swamp wood:** brackish to freshwater swamp wood, dominated by kofimama (*Erythrina glauca*) |
| **12** | **brackish-freshwater mangrove**: brackish to freshwater black and / or red-mangrove (*Avicennia germinans / Rhizophora* spec.) forest with "pina" (*Euterpe oleracea)* palms |
| **13** | **riverside (red) mangrove:** brackish to freshwater red-mangrove (="mangro")-forest, dominated by *Rhizophora*-species: *Rhizophora mangle, R. harrissonii and R. racemosa*. White-mangrove (="akira") (*Laguncularia racemosa*) trees may be found along brackish tidal creeks |
| **14** | **"pruimen-zuurzak" swamp wood:** closed freshwater to slightly brackish swamp wood characterized by "zwamppruim" (*Chrysobalanus icaco*) and "zwampzuurzak" (*Annona glabra*) |
| **15** | **"babun-mataki-pina" swamp forest** with "babun" (*Virola surinamensis*), "mataki" (*Symphonia globulifera*) and "pina" palms (*Euterpe oleracea*), locally mixed with "posentri" (*Hura crepitans*) or morisi palms (*Mauritia flexuosa*) |
| **16** | **"mira-udu"- swamp forest:** freshwater swamp forest, dominated by mira-udu (*Triplaris surinamensis*) |
| **17-18** | **"watrabebe" swamp wood:** closed **(17)** and open **(18)** freshwater (to slightly brackish) swamp wood dominated by "blood wood" (="watrabebe") (*Pterocarpus officinalis)* |
| **19-21** | **"morisi" swamp forest**: open **(19)** to closed **(20)** swamp forest dominated by "morisi" palms (*Mauritia flexuosa*), locally with swamp wood islands dominated by "watrabebe" *(Pterocarpus officinalis*) and/or "zwamppanta" (*Tabebuia insignis*) **(21)** |
| **22** | **freshwater grass swamp:** species-rich freshwater (to slightly brackish) tall grass (graminoid) swamps, locally dominated by the tall "reed mace" (="cattails" or "langa-grasi" or "papayagrasi") (*Typha angustifolia*), "Fefikanti-grasi" (*Fuirena umbellata*) "prasorograsi" (*Cyperus giganteus)* and "mokomoko" *(Montrichardia arborescens*); also short swamp ferns (*Blechnum indicum*) may dominate, locally with scattered "morisi" palms (*Mauritia flexuosa*) |
| **23** | **ombrogenous peat swamp:** on thick layer of peat, possibly also on floating peat |
| **24** | **dry crop polders and (fallow) rice fields** |
| No. | **RIDGES** |
| **25** | **coastal forest on Moleson ridges:** mixed xero-mesophytic dryland and marsh forest |
| **26** | **drowned Moleson ridges**: open grass swamps with or without scattered Morisi palms |

All proposed drilling locations are situated along the Oost-Westverbinding. Therefore, all ecosystems are already affected to some extent by human influences. At proposed location CEP01 a lagoon is found (unit 5), bordered by parwa forest (unit 2). CEP02 is situated within a parwa forest (unit 2/3) and CEP03 in a freshwater swamp forest (unit 15). High swamp forest in Suriname known as babun – mataki – pina forest (mapping unit 15) has the highest level of biodiversity of all swamp forest vegetation. Because of past peat fires and more recent vegetation clearing, this type of forest is becoming rare in Suriname. The proposed seismic lines run through open coastal swamps and mangroves, open to closed freshwater ecosystems and the plantation area with agricultural lands and low to high secondary vegetation. See **Photo 1**- Photo 4 for some observations.

**Photo 1: Freshwater swamp forest near CEP03**

**Photo 2: Dead mangrove trees north side of the Oost Westverbinding (km 153-155)**

**Photo 3: Mauritia palms south side of the Oost-Westverbinding (approx. km 119- 121)**

**Photo 4: Parwa forest with dead trees among in Bigi Pan MUMA**

### 4.3.2 Fauna

The fauna along the road will be typical for man-made and man-affected ecosystems, with animal species that are adapted to/tolerating, or able to cope with the presence of men in general, forest clearing, bush fires (habitat destruction), noise, road kills, hunting and fishing pressure and trapping.
Mangrove forest and associated ecosystems are the feeding and nesting places for coastal birds like Scarlet Ibises (**Photo 5**) and Heron species (breeding seasons from March/April up to July/August and from March-September respectively). These ecosystems are the most important feeding grounds for migrating birds from the North (Canada and Alaska).
Given the location of the proposed drilling locations along the Oost-Westverbinding, no unique, rare, endangered, vulnerable or biogeographically important plant or animal species are expected. Some, like the near threatened (IUCN Red list 2023) Jaguar (Panthera onca), however, occasionally venture into inhabited rural areas, but they tend to avoid people as much as possible.
The proposed seismic lines cross coastal and freshwater swamps. The coastal swamps comprise mangrove forest, lagoons and open brackish water swamps. It is also indicated as the estuarine zone. Mangrove forests are nursery grounds for many species of marine fish and shrimp and contain a high degree of biodiversity. The entire estuarine zone of Suriname applies to the RAMSAR criteria for wetlands of international importance as all its sub-areas contain the internationally important feeding and nesting sites for Caribbean coastal birds and internationally important feeding grounds for migratory birds from North America.

For the Coronie Swamp the following is mentioned about the fauna by Noordam & Teunissen (2007).

- At least 8 species of mammals are expected to be common of which 4 species of monkeys;
- The freshwater wetlands are considered to be important for many wetland birds including Rallidae (Rails) and some Ardied (Heron-like) species;

- The Coronie wetlands and the nearby Peruvia Nature Reserve are rich in Psittacidae, particularly the Blue-and-Yellow Macaw (*Ara araurana*), the Red-bellied Macaw (*Ara manulata*), the Red-shouldered Macaw (*Ara nobilis*) and the Amazon (*Amazona amazonica*);
- The Coronie Swamp may be one of the few localities in Suriname where the twatwa (*Oryzoborus crassirostris*) still occurs in significant numbers.
- The number of reptiles and amphibians in the Coronie Swamp may be limited and no unique, rare, endangered, vulnerable or biogeographically important species were found up to now.
- During their nesting season, caimans may become aggressive.
- Anacondas may become very large in the inaccessible parts of the Coronie Swamp.

Parahoe (2008) reports the collection of 39 species of swamp fish. The most well-known are kwikwi (*Hoplosternum* and *Callichthys* spp), krobia (mainly *Aequidens* spp.), pataka (*Hoplius malabaricus*) and walapa (*Erythrinus erythrinus*).

**Photo 5: Observed birds, including scarlet ibis at open area in Ingikondre (km 127- 128)**

### 4.3.3 Protected areas and areas of biological importance

The protected areas within the wider study area are shown in **Figure 18**.

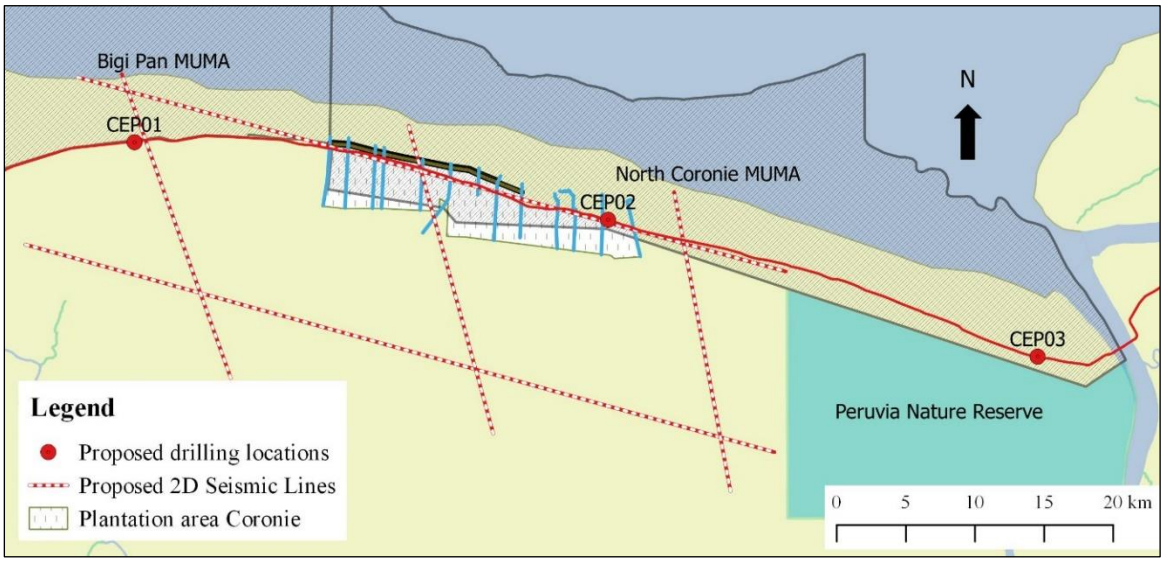


**Figure 18: Protected areas in the wider study area.**

The Peruvia Nature Reserve was established in 1986 (Staatsblad B 52, 1986), because of its unique ecosystems, species of flora and fauna, and archaeological findings (Teunissen, 1979). As it was recognized that protection of a small part of the (changing) coastline was not adequate to meet the overall goals, the concept of “Multiple Use Management Areas" (MUMA’s) has been adopted. MUMA's are defined as areas where special management by or on behalf of the Government is needed for a rational use of the natural resources, which includes the protection of vulnerable ecosystems and species.

The goals of MUMA’s are:

- To optimize the long-term productivity and sustainable use by man.
- To optimize the long-term natural productivity of the estuarine land zone and the bordering ocean. This will be achieved by maintaining or enhancing the quantity, quality, and diversity of the natural ecosystems and those of formerly cultured areas.
- To promote the development of the sustainable production in man-made ecosystems (as agriculture, animal husbandry and oil exploitation), taking into consideration the demand of unspoiled ecosystem areas. This will be achieved only by respecting the management rules and recommendations set for the area.

At this moment four MUMA’s have been established in most of the estuarine zone of Suriname. Project activities are partly planned within the Bigi Pan and North Coronie MUMA. The MUMA’s in Suriname fall under IUCN Category VI, Protected area with sustainable use of natural resources. The main goal of this category is to protect natural ecosystems and use natural resources in a sustainable way. The MUMA’s comprise a terrestrial and a marine part. The Head of Lands Bosbeheer (LBB; Suriname Forest Service) is the Management Authority of the North Coronie MUMA.

Important Bird Areas (IBA)

Both the Bigi Pan and the North Coronie MUMA are also Important Bird Areas (IBA) which are part of an Endemic Bird Area (EBA) because of the common occurrence of three range restricted species, i.e. with world distributions of less than 50,000 sq. km. Furthermore, the MUMA’s are known to hold, on a regular basis, 1% of the biogeographic population of a congregating waterbird species, and to hold, on a regular basis, 20,000 waterbirds or 10,000 pairs of seabirds of one or more species.

## 4.4 Socio-Economic Environment

This chapter describes the socio-economic environment of the study area based on existing data, field observations in April, July, and August 2023, several stakeholder consultations, and a resident survey conducted.

### 4.4.1 Administrative structure

The Area of Influence (AOI) for the project encompasses a significant portion of the Coronie district, situated in the northwestern part of Suriname. Coronie covers an area of 3,902 km², with its capital being Totness. The district is divided into three administrative regions or resorts, each named after its main settlement: Welgelegen, Totness, and Johanna Maria (ABS, 2020). These resorts, along with the capital of Coronie, are depicted in **Figure 19**.

In Suriname, each district is overseen by a District Commissioner (DC), appointed by the government, and affiliated with the Ministry of Regional Development (www.gov.sr). The DC is aided by an advisory council comprising elected civil servants at both the district (known as District Council members or district raadsleden) and resort (Resort Council members or ressort raadsleden) levels. At the local level, the DC is supported by a workforce consisting of BOs and OBOs. Since 2018, the DC has also received support from Adjunct District Secretaries (ADS).

The District Commissioner's Office is situated in Totness, Coronie's primary town, where most of the state's administrative services are concentrated. These include government offices for ministries such as Agriculture, Livestock & Fisheries (Min. LVV), Public Works (Min. OW), and Regional Development and Sport (ROS). Additionally, other facilities noted during the site visit to Totness include telecommunications provider Telesur, banks, the central market, the police station, and a fire station.

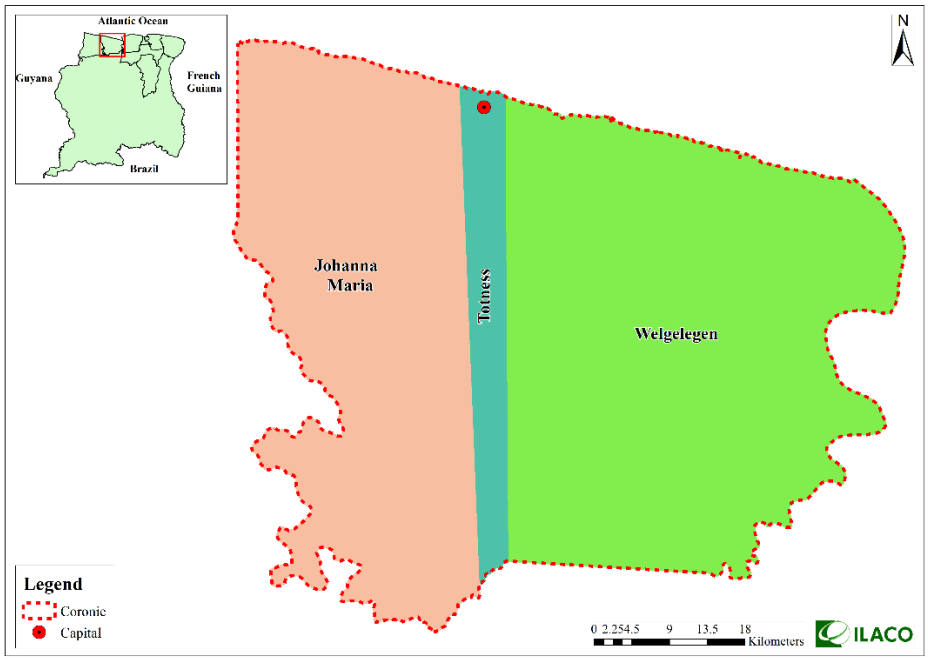


**Figure 19: Overview resort of Coronie**

### 4.4.2 Population and Demographics

According to statistics from the Central Bureau of Civil Affairs, the population of Coronie was 2,657 inhabitants as of December 31, 2013, which accounted for less than 1% of the total population of Suriname. After experiencing an average negative growth rate during the period 2006 – 2009, there was a slight increase observed in 2010, followed by negative growth again in 2011 and 2013. A selective form of migration takes place, leading to an aging population (Stichting Planbureau Suriname, 2014).

After 2014 an increase in the population of Coronie is noticeable. After 2014, there has been a noticeable population growth in Coronie. The Coronie district now has approximately 4,000 inhabitants[7] with the majority residing in the Totness ressort, primarily along the Oost-Westverbinding.

### 4.4.3 Infrastructure and Services

Land ownership and titling

Land in Coronie district can fall under various categories including domain land (domeingrond, or state property), private property (privé-eigendom), allodial property and inherited assets (allodiaal eigendom en erfelijk bezit - aeeb) or landlease (grondhuur). Allodial property (aeeb) is the most common land title in Coronie. Much of the land that is classified as allodial property comprises undivided estates (boedel). This means that a -sometimes substantial- number of family members must agree on decisions regarding the land, even if these family members live abroad. In the Coppename area, several families hold land lease titles (NEC, 2014). As part of the project, Staatsolie is gathering data from the Management Institute Land Registration and Land Information System (MIGLIS). Notably, the digitalization of land titling information for Coronie, carried out by MI-GLIS, remains incomplete, a status that persists as of 2023. Consequently, providing specific details about land ownership and titling in various segments of the Coronie district proves to be challenging.

Healthcare

Primary healthcare in the study area falls under the Regional Health Service (Regionale Gezondheid Dienst- RGD). During the site visit, the main RGD-clinic was observed in Totness along with a smaller clinic in Hamilton. A Mylab clinic was also identified in Totness.

Education

The Coronie district has four primary schools, 1 Lower Basic Education (LBGO) school, and 1 Secondary Education (MULO) school. Additionally, there is a school dedicated to Lower Technical Education (LTS).

Sports, Recreation, and Culture

The youth in the district lack adequate and sufficient recreational opportunities. Additionally, there is a need for a well-equipped public library stocked with quality literature to promote reading habits. It is proposed (by stakeholders) that a portion of the Cultural Center Coronie building be allocated for this purpose. Furthermore, the districts boast ten religious' denominations in the district and five sports fields. Given the keen interest of young people in activities such as softball and volleyball, there is a significant demand for professional sports guidance.

Drinking water

Due to the small size and dispersion of the population, establishing or expanding utility services on a per-user basis incurs significant costs, thereby limiting households' access to these services. The management of the drinking water supply falls under the Suriname Water Supply Company (SWM). The provided drinking water is of good quality. Drinking water stations were observed on-site in Jenny and Totness.

**Photo 6: SWM station at Jenny**

Electricity

Electricity is supplied by N.V. Energie Bedrijven Suriname (EBS). However, not all areas along the Oost-Westverbinding are connected to the grid. The area from Burnside onwards (commonly known as the Kutai area) and some inland roads in Coronie do not have access to electricity[8]. In February 2020,

[7] Personal Communication with Suwena Mettendaf, Secretary Districts commissioner of Coronie, August 2023
[8] Personal communication with Micheal Udenhout, Ministry of Agriculture, Animal Husbandry and Fisheries, 28 august 2023

a solar power plant project was realized in Coronie in the Soemboredjo area by Caribbean Development Bank (CDB) and the Ministry of Finance. This solar power plant consists of 920 solar panels, which provides about 9 percent of Coronie's households with electricity through solar energy (N.V. EBS).

Telecommunication

The Totness region is fully equipped with fixed phone lines, while the Welgelegen and Johanna Maria administrative regions have partial coverage. In the Johanna Maria region, the fixed phone line extends as far in the Totness area, and in the Welgelegen region, there is no connection from Mary's Hope to Jenny. The completion of Telesur's fiber-optic project in 2021 has significantly improved the service quality. Further, the offshore sub-sea cables known as the "Suriname-Guyana Submarine Cable System (SGSCS)" makes landfall in Suriname at Totness as indicated in **Figure 20**.

In terms of radio reception, the Suriname Radio Broadcasting Foundation (SRS), broadcasting from Paramaribo, is the only radio station that can be received well throughout the district. Among the two local stations, one is privately operated, and the other is government operated. Additionally, residents in the district can receive television stations such as STVS, ATV, and Apintie.

Waste collection

Waste collection services in Coronie are overseen by the Directorate of Public Greenery, with garbage disposal taking place on Kokoslaan in the Totness administrative region. Supervision of garbage collection and disposal is conducted once a month by the Administrative Service. While Totness benefits from a waste collection service, the Welgelegen and Johanna Maria administrative regions do not. As a result, many residents' resorts to burning garbage in their backyards. Additionally, the improper disposal of garbage along the roads by car passengers presents a significant problem, causing issues for both human health and the environment

Coastal and Water Management

Coronie is susceptible to flooding, prompting various initiatives to tackle waterlogging issues through infrastructure enhancements. To begin with, a 12 km long seawall has been erected along the coastline to mitigate salinization of coastal areas and curb erosion along the Oost-Westverbinding. This construction effort has liberated hundreds of hectares of agricultural land, providing adequate protection against sea encroachment for the inhabited areas of Coronie. Efforts have also been directed at rejuvenating the deteriorated infrastructure for rice production. This includes the construction of canal systems and the cleaning of existing north-south canals. The water-retaining dam, which prevents rice fields from flooding during the rainy season, has been fully restored and is receiving regular maintenance. These improvements in land and water management, coupled with the seawall construction, are fundamental prerequisites for advancing infrastructure development and fostering economic progress (Stichting Planbureau Suriname, 2014). Recently, several dam breaks have occurred along the Coronie shoreline, causing salinization of the ecosystems especially in the northern part of the district.

Transport Infrastructure and Road Network

Transportation to and from Paramaribo is managed by private bus operators. Within Coronie, the National Transportation Company operates a service between Burnside, Friendship, Ingikondre, and Jenny. The National Transportation Company also operates a service with Paramaribo and Nickerie. The road network of Coronie is dominated by the Oost-Westverbinding. Only Totness has several secondary and tertiary roads, some of which are gravel, and a few have been. In 2019, the Jenny- Henar Project was initiated, also aiming to asphalt the Oost-Westverbinding stretch from km 90 to km 209 in Coronie. As of July 2023, sections from km 104 to km 115, km 143.5 to km 148, and km 188 to km 197.5 have already been asphalted in Coronie (ILACO, 2023).

The location of the main infrastructure and facilities are presented in the figure below.

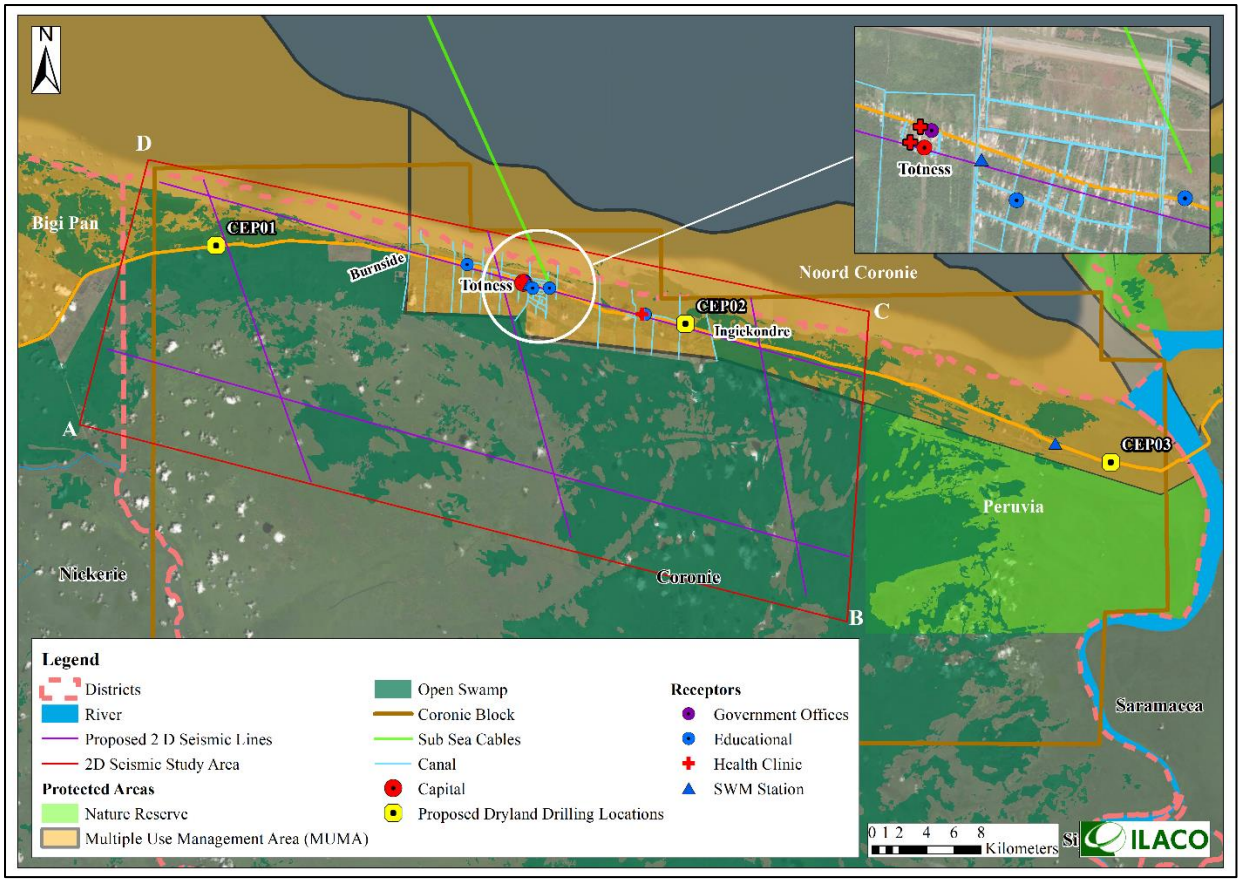


**Figure 20: Overview observed facilities within Coronie**

### 4.4.4 Economic activities

The various economic activities in the district include agriculture (rice cultivation and livestock farming), beekeeping, fishery and mining (shell and sand). Trade in products such as coconut oil, honey, and tamarind syrup also occur mainly along the Oost- Westverbinding. Sometimes, fresh fish and crabs caught from the immediate surroundings are also sold.

#### 4.4.4.1 Agriculture

Coronie is located on fertile land, making agriculture its primary economic activity. According to the Ministry of Agriculture, Animal Husbandry and Fisheries, in Coronie, approximately. 4000 ha is used for rice cultivation. Rice is planted in the spring (February-March) and in the fall (November-December). The current planting area is approximately 500 ha. Rice cultivation takes place near the freshwater swamps[9] . Other agriculture land-uses include stock breeding (cattle, poultry and pig farming), fruits and vegetables (banana, coconuts, cassava etc.) and horticulture. Currently, there are two rice farmers and approx. 50 greengrocers located in the district.[10] During the site visit an agriculture area was observed (at km 138) that is part of the Suriname Agriculture Market Access Project (SAMAP). Some photos of agriculture activities are presented in **Photo 7- Photo 9.**

[9] Personal communication with Micheal Udenhout, Ministry of Agriculture, Animal Husbandry and Fisheries, 27 April 2023

[10] Personal communication with Suwena Mettendaf, Commisariaat Coronie, 22 August 2023

**Photo 7: Rice area in Coronie (May 2023)**

**Photo 8: Agriculture facility Coronie**

**Photo 9: Plantain/ Banana field observed**

#### 4.4.4.2 Beekeeping

Over 50% of all beehives in Suriname are located in this district. There are about 25- 30 beekeepers in the district, spread across the entire area from Coppename to Novar[1], located in the Totness area. Important nectar plants include Mira-udu, Parwa, Watrabebe, Dyamun, Tapirira, and Brokobaka. Primary challenges in beekeeping include finding suitable locations, the relatively long time between initial investment and harvest, material supply, and transportation facilities (Stichting Planbureau, 2014). According to the Ministry of Agriculture, Animal Husbandry, and Fisheries, the beehives are located between km 120-145. Additionally, near km 163, beyond the Burnside area, beehives are also present[11] (see **Figure 21**). The Ministry of Agriculture, Animal Husbandry and Fisheries supports beekeepers of Coronie by providing training on Hazard Analysis Critical Control Point (HACCP), aiming to meet international standards in order to gain access to the market (www.lvv.gov.sr). It should be note that some of the seismic line as well as the drilling location CEP02 are in close proximity of indicated beehives (see **Figure 21**).

[1] Novar is a village and former plantation in the Coronie district in Suriname. It is on the Oost-Westverbinding, between Johanna Maria (Eastern) and plantation Clyde (Western) in the Totness area.

[11] Personal Communication with Michael Udenhout, Ministry of Ministry of Agriculture, Animal Husbandry, and Fisheries, 29 august 2023

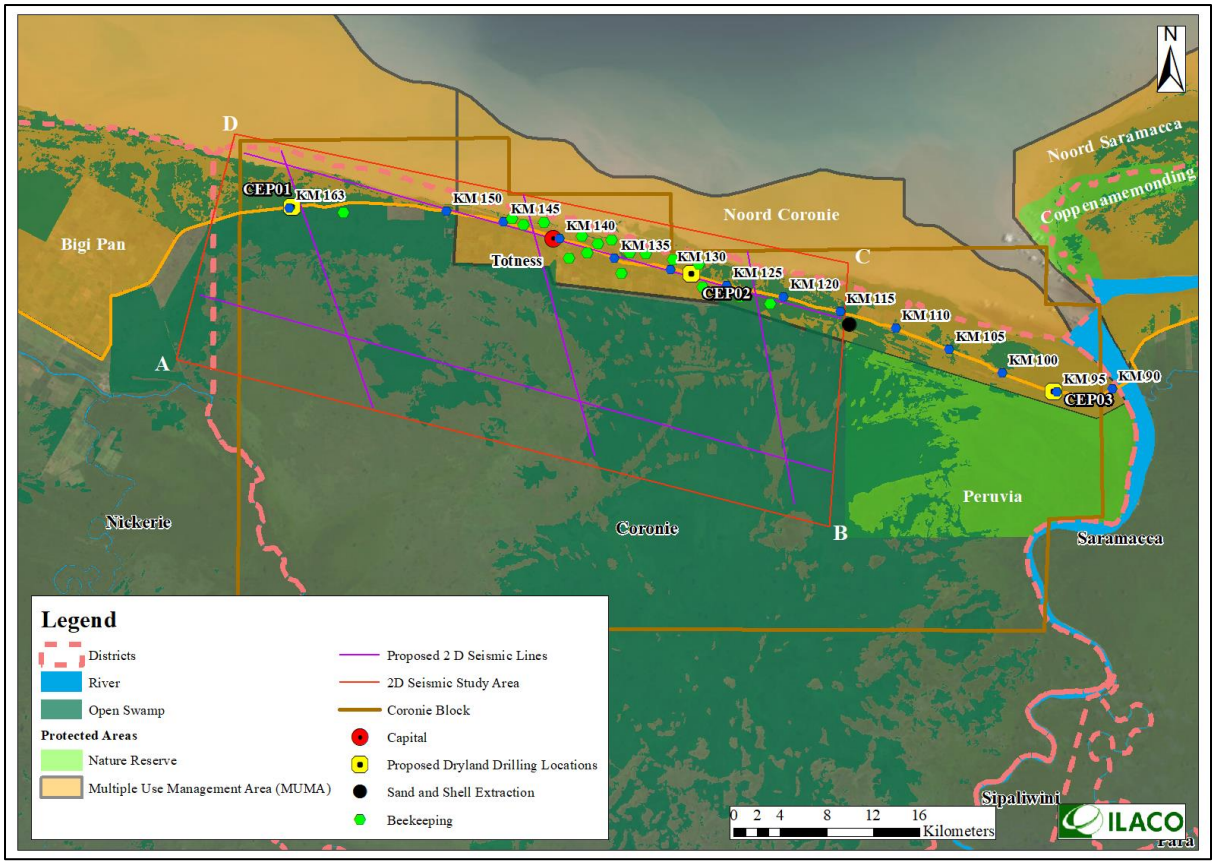


**Figure 21: Indicative location of beekeeping**

#### 4.4.4.3 Fishery

In Coronie, fishing is carried out on a small-scale in the swamps, mostly near the rice fields, and along the Oost-Westverbinding. Swamp fishing involves catching species such as kwiekwie, krobia, and pataka. Additionally, marine fish, such as sea-shrimps, bang-bang and kandratiki are caught at the coast by individuals with licenses.

#### 4.4.4.4 Shell and Sand Excavations

Large-scale sand and shell excavations are widespread in the district, resulting in significant deforestation and habitat loss for various species. Excavations create large ponds and swamps. Without proper solutions, this human-created issue, combined with natural factors, could lead to even more flooding. Further, sand and shell extraction (mining) are observed within the project area on the south side of the Oost-Westverbinding (see **Figure 22,** black dot).

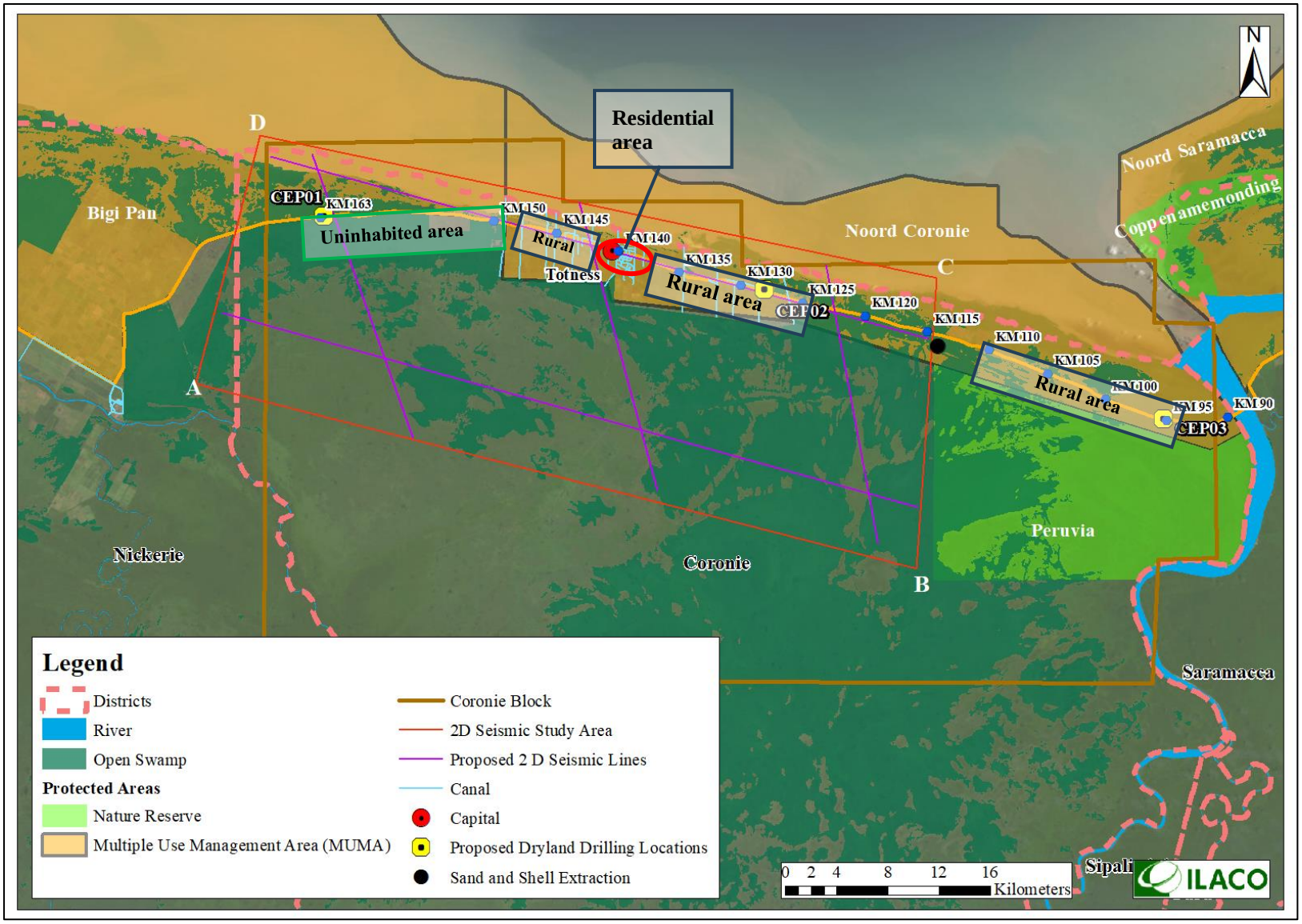


**Figure 22: Overview of land use within the project area**

### 4.4.5 Receptors

Coronie is predominantly characterized by extensive brackish and freshwater swamps, collectively referred to as the Coronie Swamp, which remain uninhabited. The inhabited areas can be classified into two main categories: residential areas, including Totness and Friendship, and rural areas, spread intermittently along parts of the Oost-Westverbinding. The majority of the population and housing development is concentrated in the region between Ingikondre and Burnside, spanning kilometers 127 to 150, with Totness having the highest building density. Isolated residences can be found in the area between Ingikondre and Jenny, known as Coppenamepunt. While most of the Oost-Westverbinding features human habitation, there are also uninhabited sections, such as the west side of Burnside. For a visual overview of the open swamps, residential areas (indicated with red circles), rural zones, and primary uninhabited areas along the Oost-Westverbinding, see **Figure 22**.

The nearest receptors to the project drilling activities are description in **Table 15** and some photo's are presented below.

**Table 15: Overview nearest receptors of the drilling locations**

| Well location | Location | Distance to nearest resident |
|---|---|---|
| CEP01 | Oost-Westverbinding km 163 | Uninhabited area |
| CEP02 | Oost-Westverbinding, near km 95 | At approx.170 m south of the proposed well location. At approx. 120 m south of proposed well location CEP02, a house under construction was also observed. |
| CEP03 | Oost-Westverbinding, near km 128 | At approx. 1440 m west side of the proposed well location. |

**Photo 10: Uninhabited area near proposed drilling location CEP01**

**Photo 11: House under construction approx. 120 m south of proposed well location CEP02**

**Photo 12: Mangrove trees, some dead among, near proposed well location CEP02**

**Photo 13: Uninhabited area with 1 km from proposed well location CEP03**

The proposed east- west 2D seismic line on land goes through the inhabited areas between Ingikondre and Burnside. During the side visit it was observed that this line currently cross some agriculture site and buildings. Indicative location of these areas are descriped in **Table 16** and some photos are presented below.

**Table 16: Overview receptors near seismic lines**

| Location | Approx. distance | Description |
|---|---|---|
| Hamilton | Km 132 | The seismic line pass near a guesthouse (Howards Appartementen) |
| Mary's Hope | Km 138 | The seismic line crosses an agriculture area. The site is fenced and some greenhouses were observed (**Photo 8**). |
| Totness | Between km 138 and 141 | The seismic line crosses or pass nearby several buildings within this section, such as a shop, houses, child care centrum and government offices in the Geraniumstraat. Nearby, two graveyards and the drinking water supply stations (SWM stations) in Totness were also observed. |
| Burnside | Between km 148 and 149 | The seismic line cross/ goes near some buildings (houses) |

**Photo 14: A childcare centrum in the Geraniumstraat (Totness)**

**Photo 15: Houses and cemetery in the Geraniumstraat (Totness)**

**Photo 16: RGD clinic at Hamilton (km 132-132)**

**Photo 17: A school, church and graveyard at Hamilton (km 131- 132)**

**Photo 18: RGD clinic in Totness (km 141)**

**Photo 19: Health clinic (My Lab) in Totness (km 141)**

**Photo 20: A church observed at km 145**

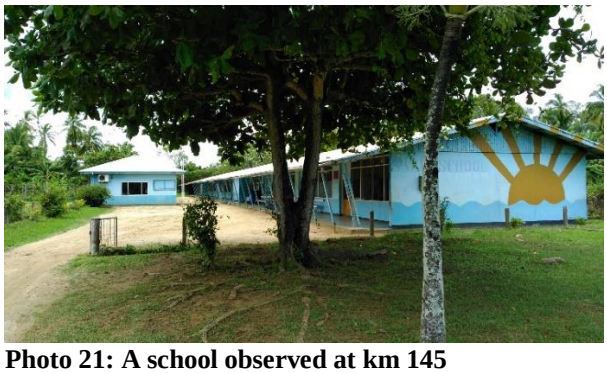

**Photo 21: A school observed at km 145**

### 4.4.6 Planned Developments

Planned developments for the Coronie District include the hydrological study of the Coronie Swamp, which involves an investigation of a hydrological system and drainage of the Coronie swamp, including coastal management. Furthermore, there is the continuation of the Jenny- Henar Rehabiltation Project, which covers the Oost-Westverbinding (ILACO, 2023). Another planned project is the start of coconut planting by the company Pomeroon. The planting area will be approximately 1000 ha and will be located at the area near the Oost-Westverbinding km 170 (De West, 27 September 2023). Finally, there is a potential UNDP project concerning the protection of the parwa and the mangrove zones (ILACO, 2023).

### 4.4.7 Archeological and historical sites

Mounds associated with the Hertenrits Culture (700 – 1250 years A.D.) have been discovered both to the east (Peruvia) and to the west (Hertenrits) of the project area. Notably, a mound attributed to the Hertenrits Culture has also been identified in Burnside, Coronie.

Within the ridge area of Coronie, six (6) archaeological sites are recognized, although none have been definitively linked to a particular culture. Importantly, there are no known historical sites within the Coronie Swamp (Noordam & Teunissen, 2008). It's worth noting that all these known archaeological areas within the ridge area of Coronie fall within the Area of Influence (AOI) of the project.

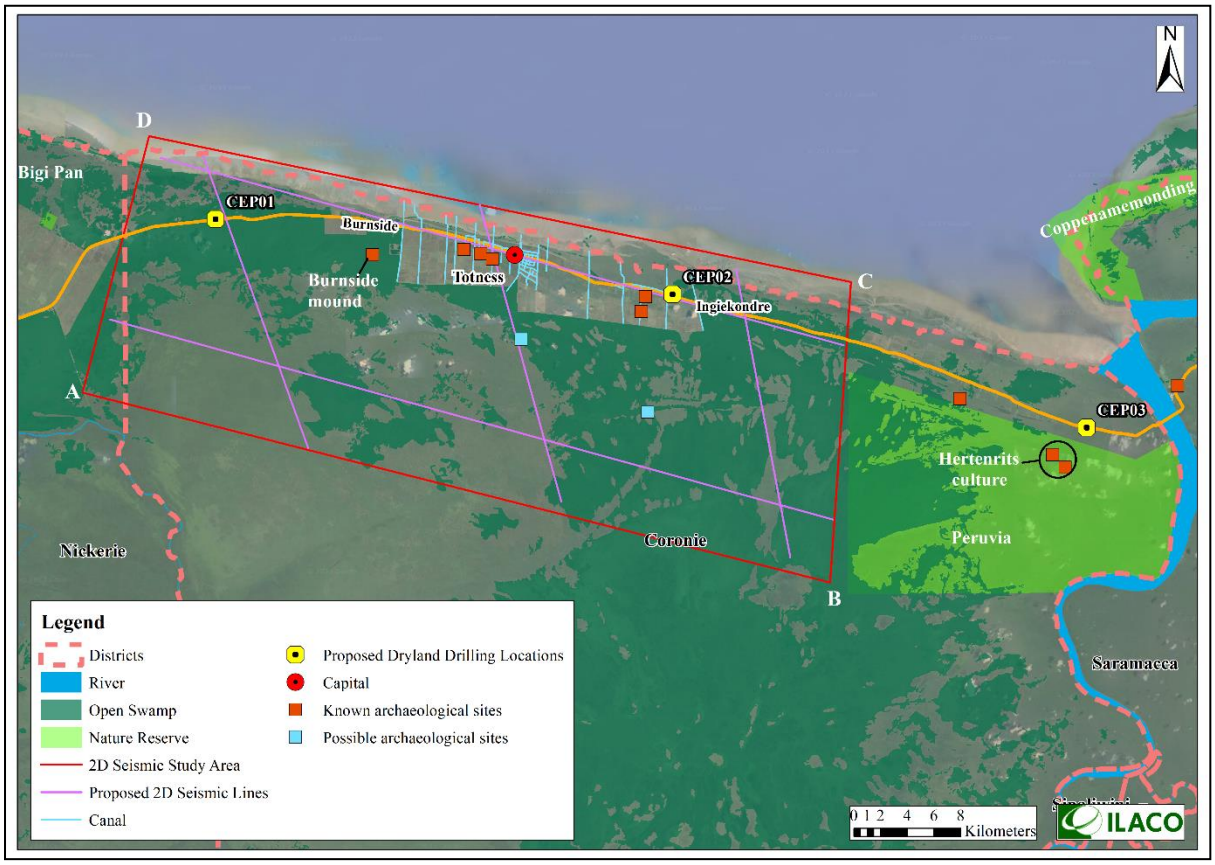


**Figure 23: Overview known and possible archaeological sites in Coronie (Noordam & Teunissen, 2008)**

# 5 Public Consultation

## 5.1 General

Stakeholder engagement and consultation are integral components that run throughout the EIA process. The purpose of stakeholder engagement is to ensure that stakeholders are consulted beforehand about the project and its potential environmental and social impacts. The process offers stakeholders the opportunity to make comments, suggestions, and voice any concerns, which are then considered during the preparation of the ESIA report and the development of mitigation measures and management plans for the project.

The study began with the official Contract Signing. The project approval and the official kick-off meeting were held on the 18th of November 2022. On the 15th of December 2022, NIMOS was consulted about the approach, methodology, and additional concerns to be included in the study.
Stakeholders have been consulted during the scoping and during the ESIA assessment phase. Prior to these consultation meetings, individual stakeholders were contacted by email, along with a Background Information Document containing a non-technical summary of the project and the ESIA process, to provide stakeholders with advance project information.

During the scoping phase, individual meetings were held with the:

- Nature Conservation Division of the Forestry Service Suriname (NB-LBB) on the 26th of April 2023,
- The District Commissioner of Coronie on the 27th of April 2023, and
- The Division of the Ministry of Agriculture, Animal Husbandry and Fisheries (Min. LVV) in Coronie on the 27th of April 2023.

Additionally, on May 10, 2023, a public meeting was held in the Multifunctional Hall (Multifunctionele zaal) near the DC's office. The process and the outcomes of this meeting are presented in the Final Scoping Report (ILACO, July 2023).

During the ESIA assessment phase, individual meetings were also conducted, and a resident survey was undertaken (see **Table 17**). Prior to these meetings, Staatsolie published a notification through the Districts Commissariat (DC) via their social media from June 16th to June 23rd, 2023, for registration of landowners in the project area. With information gathered through this notification, Staatsolie provided a stakeholder list with potential landowners to be consulted. This complete list is included in **Appendix 6**.

**Table 17: List of consulted stakeholders**

| Date | Time (approx.) | Stakeholder | Type of meeting | Platform |
|---|---|---|---|---|
| **Government organizations** | | | | |
| 22-Aug-23 | 09:30 | Natuurbeheer Regio West | Individual | By phone call |
| Possible Landowners | | | | |
| 2-Aug-23 | 11:00 | Landowner #1 (km 97) | Individual | Physical in Paramaribo |
| 2-Aug-23 | 13:00 | Landowner #2 (km 99-100) | Individual | Physical in Paramaribo |
| 4-Aug-23 | 10:00 | Landowner #3 (km 119-120) | Individual | Physical in Paramaribo |
| 4-Aug-23 | 13:00 | Landowner #4 (km 108) | Individual | Physical in Paramaribo |
| 10-Aug-23 | 13:00 | Landowner #5 (km 98) | Individual | By phone call |
| 11-Aug-23 | 15:00 | Landowner #6 (km 98) | Individual | Physical in Coronie |
| 11-Aug-23 | 14:00 | Landowner #7 (Burnside) | Individual | Physical in Coronie |
| 11-Aug-23 | 12:00 | Landowner #8 (km 98) and (km 173) | Individual | Physical in Coronie |

| | | | | |
|---|---|---|---|---|
| 16-Aug-23 | 16:00 | Landowner #9 (km 98) | Individual | Physical in Coronie |
| 16-Aug-23 | 15:00 | Landowner #10 (108) | Individual | Physical in Coronie |
| 16-Aug-23 | 15:30 | Landowner #11(km 98) | Individual | Physical in Coronie |
| 23-Aug-23 | 14:00 | Landowner #12 (km 99,5) en (km 123) | Individual | By phone call |
| 23-Aug-23 | 13:00 | Landowner #13 (km 121) | Individual | By phone call |
| Residents – 57 respondents | | | | |
| 11th and 16th of August 2023. | 9.00-16.00 | Residents (km 57- km 150) | Individual | Questionnaire (included in **Appendix 6**) |

## 5.2 Stakeholder Consultation Results

A summary of concerns voiced during the stakeholder consultation is presented in the table below. See further information in **Appendix 6**.

**Table 18: Results stakeholder meetings and resident survey**

| Stakeholder Category | Stakeholder | Concerns |
|---|---|---|
| Government | Department of State Forest Management (LBB)- Natuurbeheer Regio west Coronie | • LBB carries out observations in the area to identify any illegal or unauthorized activities. While such activities are infrequent, instances of individuals from different regions engaging in activities like bird hunting off the coast have been observed.<br>• One of the key challenges faced by Nature Conservation Regio West is the lack of a seaworthy boat. This limitation restricts their ability to effectively monitor and control activities in coastal areas.<br>• Based on lessons learned from previous projects, it is crucial to establish effective communication and coordination with contractors of Staatsolie. |
| Landowners | Several | • Clarity about the locations where Staatsolie is planning activities.<br>• Various landowners engage in agricultural activities and beekeeping on their land, which can be impacted by the project activities.<br>• In previous projects there was a lack of clear agreements: which led to misunderstandings and conflicts with landowners.<br>• Timely, clear and transparent communication from Staatsolie including adequate information sharing.<br>• Community awareness: in previous projects there was also a lack of awareness among local communities about ongoing activities and upcoming developments.<br>• There is a concern for environmental damage (e.g. poor soil preventing agricultural activities) and damage to property (e.g. cracks in houses)<br>• Landowners are also concerned about the property inheritance issues that and how these will be addressed by Staatsolie. |
| Residents | Several | • Several landowners have concern about flooding and saltwater intrusion (due to dam breaches and drainage canals that are not maintained). This is an existing issue in the district.<br>• There are concerns about damage to houses, cracks and sinking of houses, poor soil quality that will prevent agriculture.<br>• Environmental impact and impact on animals in the area.<br>• Improvement of communication with the local community during all project phases. Residents would like to be informed for example through the use of a sound truck and/or distribution of flyers. To address the local dispersion of residents, it has been proposed to arrange transportation for public meetings so that they can actively participate and stay informed. Some residents mentioned that they heard about the project, but were unable to attend the public meeting because of lack of transportation. |

Based on the consultations, it can be concluded that stakeholders generally welcome the project and development in their district. They are open to engaging in dialogue with Staatsolie, provided that their concerns are addressed. In summary, these concerns include:

1. Establish effective communication, involvement, and coordination with Staatsolie. Information sharing and community awareness are crucial throughout all project phases.
2. Addressing concerns related to environmental and property damage.
3. Addressing potential impacts on livelihood of those engaged in agricultural activities and beekeeping in areas where the project activities will be conducted.
4. Managing the potential of coastal area flooding due to project activities, recognizing that this is an existing problem.

## 5.3 Stakeholder Engagement Plan

Additionally, a Stakeholder Engagement Plan (SEP) has been developed for the project to ensure a consistent procedure is followed during all stakeholder engagement. The ESIA-consultant is responsible for the stakeholder engagement during the ESIA process and Staatsolie is responsible for the stakeholder engagement during the project execution.

Communication with several relevant stakeholders will be an ongoing process.
**Table 19** presents the preliminary SEP (Stakeholder Engagement Plan), with relevant stakeholders and required actions per project phase. The SEP may be updated during the execution of the project.

**Table 19: Stakeholder Engagement Plan**

| **Stakeholder (Who)** | **Information sharing (What)** | **Frequency (When)** | **Communication method (How)** |
|---|---|---|---|
| **Phase 1: ESIA study (responsibility of consultant with input from the Applicant)** | | | |
| Government institutes (DC, LBB, LVV, KPS etc.) | Proposed project and planning of the project<br>Expected impacts<br>Project risks, safety and security measures | Scoping and ESIA phase | BID document<br>Online/ physical meetings<br>Public consultations |
| Directly affected stakeholders (landowners/ land and road users/ residents) | Proposed project and planning of the project<br>Expected impacts and mitigation measures | Scoping and ESIA phase | BID document<br>One-on one meetings<br>Public consultations<br>Release of ESIA report |
| **Phase 2: Prior to the start and during the project (responsibility of the Applicant)** | | | |
| Government institutes (DC, KPS, LBB, LVV etc.) | Announcement regarding general information and/ or update planning about the project. | Prior to the start and during the project | During regular communication<br>Phone calls |
| Directly affected stakeholders (landowners/ land users/ residents) | | | Posters/ Flyers<br>Phone calls<br>Field visits<br>Focus group meetings |
| Users of the Oost-West verbinding | Planning of the project (transportation of equipment along main roads) | During the life of the project, where applicable | Posters/ Flyers<br>Announcements in newspapers<br>Staatsolie website/ Facebook page<br>Through BIC Coronie |
| **Phase 3: After the seismic or drilling activities (responsibility of the Applicant)** | | | |
| Local community and relevant institutes | Project results and outcomes | Upon project completion | Poster/Flyers<br>Focus group meetings<br>Staatsolie website/Facebook page<br>Through BIC Coronie |

# 6 Environmental Impact assessment

## 6.1 Introduction

In this Chapter, the actual and potential impacts of the proposed project and their mitigation measures are evaluated and discussed. The applied methodology is explained in **Appendix 1**.

Due to the resemblance with previous similar projects a range of standard best practice procedures and impact reduction measures (or inherent mitigation measures) are adopted from the previous studies. The lessons learned regarding the efficiency of proposed mitigation measures based on existing monitoring results elsewhere have also been taken into consideration. In addition, the experiences of stakeholders from previous projects have also been taken into consideration. Finally, any identified cumulative impacts are discussed separately.

## 6.2 Impact assessment

A summary overview of the potential impacts, impact significance, mitigation measures and residual impact for the environmental and socio-economic environment is presented in the tables below.

### 6.2.1 The 2D Seismic Exploration Program

**Table 20: Bio-physical Impacts with Proposed Mitigation Measures for the 2D seismic operation**

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| Air | Reduction of air quality due to project emissions | Local receptors | Mag: negligible; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Negligible | • Select the quietest and most effective equipment available.<br>• Ensure that the contractor has a maintenance schedule for combustion equipment and that maintenance on the equipment is done accordingly.<br>• Reduce the number of transportation trips to the minimum (adequate planning) | Negligible |
| Noise | The noise of project traffic will affect local population when operated near inhabited areas | Local receptors | Mag: low; medium-term; small-scale<br><br>Probability: high<br><br>Significance: Minor | • Locate the landing stages at such distance from houses or working locations that noise levels for people are acceptable<br>• Reduce the number of transportation trips to the minimum (adequate planning)<br>• Have a complaint mechanism in place (Grievance Redress Mechanism) | Negligible |
| | Noise and vibration due to the use of seismic explosives | Local receptors | Mag: low; medium-term; small-scale<br><br>Probability: low<br><br>Significance: Negligible | • This impact cannot be further reduced. Small charges of explosives will be used at 20 m below surface level. | Negligible |
| Water resources | The construction of seismic drilling holes can result in result in changes in water quality (suspended solids) in swamps and canals | Aquatic life and water users | Mag: low; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Minor | • Plan drilling holes on third party land in consultation with the landowners and have a proper landowner agreement in place<br>• Plan drilling holes in consultation with land and water users (in stakeholder meetings)<br>• Locate transport routes as much as possible in herbaceous vegetation | Negligible |
| | Fuel or oil spills from equipment (e.g. boats) can lead to water pollution | Aquatic life and water users | Mag: low; medium-term; small-scale<br><br>Probability: low<br><br>Significance: Negligible | • Use leak proof containers and storage tanks at landing stages<br>• Provide adequate containment in case of container or tank leakage<br>• Have the oil spill contingency plan in place for the area under consideration | Negligible |

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| | Project transportation leads to change of water quality: increased pollution with suspended solids in swamps and canals | Aquatic life and water users | Mag: low; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Minor | • Keep a low speed when a swamp area or canal has to be crossed | Minor |
| | The construction of new trails and drilling holes can result in changes in the swamp hydrology and hydrology of areas susceptible to flooding | Local receptors | Mag: negligible; medium-term; small-scale<br><br>Probability: low<br><br>Significance: Negligible | • Limit to a minimum the construction of trails in swamps and waterways<br>• Scouting must be conducted before commencing the work. The objective is to map any dams and/or ridges. For seismic operations the breaching of dams/ridges is not foreseen.<br>• Plan trails on third party land in consultation with the landowners and have a proper landowner agreement in place<br>• Plan trails in consultation with land and water users (in stakeholder meetings, see Stakeholder Engagement Plan) | Negligible |
| Ecosystems: vegetation clearing for camp sites and trails | Loss of trees in forests within the Bigi Pan and North Coronie MUMA at the proposed project area | Vegetation and wildlife | Mag: low; long-term; small-scale<br><br>Probability: high<br><br>Significance: Minor | • Do not construct landing stages and camps or trails in protected areas<br>• When relocation of seismic lines is not possible: apply only hand clearing in forests near the proposed nature reserve<br>• Limit clearance to 1-2m for seismic trails | Negligible |
| Ecosystems: grass and peat fires | Increased fire hazards due to third parties that accidentally or on purpose set fire in swamp areas of the project area especially in the dry seasons: grass and peat fires damage vegetation, flora and fauna and threaten people, camps, boats, equipment and vehicles | Vegetation, wildlife and humans (workers in the area) | Mag: low; medium-term; small-scale<br><br>Probability: low<br><br>Significance: Negligible | • Develop and implement strict fire control procedures and measures<br>• Plan operations outside the height of the dry season<br>• Include fire risk awareness in the training program for the contractors working in the seismic survey area | Negligible |

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| Ecosystems: noise and fauna | Noise of project traffic can disturb wildlife, especially near breeding colonies of coastal birds, and areas with foraging birds as is the case with the Blue-and-Yellow Macaws in the posentri forests in the Peruvia NR | Fauna | Mag: low; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Minor | • Staatsolie will not conduct any project activities (including traffic routes) within the nature reserve<br>• Use other means of transport near nature reserve<br>• If activities have to be conducted near the nature reserve plan these activities outside the breeding seasons (March/April up to July/August and from March-September)<br>• Keep the noise levels as low as possible and the project period as short as possible; use manual augers instead of motorized drilling equipment near the nature reserve | Minor |
| Ecosystems: water transport and fauna | Water travel can result in collisions with wildlife resulting in death of animals | Fauna | Mag: low; medium-term; small-scale<br><br>Probability: low<br><br>Significance: Negligible | • Apply the Waterway Traffic Regulations developed for Calcutta (adapted when necessary)<br>• When constructing new trails, avoid as much as possible creeks with floating vegetation<br>• All transport outside the project area and off the trails should be forbidden, or should be bound to permission from the Project Manager<br>• Keep a low speed when a swamp area or creek has to be crossed or when wildlife is observed. | Negligible |
| Ecosystems: water pollution and fauna | Increased pollution with suspended solids, fuel or oil can affect the aquatic fauna and fisheries | Fauna | Mag: low; medium-term; small-scale<br><br>Probability: high<br><br>Significance: Minor | • See measures for water resources | Negligible |
| Ecosystems: hunting, poaching and collecting | Improved access and the influx of people can cause increased poaching and bird trapping in the project area and cause general disturbance to the fauna | Flora and fauna | Mag: low; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Minor | • Enforce strict admission rules for third parties for the project areas (if legally possible)<br>• Trapping of song birds should be prohibited also for contractors<br>• If required, request special assistance from government's game and fish wardens (e.g. LBB) responsible for control of fish and wildlife as early as possible in the project and follow their necessary permitting procedures.<br>• Upon closure: make access (only those created by Staatsolie for the project) into the project area inaccessible for third parties (unless agreed otherwise with landowners); maintain already existing trails only for example for monitoring purposes<br>• Implement above mitigation measures in consultation with the nature conservation authorities and local stakeholders | Minor |

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| Nature conservation | Seismic survey activities in the MUMA's could damage the integrity and conditions of these areas | Nature conservation | Mag: medium; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Moderate | • Organize an awareness program for the contractors in order to make them realize that they will work in, near and around MUMA's<br>• Close cooperation with LBB- Natuurbeheer | Minor |
| Archaeology | Destruction of or damage to archaeological sites occurs during soil moving/drilling activities related to trail construction or landing stages or camp sites | Archaeological sites | Mag: low; medium-term; medium-scale<br><br>Probability: medium<br><br>Significance: Minor | • Plan access routes and camp sites in such way that they remain at some distance from known or possible archaeological sites<br>• Create awareness amongst construction staff regarding the significance of such finds and on indicators of the presence of such sites (especially exposed pottery sherds, bed structures, spots with deviating terrain and vegetation).<br>• Have a chance find procedure in place (Appendix 3E):<br>– Cease all construction activities in the area if a potential site is noticed, and cordon off area<br>– Notify the Project Manager immediately, who will give a preliminary assessment of the site and will notify the National Museum ("Surinaams Museum")<br>– Ask the National Museum to undertake a detailed assessment of the site if deemed necessary in the preliminary assessment<br>– Follow recommendations made in preliminary and/or detailed assessment as appropriate | Minor |
| Solid waste and sewage | Release of solid waste and sewage from landing stages, camp sites or from workers during seismic survey can result in water pollution | Aquatic life and water users | Mag: negligible; medium-term; small-scale<br><br>Probability: low<br><br>Significance: Negligible | • Manage all solid waste, produced during project activities, according to the Staatsolie Waste Management Plan | Negligible |
| | Solid waste and sewage from project activities can affect the visual aesthetics of the study area | Local receptors (community) | Mag: low; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Minor | • Provide basic sanitary facilities<br>• Provide waste bins and have other provisions for appropriate waste collection and disposal<br>• Promote waste reduction, re-use, recycling amongst personnel<br>• Do not litter and/or leave any waste behind in the project area | Negligible |

**Table 21: Socio-economic Impacts with Proposed Mitigation Measures for the 2D seismic operation**

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| General | Loss of social license to operate due to project activities | General | Mag: medium; long-term; medium-scale<br><br>Probability: medium<br><br>Significance: Major | • Ensure that the contracted seismic company is informed and held responsible for applying the EMMP recommendations.<br>• Verify whether the seismic equipment is in conformity with the standards and ensure that there is an Emergency Response Plan, an Oil Spill Contingency Plan, and a Waste Management Plan in place; these plans should be approved by NIMOS.<br>• Ensure that land-use agreements have been signed with all landowners (where applicable), prior to the start of seismic activities.<br>• Certify that the Seismic Contractor is equipped to comply with the EMMP. | Moderate[12] |
| | Income generation for local businesses and employment of local workers due to local purchasing of goods and services | Local community | Mag: low; medium-term; small-scale<br><br>Probability: low<br><br>Significance: Negligible | • Require that seismic contractor sources goods/materials and services locally, as much as possible.<br>• Build/strengthen capacity of local workforce to obtain skills necessary for the project. | Minor |
| | Social conflicts and community health, safety and security | Local community | Mag: medium; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Moderate | • Ensure that seismic contractor personnel are aware of the HSEQ requirements of Staatsolie (e.g., Code of Conduct, Alcohol and Drugs policy, COVID-19 Preventive measures in accordance with Public Health regulations, etc.).<br>• Ensure that the contents of the CR Policy of Staatsolie is communicated with and disseminated amongst personnel.<br>• Ensure that a Code of Conduct that applies to premises outside Staatsolie (e.g., at their settlement) is in place and all personnel (both foreign and local workers) are aware of the content of this Code.<br>• Ensure that an Alcohol and Drugs Policy is in place, that applies to premises outside Staatsolie (e.g., at their settlement) and all personnel (both foreign and local workers) are aware of the content of this Policy. | Minor |

[12] This impact requires attention from Staatsolie and has been classified as moderate, even with mitigation measures. This because not all relevant stakeholders (landowners) are known at this point. It should be noted that the impact can be further reduced to minor during project execution, once Staatsolie has identified the landowners and establishes agreements with them.

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| | | | | • Have a communication plan in place and adhere to the proposed stakeholder engagement plan (SEP). | |
| | Social unrest develops because people have the feeling that Staatsolie is not properly addressing nuisances that they experience or problems, which they believe to have been caused by the project | Landowners and local community | Mag: medium; medium-term; medium-scale<br><br>Probability: low<br><br>Significance: Minor | • Organize in time stakeholder meetings with the land and water users<br>• Involve the local people and keep an open dialogue during all stages of the project as relevant to them<br>• See further measures proposed for noise, hydrology, water quality and land and water use | Negligible |
| Mobilization and seismic survey | Various potential interactions due to increased traffic in general including boat traffic, wires, lines, explosives transport and personnel transportation etc. | Local community and Staatsolie | Mag: negligible; medium-term; small-scale<br><br>Probability: low<br><br>Significance: Negligible | • See measures social conflicts and community health, safety and security<br>• During the seismic project phases, have an appropriate planning in place and incorporate safety zones based on risks assessed. | Negligible |
| | Damage to pipelines, cables, buildings, agricultural area etc. | Local community | Mag: low; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Minor | • Keep sufficient distance between shot hole and objects: telephone line 7-meter, electric power line 23-meter, pipeline 15-30 meter, wells 70 meter, and brick and/or concrete buildings 85 meter.[13]<br>• Properly map existing and planned wells in case of simultaneous operation with the Exploration drilling Project.<br>• Contractor will determine safe distances by executing peak particle velocity (PPV) measurements prior to acquisition, in which case he should demonstrate that at any closer distance the effects are still insignificant.<br>• Uphold established communication structures with the local community to ensure that landowners (where applicable), and other key stakeholders are notified (verbally and/ or in writing) | Minor |

[13] These safety distances were determined during the past seismic projects executed by Seismic Company Service (SCS), considering the charge size, shot-hole depth and local conditions. SCS is highly experienced in seismic activities in similar environments and with previous Staatsolie projects in Suriname.

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| | | | | in a timely and suitable manner of the seismic schedule so that they are aware of where and when seismic activities will be taking place.<br>• One staff member of Corporate Communication Upstream must be appointed as primary contact person or focal point specifically for the project in order to avoid misunderstandings or confusion in the communication with relevant stakeholders and the name and contact information of this staff member must be communicated with relevant stakeholders.<br>• Confirm that local communities are aware of the existence of the Staatsolie grievance mechanism and/or complaints procedure and are informed how to make use of it.<br>• Continue implementing a complaints registry and investigation procedure to warrant the appropriate and satisfactory response to presented grievances.<br>• Lessons learned from previously executed similar projects should be taken into account<br>• In case seismic surveys will take place on private lands, ensure that written agreements have been signed between Staatsolie and relevant landowners. It is crucial that the agreement is reached with relevant landowners in the planning and preparation phase, before commencement of the seismic surveys.<br>• Upon completion of project activities, ensure that the premises of relevant landowners are inspected by all parties relevant, to inspect the land and check any problems, damage to buildings or other structures, improperly filled or leaking shot holes, garbage or debris, any contaminates, improperly disposed of excavated soil, tags that could damage livestock, any form of damage, and document in writing all occurrences.<br>• Any identified outstanding issues will be addressed appropriately (to the satisfaction of the landowner).<br>• When no problems or shortcomings are observed, or when any issues have been addressed, the owner will sign for release. | |
| | Water transport leads to dangerous situations with other boat transport | Water users | Mag: low; medium-term; small-scale | • Follow Calcutta Waterway Traffic Regulations | Negligible |

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| | (e.g. fishermen, tourists, game warden), with potentially fatal casualties | | Probability: low<br><br>Significance: Negligible | • Involve the local people and keep an open dialogue during all stages of the project as relevant to them<br>• Place signs in critical areas to indicate boat routes<br>• See measures listed for damages to pipelines etc. | |
| | Noise, dust and other forms of nuisance | Local community | Mag: low; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Minor | • See measures above | Negligible |
| | Occupational health and safety (attacks from wildlife such as bees, snakes, general swamp safety e.g. hydration, vector borne diseases (mosquitos), sunburn and other environmental hazards such as unstable ground, waterborne diseases, extreme weather conditions) | Staatsolie personnel and contractors | Mag: medium; medium-term; small -scale[14]<br><br>Probability: medium<br><br>Significance: Moderate | • Workers should wear protective clothing<br>• Train workers to be aware of bee activity and nests in the area. Look out for signs of beehives and avoid disturbing them<br>• Encourage employees to be vigilant and avoid reaching into tall grass or undergrowth without first checking for snakes. Snakes may be camouflaged and difficult to spot.<br>• Ensure that all survey team members are trained in basic first aid, including snakebite treatment. Have a well-equipped first aid kit on-site.<br>• Ensure that all team members receive thorough safety training, including specific instructions on how to deal with bee and snake encounters.<br>• The following safe distance measures (personal comm. with Mr. Kodabaks- Min. LVV) should be followed when working/ traveling near beehives:<br>  ○ In case the presence of high/ dense forest, a min. of 150m should be maintained.<br>  ○ In case of less dense forest, a distance of 250m should be maintained and<br>  ○ 350m should be maintained for an open area.<br>• Ensure that workers stay well-hydrated and have access to clean water. | Minor |

[14] For each location and activity, there will be a minimum of 2 people present. However, activities may run simultaneously, and the number of people can increase to 3-5 individuals, and in peak situations, even up to 15 people. The scale of this impact remains small because potential dangers will be assessed during the scouting phase (2 persons), and therefore, mitigating measures will already be in place for those who come afterward.

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| | | | | • Establish a clear communication plan for the survey team to call for help in case of emergencies.<br>• Consult with local experts or authorities who are familiar with the specific risks in the swamp area | |
| | Water pollution from fuel and oil spills, and solid or liquid waste impacts the drinking and washing water quality of local communities | Local community | Mag: negligible; medium-term; small-scale<br>Probability: low<br><br>Significance: Negligible | • Plan landing stages, camp sites and storage areas in consultation with the local stakeholders<br>• See measures proposed for waste management and fuel and oil spills | Negligible |
| | Water pollution from fuel and oil spills, suspended solids and solid or liquid waste results in lower fish catches | Local community | Mag: negligible; medium-term; small-scale<br><br>Probability: low<br><br>Significance: Negligible | • See measures proposed for water resources | Negligible |
| | Transport through swamps could damage fishing nets | Fishermen | Mag: low; medium-term; small-scale<br><br>Probability: low<br><br>Significance: Negligible | • Plan activities together with the local land and water users<br>• Limit activities in fishery zones<br>• Compensate for any damage done by Staatsolie/contractor to fishing equipment | Negligible |
| | Seismic survey activities lead to loss of crops or cattle, or damage to farm infrastructure (impact of livelihood) | Farmers | Mag: low; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Minor | • Conduct a detailed assessment of the surroundings during clearance activities and plan the seismic operation on outcome of this assessment.<br>• Involve the local people (those affected and the local government) and keep an open dialogue during all stages of the seismic survey activities in their area (communication plan and SEP)<br>• Perform activities in rice polders preferably on dry land, not when cropped<br>• Where and when possible: relocate seismic lines to an area outside pastures and active cropping land | Negligible |

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| | Solid waste pollution / Visual and health related problems | Community | Mag: negligible; medium-term; small-scale<br><br>Probability: low<br><br>Significance: Negligible | • Manage all solid waste, produced during project activities, according to the Staatsolie Waste Management Plan<br>• See further measures proposed for solid waste and sewage (**Table 20**) | Negligible |
| | Sewage / Water pollution and health related problems | Local community | Mag: negligible; medium-term; small-scale<br><br>Probability: low<br><br>Significance: Negligible | • Provide basic sanitary facilities<br>• See further measures proposed for solid waste and sewage (**Table 20**) | Negligible |
| Decommissioning and restoration | Upon completion of project activities, there is remaining damage to the property, or waste present | Landowners and local community | Mag: medium; long-term[15]; small-scale<br><br>Probability: medium<br><br>Significance: Moderate | • Staatsolie and (where applicable) the respective landowner shall inspect the land and check any outstanding actions resulting from the work activities, damage to buildings or other structures, improperly filled or leaking shot holes, garbage or debris, any contaminates, improperly disposed of excavated soil, tags that could damage livestock, any form of damage, and document in writing all occurrences. When no problems or shortcomings are observed, the owner will sign for release. | Minor |

[15] This impact is scaled with a long-term duration because there may be ongoing agreements with the landowners after the project concludes

### 6.2.2 Exploration Drilling Program

**Table 22: Bio-physical Impacts with Proposed Mitigation Measures for the exploration drilling**

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| Air quality | Reduction of air quality due to project emissions | Local receptors | Mag: low; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Minor | • Select quietest and most effective equipment available.<br>• Regularly maintain engines of vehicles and equipment.<br>• Operate and maintain exhaust systems and engines in accordance with the manufacturer's specifications.<br>• Use preventative maintenance and repair programs.<br>• Reduce number of transportation trips to the minimum (adequate planning)<br>• Require above also from Contractors | Negligible |
| Noise | Noise during land preparation, construction of required installations and equipment, drilling, transportation- on-site and via access roads, and during decommissioning activities | Local receptors | Mag: low; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Minor | • See measures for air quality<br>• Conduct site inspections and keep a minimum distance of 100 meter between the drilling site and the nearest dwelling.<br>• Consider safe distances to avoid effects on bees (aggressive or immobile bees due to increase noise levels), see measures at occupational health and safety.<br>• Truck and other heavy transport should only be operational during daytime.<br>• Install noise screens around the drilling site or at least at the side where houses are found within the 100 m.<br>• Have a complaint procedure in place (Grievance Redress Mechanism) | Negligible |
| Soil resources | Soil degradation and loss of soil productivity due to compaction and/or soil contamination during construction of access roads and preparation of drilling site | Landowners and land users | Mag: low; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Minor | • Make an assessment of the local soil conditions of any access route and the well location before the start of activities, comprising soil profile description, soil density and soil analytical parameters that could be affected by the activity (salinity, visual oil contamination in soil and/or groundwater)<br>• Avoid clearing and construction works under wet conditions as much as possible.<br>• Limit clearance of shrubs and low trees as needed and preferably by light machine<br>• Spread sand without disturbance of the original topsoil.<br>• During drilling: use mats or other protective materials as required | Minor |

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| | | | | • After decommissioning: Conduct a soil assessment to check any changes and if necessary, ameliorate the soil-by-soil tillage (to remove soil compaction) and soil cleaning (in case of contamination, or<br>• Compensate the owner for any loss of land if so identified | |
| Surface water resources | Water pollution during construction of access roads and preparation of drilling site | Aquatic life, water users and landowners | Mag: low; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Minor | • See measures soil resources<br>• Plan access roads and drilling sites in consultation with the relevant stakeholders (see Stakeholder Engagement Plan)<br>• Access roads and drilling sites on third party land should be done with a proper landowner agreement in place | Negligible |
| | Water pollution with spilled or leaked oil, grease or fuel, or drilling liquid and completion fluid during drilling operation | Aquatic life, water users and landowners | Mag: medium; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Moderate | • Staatsolie will not locate drilling locations in an open water area.<br>• Provide adequate containment for tanks.<br>• Use drip-pans, leak-proof containers and storage tanks.<br>• Follow the Staatsolie guidelines for inspection, maintenance and clean-up.<br>• Conduct daily visual inspection of pipes and valves for signs of corrosion and replace pipes and valves when corrosion is found.<br>• Have the oil spill contingency plan in place for the area under consideration and have the required clean-up materials and equipment on-site. | Minor |
| | Water pollution as a result of truck accident | Aquatic life, water users and landowners | Mag: medium; medium-term; small-scale<br><br>Probability: low<br>Significance: Minor | • Have procedures, materials and equipment in place to ensure immediate containment and cleanup by competent personnel, in the event an accident. | Negligible |
| | Blockage of waterways and changes in hydrology and drainage due to construction of access roads and preparation of drilling site | Local community | Mag: medium; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Moderate | • Conduct an assessment of existing hydrology and do not obstruct natural waterways, canals and creeks without necessary provisions (placement of culverts)<br>• Do not open existing dams without the necessary provisions<br>• Plan access roads and drilling sites in consultation with the relevant stakeholders<br>• Access roads and drilling sites on third party land should be done with a proper landowner agreement in place | Minor |

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| Ecosystem | Damage to ecosystem, loss of high swamp forest and vegetation in the MUMA's | Vegetation and wildlife | Mag: medium; long-term; small-scale<br><br>Probability: high<br><br>Significance: Moderate | • Limit the footprint of disturbance to the minimum through optimized planning<br>• Organize an awareness program for the contractors in order to make them realize that they will work in, near and around MUMA's<br>• Close cooperation with LBB-Natuurbeheer | Minor |
| | Improved access and influx of people can cause increased poaching and bird trapping and cause general disturbance | Wildlife | Mag: low; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Minor | • Enforce strict admission rules for third parties for the project areas (if legally possible)<br>• Trapping of song birds should be prohibited also for contractors<br>• Request special assistance from government's game and fish wardens responsible for control of fish and wildlife<br>• Upon closure: make access into the project area inaccessible for third parties (unless agreed otherwise with landowners)<br>• Put up clearly marked signs indicating "No Entry or No Trespassing"<br>• Implement above mitigation measures in consultation with the nature conservation authorities and local stakeholders | Negligible |
| | Nature conservation: activities in MUMA's could damage the integrity and conditions of these areas | Nature conservation | Mag: medium; long-term; small-scale<br><br>Probability: high<br><br>Significance: Moderate | • Organize an awareness program for the contractors in order to make them realize that they will work in, near and around MUMA's<br>• Close cooperation with LBB-Natuurbeheer | Minor |
| Archaeological and historical sites | Disturbance or destruction of archaeological sites | Archaeological sites | Mag: low; medium-term; small-scale<br><br>Probability: low<br><br>Significance: Negligible | • Create awareness amongst construction staff regarding the significance of such finds and indicators of the presence of such sites (especially exposed bottles, pieces of earthenware, metal, pottery sherds, bed structures, spots with deviating terrain and vegetation).<br>• Have a chance find procedure in place (see Appendix 3E):<br>– Cease all construction activities in the area, if a potential site is noticed, and cordon off the area.<br>– Notify the Archaeological Service, and request them to give a preliminary assessment of the site.<br>– Allow that a detailed assessment of the site is undertaken by, or on behalf of, the Archaeological | Negligible |

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| | | | | Service deemed necessary in the preliminary assessment.<br>– Follow recommendations made in preliminary and/or detailed assessment as appropriate | |
| Solid waste and sewage | Release of solid waste and sewage during project activities | Local receptors | Mag: low; medium-term; small-scale<br><br>Probability: high<br><br>Significance: Minor | • Provide basic sanitary facilities<br>• Provide waste bins and have other provisions for appropriate waste collection and disposal<br>• Promote waste reduction, re-use, recycling amongst personnel<br>• Do not litter and/or leave any waste behind in the project area<br>• Dispose waste in line with local laws and regulations and international best practices | Negligible |

**Table 23: Socio-economic Impacts with Proposed Mitigation Measures for the exploration drilling**

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| General | Loss of social license to operate due to project activities | General | Mag: medium; long-term; medium-scale<br><br>Probability: medium<br><br>Significance: Major | • Present this ESIA during stakeholder meetings to all involved landowners, including neighbors, and involved authorities like DC, DS and BO, LVV, OW, SWM, and upon request make the document available to interested parties.<br>• Have a communication plan and adhere to the Stakeholder Engagement Plan (SEP)<br>• Ensure that the local government representatives and the population are well informed of the project activities and their timing and location.<br>• Implement a communication and information point for questions and answers in the local area, with a community-based project communication officer to contact.<br>• Communicate the occurrence of large/exceptional transports of equipment, materials and supplies along inhabited roads with the local population (through BO) and road users (through national media).<br>• Restrict heavy transport to daytime only.<br>• Conduct transportation as much as possible during the weekend morning hours, when the intensity of other traffic tends to be low.<br>• Require that double or more axle trucks are being used for the transportation of fill sand in order to avoid (more) damage to the local roads.<br>• Ensure that there is an Emergency Response Plan, an Oil Spill Contingency Plan and a Waste Management Plan in place; these plans should be approved by NIMOS.<br>• Consult landowners for their cooperation prior starting the activities.<br>• Ensure that land-use agreements have been signed with respective landowners (where applicable). Staatsolie will adhere to the TTT (Team Toegang Terreinen) procedure which includes all steps to be taken to identify, inform, and negotiate | Moderate[16] |

[16] This impact requires attention from Staatsolie and has been classified as moderate, even with mitigation measures. This because not all relevant stakeholders (landowners) are known at this point. It should be noted that the impact can be further reduced to minor during project execution, once Staatsolie has identified the landowners and establishes agreements with them.

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| | | | | with the legitimate landowners regarding the planned activities, and monitoring of the compliance of agreements. | |
| | Social conflicts incl. community health and safety and nuisance to receptors close to the drilling sites | Local community | Mag: medium; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Moderate | • Organize in time stakeholder meetings with the land and water users<br>• Involve the local people and keep an open dialogue during all stages of the project as relevant to them<br>• Enter into land use agreement with landowners<br>• Register and address complaints according to the Grievance Redress Mechanism<br>• Have a close out inspection with all relevant parties<br>• Ensure that personnel are aware of the HSEQ requirements of Staatsolie (e.g. Code of Conduct, Alcohol and Drugs policy, COVID-19 Preventive measures in accordance with Public Health regulations, etc.).<br>• Ensure that the contents of the CR Policy of Staatsolie is communicated with and disseminated amongst personnel.<br>• Ensure that a Code of Conduct that applies to premises outside Staatsolie (e.g. at their settlement) is in place, and all personnel (both foreign and local workers) are aware of the content of this Code.<br>• Ensure that an Alcohol and Drugs Policy is in place, that applies to premises outside Staatsolie (e.g. at their settlement) and all personnel (both foreign and local workers) are aware of the content of this Policy.<br>• Have a communication plan in place and adhere to the proposed Stakeholder Engagement Plan (SEP) | Minor |
| Land use | Potential property damage incl. impact on livelihood | Local community and landowners | Mag: medium; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Moderate | • Have a land use agreement in place with respective landowners covering.<br>• No operations will be planned without prior consultation with the landowner, and upon any operations being undertaken, communication and notification will continue on a regular basis between Staatsolie and the owners.<br>• Written communication between the landowner and Staatsolie should ensure that adequate notice is given, so that drilling operation does not interfere with the grazing or other | Minor |

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| | | | | agricultural operations, and that communication is direct, clear and concise.<br>• Staatsolie shall permit the landowner, or its duly authorized representative, access subject to safety and health restrictions to observe operations being conducted on his land.<br>• Trespass on any area outside of the agreed upon program area is strictly forbidden and any resulting damage is the sole responsibility of the project.<br>• Staatsolie shall conduct its operations so as to protect all surface water sources and so as to not interfere with grazing animals.<br>• No fences or trees are to be cut or removed unless permission is obtained from the landowner.<br>• No garbage, trash, waste, wire or equipment shall be present upon completion of project activities.<br>• Any leak or spill of fuel, oil or other compounds shall be completely cleaned up and contaminated soil and vegetation parts shall be removed from the land at the cost of the Contractor.<br>• Any damage caused by project or by any equipment or personnel related to the project is the responsibility of the project.<br>• Upon completion of the project, Staatsolie and the respective landowner shall inspect the land and check any outstanding actions resulting from the work activities, damage to buildings or other structures, improperly closed well holes or improperly filled pits, garbage or debris, any contaminates and any form of damage, and document in writing all occurrences (see close-out inspection checklist) When no problems or shortcomings are observed, the owner will sign for release. | |
| Road use | Accidents | Road users | Mag: low; medium-term; small-scale<br><br>Probability: medium<br><br>Significance: Minor | • Ensure that all project vehicles are officially tested and have additional tests conducted on brakes and steering mechanism.<br>• Enforce speed limits for all vehicles to minimize the potential of accidents. Specify road types.<br>• Keep frequent speed controls for project traffic (involve the local police if necessary).<br>• All truck drivers, including contractors, should follow a Defensive Drivers training | Negligible |

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| | | | | • Place warning signs, warning lights and mobile speed bumps at intersections of the exit of construction traffic (involve local police).<br>• Have (a) trained flag man (men) at intersections. | |
| Solid waste and sewage | Visual and health related problems | Local community | Mag: low; medium-term; small-scale<br><br>Probability: high<br><br>Significance: Minor | • Manage all solid waste, produced during project activities, according to the Staatsolie Waste Management Plan<br>• Provide basic sanitary facilities<br>• See further measures proposed for solid waste and sewage (**Table 22**) | Negligible |
| Occupational health and safety | Attacks from wildlife such as bees, snakes, general swamp safety e.g. hydration, vector borne diseases (mosquitos), sunburn and other environmental hazards such as unstable ground, waterborne diseases, extreme weather conditions | Staatsolie personnel and contractors | Mag: medium; medium-term; small-scale[17]<br><br>Probability: medium<br><br>Significance: Moderate | • Workers should wear protective clothing<br>• Train workers to be aware of bee activity and nests in the area. Look out for signs of bee hives and avoid disturbing them<br>• Encourage employees to be vigilant and avoid reaching into tall grass or undergrowth without first checking for snakes. Snakes may be camouflaged and difficult to spot.<br>• Ensure that all survey team members are trained in basic first aid, including snakebite treatment. Have a well-equipped first aid kit on-site.<br>• Ensure that all team members receive thorough safety training, including specific instructions on how to deal with bee and snake encounters.<br>• The following safe distance measures should be followed when working/ traveling near beehives (personal comm. with Mr. Kodabaks- Min. LVV):<br>  ○ In case the presence of high/ dense forest, a min. of 150m should be maintained.<br>  ○ In case of less dense forest, a distance of 250m should be maintained and<br>  ○ 350m should be maintained for an open area. | Minor |

[17] For each drilling location there will be 3-5 people present for the construction phase, approx. 10 people for the operation phase and 2-3 people for the decommissioning phase. The scale of this impact remains small because potential dangers will be assessed during the mobilization and construction phase (3-5 persons), and therefore, mitigating measures will already be in place for those who come afterward.

| Component | Impact Description | Receptors | Impact significance | Mitigation measures | Residual Impact |
|---|---|---|---|---|---|
| | | | | • Ensure that workers stay well-hydrated and have access to clean water.<br>• Establish a clear communication plan for the survey team to call for help in case of emergencies.<br>• Consult with local experts or authorities who are familiar with the specific risks in the swamp area | |
| Employment and local economy | Income generation | Local community | Mag: low; medium-term; small-scale<br><br>Probability: low<br><br>Significance: Negligible | • Recruit local labor, as far as available and feasible.<br>• Purchase food, lodging and other necessary resources as much as possible from local entrepreneurs.<br>• Keep a record and give feedback on jobs provided to locals and others with clear reporting on each job profile. | Minor |

### 6.2.3 Cumulative impacts

The seismic survey and exploration drilling program are not expected to be conducted simultaneously; therefore, cumulative impacts are not anticipated. However, it is important to consider the following if the planning changes, considering the potential planned developments (see chapter 4.4) as well.

Environmental Impacts:

a. Habitat Disruption: The simultaneous operation of seismic surveys and drilling rigs can disrupt local ecosystems, particularly if they are conducted in sensitive habitats like in the Coronie area.
b. Noise Pollution: Both activities generate noise, which can disturb wildlife, including nesting birds and other sensitive species. The cumulative noise impact can be more significant when conducted together.
c. Water Pollution: Drilling fluids and other chemicals used in exploration drilling can potentially contaminate nearby water bodies. Seismic surveys may also affect water quality.
d. Air Quality: Dust, emissions from machinery, and vehicle exhaust from both activities can degrade air quality especially in the dryer seasons.

Community Impacts:

a. Social Disruption: The presence of multiple operations simultaneously can lead to increased traffic, noise, and other disturbances and conflicts in local communities.
b. Health Concerns: Air, soil and water pollution can raise health concerns for nearby communities, particularly if there is a cumulative exposure to pollutants from both activities.

Operational Challenges:

a. Logistical Challenges: Coordinating and managing the activities of seismic surveys and drilling programs simultaneously can be complex, requiring careful planning and logistics.
b. Safety: Increased activity in the same area raises safety concerns, both for workers on-site and for the surrounding community.

Effective communication and consultation with local stakeholders will be crucial for addressing above listed and finding mutually beneficial solutions.

# 7 Environmental Management and Monitoring Plan

This chapter presents the Environmental Management and Monitoring Plan (EMMP) for the 2D Seismic Exploration Program and the Exploration Drilling Program in the Coronie Block.

## 7.1 Description of the EMMP

**Scope of the EMMP**

The EMMP applies to all Staatsolie' s activities associated with the 2D Seismic Exploration Program and the Exploration Drilling Program including operations conducted on Staatsolie' s behalf by contractors and sub-contractors. This includes, but is not limited to, seismic or drilling and support operations as well as administrative support.

The EMMP is linked to and works together with the following documents which are to be submitted by the selected Seismic or Drilling Contractor: Emergency Response Plan (ERP), the Oil Spill Response Plan (OSRP), Community Relations Plan (CRP) and Waste Management Plan (WMP) for the project. All plans should also be in line with the Staatsolie procedures as considered relevant.

**Purpose of the EMMP**

The purpose of the EMMP is to set out the management and monitoring measures required to minimize the environmental impacts of construction, operations and decommissioning the projects, and to ensure that responsibilities and appropriate resources are efficiently allocated to the project. The EMMP addresses all the phases of the projects. This plan may be reviewed and where necessary, updated as required.

**Structure of the EMMP**

The roles and responsibilities, management and monitoring and reporting requirements for seismic and drilling is described separately, respectively in subchapter 7.2 and 7.3. The Staatsolie grievance mechanism, applicable for both projects, is described in subchapter 7.4.

## 7.2 EMMP 2D Seismic Exploration Program

### 7.2.1 Roles and Responsibilities

The Staatsolie organizational structure, focusing on those personnel with environmental responsibilities/accountabilities, is described below.

**Table 24: Organizational structure and responsibilities seismic project**

| Position | HSE responsibility |
|---|---|
| Upstream Director | Overall accountability for HSE matters for all exploration & production activities |
| Exploration Manager (Project Sponsor) | Overall accountability for HSE matters for all exploration operations and activities. |
| Project Owner | Overall accountability for management of the seismic project, including environmental management aspects:<br>• Provide direction on strategic matters to the Project Manager; and<br>• Review monthly reports on the performance of the environmental management and monitoring of the seismic project that are submitted by the Project Manager |
| Project Manager | Overall responsibility for the seismic project activities, including environmental management aspects:<br>• Ensure that the key on-site staff (Staatsolie and Seismic Contractor) are duly informed of the EMMP and associated responsibilities and implications of this EMMP prior to commencement of the project;<br>• Inform key on-site staff through initial environmental awareness training of their roles and responsibilities in terms of the EMMP;<br>• Ensure that a copy of the EMMP shall be available on site; and<br>• Keep all relevant team members within Staatsolie informed. |

| | |
|---|---|
| Seismic Acquisition Contractor | Responsibility for HSE matters related to activities under its control:<br>• Submit ERP, OSRP, WMP for the project<br>• Ensure that all personnel on site (including Sub-Contractors and their staff, and suppliers) are familiar with and understand the requirements of the EMMP by discussing these during safety meetings<br>• Hold daily safety meetings to keep all personnel aware of HSE issues<br>• Ensure that all employees and sub-contractors comply with this EMMP;<br>• Ensure that any problems and non-conformances are remediated in a timely manner, to the satisfaction of the Project Manager;<br>• Ensure that all personnel are aware of the ERP; are adequately trained therein and hold regular ERP drill;<br>• Report all incidents and non-conformance to the Project Manager, such as: oil spills; and stakeholder's complaints; and<br>• Compile compliance reports to include summary of incidents; safety meetings; ERP drills and waste register. |
| Seismic Quality Control (QC) Staatsolie representative | Overall responsibility to ensure that Seismic Contractor complies to the contract for the day-to-day on-site project activities, including environmental management aspects:<br>• Ensure that Seismic Contractor complies to all contractual obligations under the contract including those related to the EMMP;<br>• Be the eyes and ears of the Project Manager for all contractor's and on-site Staatsolie activities during operations;<br>• Regularly inform the Project Manager of progress of the activities and will immediately report any discrepancies or default, including those related to the EMMP; and<br>• Undertake weekly site inspections to determine compliance with the EMMP and monitor their activities on site with regard to the requirements outlined in this EMMP. Inspection reports are reported to the Project Manager, Project owner and HSE Department |
| HSSE Upstream Manager, Staatsolie | Responsibility to support the operations and monitor the performance with regards to HSE and Community matters:<br>• Identify areas of non-compliance and proposes action items to rectify them in consultation with the Project Manager/Project Leader. Undertakes spot inspections to determine compliance with the EMMP and monitor the activities of the contractor on site with regards to the requirements outlined in this EMMP;<br>• Alert when action items intended to remedy non-compliance are not closed out in a timely and satisfactory manner;<br>• Compile compliance reports;<br>• Submit reports on the implementation of the EMMP and non-compliance to the NIMOS;<br>• Undertake a post-decommissioning inspection upon completion of the project area, which may result in recommendations for additional clean-up and rehabilitation measures. |
| Environmental Engineer | Overall responsibility for Environmental Support for the project |
| Corporate Communications Upstream Head | Overall accountability of Community and Public Relations support for the project:<br>• Put the Stakeholder Engagement Plan into effect;<br>• Establish a communication structure to liaise with the main stakeholders (see separate SEP);<br>• Ensure that all affected parties as identified in the EMMP and SEP are duly informed of the seismic activities (what, where and when); and<br>• Organize and undertake local information meetings with key affected stakeholders (e.g. communities), as required. |
| Staatsolie Employees and contractors | Shall be aware of the EMMP requirements and adhere to the relevant mitigation measures. |

### 7.2.2 Environmental Training

Environmental awareness training courses shall be run for all personnel on site. It is incumbent upon the Project Owner to convey the objectives of the EMMP and the specific provisions of the EMMP to all personnel involved in the operation of the 2D Seismic Exploration Program. Environmental training must cover the specific environmental management requirements as set out in the EMMP but must also ensure that all on-site staff are aware of and familiar with the relevant requirements and principles/objectives of the HSEQ Policy, Community Relations Policy, applicable procedures (GFIs) and the EMMP.

The Project Owner will initialize the training sessions for all new or additional staff and the HSE department shall support with Environmental Awareness Courses (Integrated Health, Safety and Environmental Inductions). The Process Owner shall ensure that all his/her staff attends the awareness courses to be held not less than one week before the Commencement Date. Where applicable, the Field Supervisors shall provide job-specific training on an ad hoc basis when workers are engaged in activities that require method statements. A copy of the EMMP shall be available on site, and the Field Supervisors shall ensure that all the personnel on site (including Sub-Contractors and their staff) as well as suppliers are familiar with and understand the specifications contained in the EMMP.

Operation training will include information on:

- Working on privately owned land
- Current land and water use
- Clearing, access and transportation
- Waste minimization, handling and disposal methods
- Fire and spill prevention and control
- Emergency response procedure (Health, Safety and Environmental issues)
- Handling and storage of hazardous materials, fuels and oils
- Reclamation measures.

### 7.2.3 Environmental and Social Specification

**Table 25: Environmental and Social specification table for the 2D seismic program**

| Component | Impact Description | Mitigation measures | Responsibility | Monitoring and Performance Evaluation | | Compliance Reporting |
|---|---|---|---|---|---|---|
| | | | | Performance indicator | Monitoring Method | |
| **Environmental impacts** | | | | | | |
| Water resources | The construction of seismic drilling holes can result in result in changes in water quality (suspended solids) in swamps and canals/ Fuel or oil spills from equipment (e.g. boats) can lead to water pollution | • Plan drilling holes on third party land in consultation with the landowners and have a proper landowner agreement in place<br>• Plan drilling holes in consultation with land and water users (in stakeholder meetings)<br>• Locate transport routes as much as possible in herbaceous vegetation<br>• Use leak proof containers and storage tanks at landing stages<br>• Provide adequate containment in case of container or tank leakage | Project Manager/ Seismic contractor | Number of complaints<br><br>Number of incidents/ accidents and spills<br><br>Presence of turbid water/ oil sheen, etc. | Field inspection | Weekly progress on construction of water trails<br><br>Weekly checklist (**Appendix 3D**)<br><br>Method statement (**Appendix 3B**) |
| Nature conservation | Seismic survey activities in the MUMA's could damage the integrity and conditions of these areas | • Organize an awareness program for the contractors in order to make them realize that they will work in, near and around MUMA's<br>• Close cooperation with LBB- Natuurbeheer | Project Manager/ Environmental Engineer | Plan in place and awareness among field staff<br><br>Number of complaints | Field inspection | Compliance report |
| **Social impacts** | | | | | | |
| General | Loss of social license to operate due to project activities | • Ensure that the contracted seismic company is informed and held responsible for applying the EMMP recommendations.<br>• Verify whether the seismic equipment is in conformity with the standards and ensure that there is an Emergency Response Plan, an Oil Spill Contingency Plan, and a Waste Management Plan in place; these plans should be approved by NIMOS. | Project Manager/ HSEE Upstream Manager/ CCU head | Number of complaints<br><br>Number of focus group meetings<br><br>Percentage of attendance | Field inspection | Signed agreement<br><br>Community Relation (CR) report |

| Component | Impact Description | Mitigation measures | Responsibility | Monitoring and Performance Evaluation | | Compliance Reporting |
|---|---|---|---|---|---|---|
| | | | | **Performance indicator** | **Monitoring Method** | |
| | | • Ensure that land-use agreements (**Appendix 3C**) have been signed with all landowners (where applicable), prior to the start of seismic activities.<br>• Certify that the Seismic Contractor is equipped to comply with the EMMP. | | Number media announcements of project information | | |
| | Social conflicts and community health, safety and security | • Ensure that seismic contractor personnel are aware of the HSEQ requirements of Staatsolie (e.g., Code of Conduct, Alcohol and Drugs policy, COVID-19 Preventive measures in accordance with Public Health regulations, etc.).<br>• Ensure that the contents of the CR Policy of Staatsolie is communicated with and disseminated amongst personnel.<br>• Ensure that a Code of Conduct is in place, that applies to premises outside Staatsolie (e.g., at their settlement) and all personnel (both foreign and local workers) are aware of the content of this Code.<br>• Ensure that an Alcohol and Drugs Policy is in place, that applies to premises outside Staatsolie (e.g., at their settlement) and all personnel (both foreign and local workers) are aware of the content of this Policy.<br>• Have a communication plan in place and adhere to the proposed stakeholder engagement plan (SEP) | CCU Head | Number of complaints | Focus group meetings | Community Relation (CR) report |

| Component | Impact Description | Mitigation measures | Responsibility | Monitoring and Performance Evaluation | | Compliance Reporting |
|---|---|---|---|---|---|---|
| | | | | Performance indicator | Monitoring Method | |
| Mobilization and seismic survey | Occupational health and safety (attacks from wildlife such as bees, snakes, general swamp safety e.g. hydration, vector borne diseases (mosquitos), sunburn and other environmental hazards such as unstable ground, waterborne diseases, extreme weather conditions) | • Workers should wear protective clothing<br>• Train workers to be aware of bee activity and nests in the area. Look out for signs of bee hives and avoid disturbing them<br>• Encourage employees to be vigilant and avoid reaching into tall grass or undergrowth without first checking for snakes. Snakes may be camouflaged and difficult to spot.<br>• Ensure that all survey team members are trained in basic first aid, including snakebite treatment. Have a well-equipped first aid kit on-site.<br>• Ensure that all team members receive thorough safety training, including specific instructions on how to deal with bee and snake encounters.<br>• The following safe distance measures should be followed when working/ traveling near beehives:<br>  ○ In case the presence of high/ dense forest, a min. of 150m should be maintained.<br>  ○ In case of less dense forest, a distance of 250m should be maintained and<br>  ○ 350m should be maintained for an open area.<br>• Ensure that workers stay well-hydrated and have access to clean water.<br>• Establish a clear communication plan for the survey team to call for help in case of emergencies. | Project Manager/ Environmental Engineer | Awareness among field staff (number of trainings conducted, 100% attendance in training)<br><br>Number of incidents/ accidents<br><br>Number of sick leave<br><br>Number of PPE provided | Training records/<br><br>Number of safety talks | Incident report<br><br>Complaint register<br><br>Personnel and staff record |

| Component | Impact Description | Mitigation measures | Responsibility | Monitoring and Performance Evaluation | | Compliance Reporting |
|---|---|---|---|---|---|---|
| | | | | Performance indicator | Monitoring Method | |
| | | • Consult with local experts or authorities who are familiar with the specific risks in the swamp area | | | | |
| Decommissioning and restoration | Upon completion of project activities, there is remaining damage to the property, or waste present | • Staatsolie and (where applicable) the respective landowner shall inspect the land and check any outstanding actions resulting from the work activities, damage to buildings or other structures, improperly filled or leaking shot holes, garbage or debris, any contaminates, improperly disposed of excavated soil, tags that could damage livestock, any form of damage, and document in writing all occurrences. When no problems or shortcomings are observed, the owner will sign for release. | Project Manager/ Environmental Engineer/ CCU Head | Closure completion criteria | Visual inspection on compliance | Closure report and sign off |

### 7.2.4 Monitoring and Reporting

#### 7.2.4.1 Monitoring

Respective Process Owners together with the HSSE Upstream Division are responsible for monitoring the performance of on-site personnel against the commitments of the EMMP. Overall control of this function will lie with the HSSE Manager, and responsibility for day-to-day monitoring will lie with the Process Owner representatives. The Process Owner is obliged to and will have the power to suspend activities if they do not comply with the performance standards specified in the EMMP. The following principal items will be monitored:

- Correct implementation of EMMP;
- Compliance with Method Statements; and
- Physical parameters and indicators, e.g., water quality and hydrology (table below).

**Table 26: Physical Monitoring framework for seismic program**

| Aspect | Parameters | Frequency | Monitoring locations |
|---|---|---|---|
| Water quality | • Electrical Conductivity, Turbidity (using a field meter)<br>• TSS and oil and grease or • Total Petroleum Hydrocarbons (TPH) (lab analysis)<br>• Color, water levels and clarity (visual observations) | Before (pre-monitoring baseline) | Two- three locations in the swamp |
| | • Color, water levels and clarity (visual observations) | During and after the project. | To be determined before the start of the project. |
| | Check for oil spills and oil films (visual) | Daily during project | At all activity areas |
| Vegetation | Width and location of trails in forested parts – according to design (visually) | Directly upon completion of trails | All new trails |
| Presence of wildlife and honeybees | Visual observation of presence within working area | Daily | All working locations |
| Waste | Check if landing sites and working areas are clean<br>Check proper storage of waste<br>Check proper disposal of waste<br>Log on waste | Daily<br><br>Weekly<br>Weekly<br>Daily at collection of waste | All working locations |

**Environmental and Social Inspections**

To determine the compliance with the Environmental and Social Specifications as indicated in Chapter 7.2.3, environmental inspections will be undertaken throughout the duration of the project by the contractors that are executing project activities on behalf of Staatsolie, as well as by the Process Owners.

**Data and information management**

Environmental data is stored in a respective database, which allows systematic storage and manipulation of data, and will permit rapid retrieval for the purposes of internal and external reporting. The Staatsolie HSSE Representative will ensure that relevant environmental data of the project is provided for this database. In order to ensure a consistent and coherent system for documenting the implementation of the EMMP, all written records and other information will be stored in a filing system that is compatible with the requirements of the existing HSE Management System. This comprises standardized forms, documents and reporting procedures.

#### 7.2.4.2 Reporting

The frequency and nature of reporting of environmental management performance will depend upon the nature of the activity and aspect that is being managed.
The table below summarizes the formal reporting schedule that will be used for this 3D seismic project data acquisition.

**Table 27: Regular reports and report lines**

| Name report | Description | Frequency | Responsibility of | Receiver |
|---|---|---|---|---|
| Land use Agreement (**Appendix 3C**) | "Overeenkomst toegang terreinen voor het verrichten van mijnbouwwerkzaamheden" | Prior to start of project activities at locations, if applicable | Officer Sr. Legal | Project Manager |
| Method Statement | Methods statements | Two weeks before commencement | All process owners | Project Manager and HSEE Manager |
| Waste Transfer Registration Form | Filled in forms on generated solid waste (refer to WMP) | At every transferal of waste | Seismic Contractor | Seismic QC/ HSSE Upstream Manager |
| Weekly HSE inspection | Weekly summary of the safety meetings held by the Seismic Contractor | Weekly | Seismic QC | HSSE Upstream Manager |
| Reports of ERP drills held. | Drills as emergency response etc. | Monthly | Seismic QC | HSSE Upstream Manager |
| Incidents | Report type and consequences for loss of days/oil spills | When accidents happen | Seismic QC | HSSE Upstream Manager |
| Weekly Environmental and Social Inspection | Compliance with ESIA and ESMP, using checklists | Weekly | Seismic QC | HSSE Upstream Manager |
| Water quality monitoring reports | Reports of water quality monitoring done for the project | 1 week after monitoring has taken place. | Drilling Operation | HSSE Upstream Manager |
| Community Relation (CR) report | Report on implementation of Communication Plan, and compliance with ESIA and ESMP | Quarterly | CCU officer | HSSE Upstream Manager |
| Complaints | Report each complaint in the database | Directly after complaint is received | CCU officer | HSSE Upstream Manager |

Based on data from above reports, HSSE Representative will compile a Project Completion Report that will be sent to NIMOS.

**Feedback**

Feedback on performance will be communicated to the appropriate parties (including NIMOS) concerned. Any substandard performance will trigger a process that notifies the responsible party of the nature of the issue and indicates the actions that are required to rectify the situation. This will be followed up by further monitoring to ensure that the sub-standard performance has been corrected.

## 7.3 EMMP Exploration Drilling Program

### 7.3.1 Roles and Responsibilities

The process owners and Staatsolie organizational structure, focusing on those personnel with environmental responsibilities/accountabilities, is described below.

**Table 28: Process Owners**

| Process | Process Owner |
|---|---|
| Construction of infrastructure and drilling locations | Acting Head Drilling Services |
| Drilling wells | |
| Well plug and abandonment | |
| Decommissioning | |
| Planning of locations of wells | Functional Subsurface Support Manager |
| Wireline logging | Acting Head Drilling Services |
| Repeat Formation Testing of exploration wells | Acting Head Drilling Services |

**Table 29: Organizational structure and responsibilities exploration drilling project**

| Position | HSE responsibility |
|---|---|
| Upstream Director | Overall accountability for HSE matters for all upstream operations. |
| Production Asset Manager | Overall responsibility for HSE matters with regards to activities during the operational and decommissioning phase. |
| Acting Head Drilling Services | Responsibility for HSE matters related to Construction of infrastructure and drilling locations, drilling, plug and abandonment and decommissioning of the wells. |
| FSS Manager (Project Sponsor) | Accountable for the execution of the exploration drilling project in the Uitkijk area and HSE matters related to this project |
| Project owner | Overall accountability for management of the exploration drilling program, including environmental management aspects |
| Project manager | Responsibility for the execution of the exploration drilling project in the Uitkijk area and HSE matters related to this project |
| HSSE Upstream Manager | Responsibility to support the operations and monitor the performance with regards to HSE and Community matters. |
| Environmental Engineer | Overall responsibility for Environmental Support for the project |
| Corporate Communication Upstream Head | Overall accountability of Community and Public Relations support for all Staatsolie operations and activities. |
| Corporate Communication Officer | Overall responsibility of Community Relations support for the project |
| Staatsolie Employees and contractors | Should be aware of the EMMP requirements and adhere to the relevant mitigation measures. |

### 7.3.2 Environmental Training

Environmental awareness training courses shall be run for all personnel on site. It is incumbent upon the Process Owner to convey the objectives of the EMMP and the specific provisions of the EMMP to all personnel involved in the operation of the Exploration Drilling Project. Environmental training must cover the specific environmental management requirements as set out in the EMMP but must also ensure that all on-site staff are aware of and familiar with the relevant requirements and principles/objectives of the HSE Policy, ER Policy, applicable procedures (GFIs) and the EMMP.

The Project Owner will initialize the training sessions for all new or additional staff and the HSE department shall support with Environmental Awareness Courses (Integrated Health, Safety and Environmental Inductions). The Process Owner shall ensure that all his/her staff attends the awareness courses to be held not less than one week before the Commencement Date. Where applicable, the Field Supervisors shall provide job-specific training on an ad hoc basis when workers are engaged in activities that require method statements. A copy of the EMMP shall be available on site, and the Field Supervisors shall ensure that all the personnel on site (including Sub-Contractors and their staff) as well as suppliers are familiar with and understand the specifications contained in the EMMP.

Operation training will include information on:

- Working on privately owned land
- Current land and water use
- Clearing, access and transportation
- Waste minimization, handling and disposal methods
- Fire and spill prevention and control
- Emergency response procedure (Health, Safety and Environmental issues)
- Handling and storage of hazardous materials, fuels and oils
- Reclamation measures.

### 7.3.3 Environmental and Social Specification

**Table 30: Environmental and Social specification table for the exploration drilling program**

| Component | Impact Description | Mitigation measures | Responsibility | Monitoring and Performance Evaluation | | Compliance Reporting |
|---|---|---|---|---|---|---|
| | | | | Performance indicator | Monitoring Method | |
| **Environmental impacts** | | | | | | |
| Soil resources | Soil degradation and loss of soil productivity due to compaction and/or soil contamination during construction of access roads and preparation of drilling site | • Make an assessment of the local soil conditions of any access route and the well location before the start of activities, comprising soil profile description, soil density and soil analytical parameters that could be affected by the activity (salinity, visual oil contamination in soil and/or groundwater)<br>• Avoid clearing and construction works under wet conditions as much as possible.<br>• Limit clearance of shrubs and low trees as needed and preferably by light machine<br>• Spread sand without disturbance of the original topsoil.<br>• During drilling: use mats or other protective materials as required<br>• After decommissioning: Conduct a soil assessment to check any changes and if necessary, ameliorate the soil-by-soil tillage (to remove soil compaction) and soil cleaning (in case of contamination, or<br>• Compensate the owner for any loss of land if so identified | Project Manager/HSE Manager | Number of spills<br><br>Number of complaints<br><br>Presence of oil waste, etc.<br><br>Agreements with landowners | Field inspection<br><br>Closure inspection | Method statement (**Appendix 3B**)<br><br>Closure report and signed off<br><br>Weekly checklist (**Appendix 3D**)<br><br>Complaints reporting<br><br>Landowners Agreements |
| Surface water resources | Water pollution with spilled or leaked oil, grease or fuel, or drilling liquid and completion fluid during drilling operation | • Staatsolie will not locate drilling location in an open water area<br>• Provide adequate containment for tanks.<br>• Use drip-pans, leak proof containers and storage tanks.<br>• Follow the Staatsolie guidelines for inspection, maintenance and clean-up.<br>• Conduct daily visual inspection of pipes and valves for signs of corrosion and replace pipes and valves when corrosion is found. | Project Manager/ ID&M Superintendent / Head Drilling<br><br>HSSE Manager | Awareness among field staff<br><br>Number of incidents/ accidents and spills | Field inspection<br><br>Water sampling and testing | Weekly checklist (**Appendix 3D**)<br><br>Water quality monitoring report |

| Component | Impact Description | Mitigation measures | Responsibility | Monitoring and Performance Evaluation | | Compliance Reporting |
|---|---|---|---|---|---|---|
| | | | | Performance indicator | Monitoring Method | |
| | | • Have the oil spill contingency plan in place for the area under consideration and have the required clean-up materials and equipment on-site. | | Presence of turbid water/ oil sheen, etc. | | |
| | Blockage of waterways and changes in hydrology and drainage due to construction of access roads and preparation of drilling site | • Conduct an assessment of existing hydrology and do not obstruct natural waterways, canals and creeks without necessary provisions (placement of culverts)<br>• Do not open existing dams without the necessary provisions<br>• Plan access roads and drilling sites in consultation with the relevant stakeholders<br>• Access roads and drilling sites on third party land should be done with a proper landowner agreement in place | Project Manager / HSSE Manager | Number of complaints<br><br>Presence of stagnant water<br><br>Flooding | Field inspection | Weekly progress on construction of water trails<br><br>Method statement<br><br>Complaints register |
| Ecosystem | Damage to ecosystem, loss of high swamp forest and vegetation in the MUMA's | • Limit the footprint of disturbance to the minimum through optimized planning<br>• Organize an awareness program for the contractors in order to make them realize that they will work in, near and around MUMA's<br>• Close cooperation with LBB-Natuurbeheer | Project Manager/ ID&M Superintendent<br><br>HSSE Manager | Plan in place and awareness among field staff (number of planning meetings and trainings)<br><br>Number of complaints | Field inspection | Method Statement<br><br>Weekly checklist<br><br>Compliance report |
| | Nature conservation: activities in MUMA's could damage the integrity and conditions of these areas | • Organize an awareness program for the contractors in order to make them realize that they will work in, near and around MUMA's<br>• Close cooperation with LBB-Natuurbeheer | CCU Head/ Project Manager<br><br>HSSE Manager | Plan in place and awareness among field staff<br><br>Number of complaints | | |

| Component | Impact Description | Mitigation measures | Responsibility | Monitoring and Performance Evaluation | | Compliance Reporting |
|---|---|---|---|---|---|---|
| | | | | Performance indicator | Monitoring Method | |
| | | | | | | |
| **Social impacts** | | | | | | |
| General | Loss of social license to operate due to project activities | • Present this ESIA during stakeholder meetings to all involved landowners, including neighbors, and involved authorities like DC, DS and BO, LVV, OW, SWM, and upon request make the document available to interested parties.<br>• Have a communication plan and adhere to the SEP<br>• Ensure that the local government representatives and the population are well informed of the project activities and their timing and location.<br>• Implement a communication and information point for questions and answers in the local area, with a community-based project communication officer to contact.<br>• Communicate the occurrence of large/exceptional transports of equipment, materials and supplies along inhabited roads with the local population (through BO) and road users (through national media).<br>• Restrict heavy transport to daytime only.<br>• Conduct transportation as much as possible during the weekend morning hours, when the intensity of other traffic tends to be low.<br>• Require that double or more axle trucks are being used for the transportation of fill sand in order to avoid (more) damage to the local roads.<br>• Ensure that there is an Emergency Response Plan, an Oil Spill Contingency Plan and a Waste Management Plan in place; these plans should be approved by NIMOS.<br>• Consult landowners for their cooperation prior starting the activities | Project Manager/ HSSE Manager/ CCU Head<br><br>Head Drilling / ID&M Superintendent | Number of complaints<br><br>Number of focus group meetings<br><br>Number media announcements of project information<br><br>Traffic plan in place | Field inspections | Communication plan/ SEP<br><br>Signed agreement<br><br>Community Relation (CR) report |

| Component | Impact Description | Mitigation measures | Responsibility | Monitoring and Performance Evaluation | | Compliance Reporting |
|---|---|---|---|---|---|---|
| | | | | Performance indicator | Monitoring Method | |
| | | • Ensure that land-use agreements have been signed with respective landowners (where applicable). Staatsolie will adhere to the TTT (Team Toegang Terreinen) procedure which includes all steps to be taken to identify, inform, and negotiate with the legitimate landowners regarding the planned activities, and monitoring of the compliance of agreements. | | | | |
| | Social conflicts incl. community health and safety and nuisance to receptors close to the drilling sites | • Organize in time stakeholder meetings with the land and water users<br>• Involve the local people and keep an open dialogue during all stages of the project as relevant to them<br>• Enter into land use agreement (**Appendix 3C**) with landowners<br>• Register and address complaints according to the Grievance Redress Mechanism<br>• Have a close out inspection with all relevant parties<br>• Ensure that personnel are aware of the HSEQ requirements of Staatsolie (e.g. Code of Conduct, Alcohol and Drugs policy, COVID-19 Preventive measures in accordance with Public Health regulations, etc.).<br>• Ensure that the contents of the CR Policy of Staatsolie is communicated with and disseminated amongst personnel.<br>• Ensure that a Code of Conduct is in place, that applies to premises outside Staatsolie (e.g. at their settlement), and all personnel (both foreign and local workers) are aware of the content of this Code.<br>• Ensure that an Alcohol and Drugs Policy is in place, that applies to premises outside Staatsolie (e.g. at their settlement) and all personnel (both foreign and local workers) are aware of the content of this Policy.<br>• Have a communication plan in place and adhere to the proposed stakeholder engagement plan (SEP) | Project Manager/ HSSE Upstream Manager/ CCU head/ Counsel Upstream | Number of complaints<br><br>Number of focus group meetings | Field inspection | Signed agreement<br><br>Community Relation (CR) report |

| Component | Impact Description | Mitigation measures | Responsibility | Monitoring and Performance Evaluation | | Compliance Reporting |
|---|---|---|---|---|---|---|
| | | | | Performance indicator | Monitoring Method | |
| Land use | Potential property damage incl. impact on livelihood | • Have a land use agreement in place with respective landowners.<br>• No operations will be planned without prior consultation with the landowner, and upon any operations being undertaken, communication and notification will continue on a regular basis between Staatsolie and the owners.<br>• Written communication between the landowner and Staatsolie should ensure that adequate notice is given, so that drilling operation does not interfere with the grazing or other agricultural operations, and that communication is direct, clear and concise.<br>• Staatsolie shall permit the landowner, or its duly authorized representative, access subject to safety and health restrictions to observe operations being conducted on his land.<br>• Trespass on any area outside of the agreed upon program area is strictly forbidden and any resulting damage is the sole responsibility of the project.<br>• Staatsolie shall conduct its operations so as to protect all surface water sources and so as to not interfere with grazing animals.<br>• No fences or trees are to be cut or removed unless permission is obtained from the landowner.<br>• No garbage, trash, waste, wire or equipment shall be present upon completion of project activities.<br>• Any leak or spill of fuel, oil or other compounds shall be completely cleaned up and contaminated soil and vegetation parts shall be removed from the land at the cost of the Contractor.<br>• Any damage caused by project or by any equipment or personnel related to the project is the responsibility of the project. | ID&M Superintendent (Method statement)<br><br>Project Manager/ HSSE manager (Closure completion criteria)<br>CCU Head/ Counsel Upstream | Number of complaints<br><br>Visual inspection on compliance | Closure report and sign off | Singed agreement<br><br>Closure completion criteria |

| Component | Impact Description | Mitigation measures | Responsibility | Monitoring and Performance Evaluation | | Compliance Reporting |
|---|---|---|---|---|---|---|
| | | | | Performance indicator | Monitoring Method | |
| | | • Upon completion of the project, Staatsolie and the respective landowner shall inspect the land and check any outstanding actions resulting from the work activities, damage to buildings or other structures, improperly closed well holes or improperly filled pits, garbage or debris, any contaminates and any form of damage, and document in writing all occurrences (see close-out inspection checklist). When no problems or shortcomings are observed, the owner will sign for release. | | | | |
| Occupational health and safety | Attacks from wildlife such as bees, snakes, general swamp safety e.g. hydration, vector borne diseases (mosquitos), sunburn and other environmental hazards such as unstable ground, waterborne diseases, extreme weather conditions | • Workers should wear protective clothing<br>• Train workers to be aware of bee activity and nests in the area. Look out for signs of bee hives and avoid disturbing them<br>• Encourage employees to be vigilant and avoid reaching into tall grass or undergrowth without first checking for snakes. Snakes may be camouflaged and difficult to spot.<br>• Ensure that all survey team members are trained in basic first aid, including snakebite treatment. Have a well-equipped first aid kit on-site.<br>• Ensure that all team members receive thorough safety training, including specific instructions on how to deal with bee and snake encounters.<br>• The following safe distance measures should be followed when working/ traveling near beehives:<br>o In case the presence of high/ dense forest, a min. of 150m should be maintained.<br>o In case of less dense forest, a distance of 250m should be maintained and<br>o 350m should be maintained for an open area.<br>• Ensure that workers stay well-hydrated and have access to clean water.<br>• Establish a clear communication plan for the survey team to call for help in case of emergencies. | Project Manager/ HSSE Manager/CCU Head | Awareness among field staff (number of trainings conducted, 100% attendance in training)<br><br>Number of incidents/ accidents<br><br>Number of sick leave<br><br>Number of PPE provided | Training records/<br><br>Number of safety talks | Incident report<br><br>Complaint register<br><br>Personnel and staff record |

| Component | Impact Description | Mitigation measures | Responsibility | Monitoring and Performance Evaluation | | Compliance Reporting |
|---|---|---|---|---|---|---|
| | | | | Performance indicator | Monitoring Method | |
| | | • Consult with local experts or authorities who are familiar with the specific risks in the swamp area | | | | |

### 7.3.4 Monitoring and Reporting

#### 7.3.4.1 Monitoring

Respective Process Owners together with the HSSE Upstream Division are responsible for monitoring the performance of on-site personnel against the commitments of the EMMP. Overall control of this function will lie with the HSSE Manager, and responsibility for day-to-day monitoring will lie with the Process Owner representatives. The Process Owner is obliged to and will have the power to suspend activities if they do not comply with the performance standards specified in the EMMP. The following principal items will be monitored:

- Correct implementation of EMMP;
- Compliance with Method Statements; and
- Physical parameters and indicators, e.g., soil, water quality and hydrology (table below).

**Table 31: Physical Monitoring framework for seismic program**

| Aspect | Parameters | Frequency | Monitoring locations |
|---|---|---|---|
| Water quality | • Electrical Conductivity, Turbidity (using a field meter)<br>• TSS and oil and grease or TPH (lab analysis)<br>• Color, water levels and clarity (visual observations) | Before (pre-monitoring baseline) and after the project. | Near drilling locations |
| | • Color, water levels and clarity (visual observations) | During the project | Ditch around drilling locations |
| | Check for oil spills and oil films (visual) | Daily during project | At all activity areas/ Ditch around drilling locations |
| Water levels (Hydrology) | Check the water levels in the swamp/ canal (visually) | Daily | At all activity areas |
| Soil[18] | TPH, EC and soil profile | Before start of activities and during decommissioning | At drilling site (representative sample) |
| | Soil profile | Before start of activities | At drilling site |
| Vegetation | Width and location of trails in forested parts – according to design | Directly upon completion of trails | All new trails |
| Presence of wildlife and honeybees | Visual observation of presence within working area | Daily | All working locations |
| Waste | Check if landing sites and working areas are clean<br>Check proper storage of waste<br>Check proper disposal of waste<br>Log on waste | Daily<br><br>Weekly<br>Weekly<br>Daily at collection of waste | All working locations |

[18] Incase filled soil will be removed during decommissioning.

**Environmental and Social Inspections**
To determine the compliance with the Environmental and Social Specifications as indicated in Chapter 7.3.3, environmental inspections will be undertaken throughout the duration of the project by the contractors that are executing project activities on behalf of Staatsolie, as well as by the Process Owners.

**Data and information management**
Environmental data is stored in a respective database, which allows systematic storage and manipulation of data, and will permit rapid retrieval for the purposes of internal and external reporting. The Staatsolie HSSE Representative will ensure that relevant environmental data of the project is provided for this database. In order to ensure a consistent and coherent system for documenting the implementation of the EMMP, all written records and other information will be stored in a filing system that is compatible with the requirements of the existing HSE Management System. This comprises standardized forms, documents and reporting procedures.

### 7.3.4.2 Reporting
The frequency and nature of reporting of environmental management performance will depend upon the nature of the activity and aspect that is being managed.
The table below summarizes the formal reporting schedule that will be used for this 3D seismic project data acquisition.

**Table 32: Regular reports and report lines**

| Name report | Description | Frequency | Responsibility of | Receiver |
|---|---|---|---|---|
| Land use Agreement | "Overeenkomst toegang terreinen voor het verrichten van mijnbouwwerkzaamheden" | Prior to start of project activities at locations, if applicable | Officer Sr. Legal | Project Manager |
| Method Statement | Methods statements | Two weeks before commencement | All process owners | Project Manager and HSEE Manager |
| Waste Transfer Registration Form | Filled in forms on generated solid waste (refer to WMP) | At every transferal of waste | All Process owners | HSSE Upstream Manager |
| Weekly HSE inspection | Weekly summary of the safety meetings held by the Seismic Contractor | Weekly | All process owners | HSSE Upstream Manager |
| Reports of ERP drills held. | Drills as emergency response etc. | Monthly | Acting Head Drilling Services | HSSE Upstream Manager |
| Incidents | Report type and consequences for loss of days/oil spills | When accidents happen | All Process owners | HSSE Upstream Manager |
| Weekly Environmental and Social Inspection | Compliance with ESIA and ESMP, using checklists | Weekly | All Process owners | HSSE Upstream Manager |
| Community Relation (CR) report | Report on implementation of Communication Plan, and compliance with ESIA and ESMP | Quarterly | CCU officer | HSSE Upstream Manager |
| Water quality monitoring reports | Reports of water quality monitoring done for the project | 1 week after monitoring has taken place. | Drilling Operation | HSSE Upstream Manager |
| Complaints | Report each complaint in the database | Directly after complaint is received | CCU officer | HSSE Upstream Manager |

Based on data from above reports, HSSE Representative will compile a Project Completion Report that will be sent to NIMOS.

**Feedback**
Feedback on performance will be communicated to the appropriate parties (including NIMOS) concerned. Any substandard performance will trigger a process that notifies the responsible party of the nature of the issue and indicates the actions that are required to rectify the situation. This will be followed up by further monitoring to ensure that the sub-standard performance has been corrected.

## 7.4 Community Engagement and Grievance Redress Mechanism of Staatsolie

Staatsolie has a Community Relation Policy that aims to perform business activities in such a way that communities' interest and expectations with regards to socio-environmental aspects are properly considered. The community engagement is the responsibility of the Corporate Communication Upstream (CCU) department of Staatsolie.
In addition, to Staatsolie Community Relation Policy, the SEP for these projects outlined in subchapter 5.3, will assist the stakeholder engagement process during the execution of the projects, by enabling the disclosure and dissemination of important information about the project (activities) to all relevant stakeholders that may be impacted. Key objectives of the communication plan and the SEP are:

- to maintain or strengthen productive relationships with stakeholders identified during the consultation process, conducted prior to the start of the project;
- to ensure that any additional stakeholder that may be impacted by the project is identified and included in the communication for the remainder of the project lifecycle;
- to ensure transparent, efficient, and regular dispersal of key project information;
- to provide stakeholders with an opportunity to raise issues or concerns about the project and to ensure that such feedback is addressed in a suitable manner; and
- to avoid conflicts or conflicting situations from emerging.

Further, Staatsolie has a Grievance Redress Mechanism/ complaint procedure that is followed in case of complaints (see **Figure 24**). Complaints can be reported to all personnel of Staatsolie, who should report this within one working day to the CCU department. All complaints are registered in a software allowing that complaints can be registered in the system at any time and from anywhere. There are also complaint forms available at the security posts for registration of complaints after working hours, which are later shared with CCU for registration in the system.

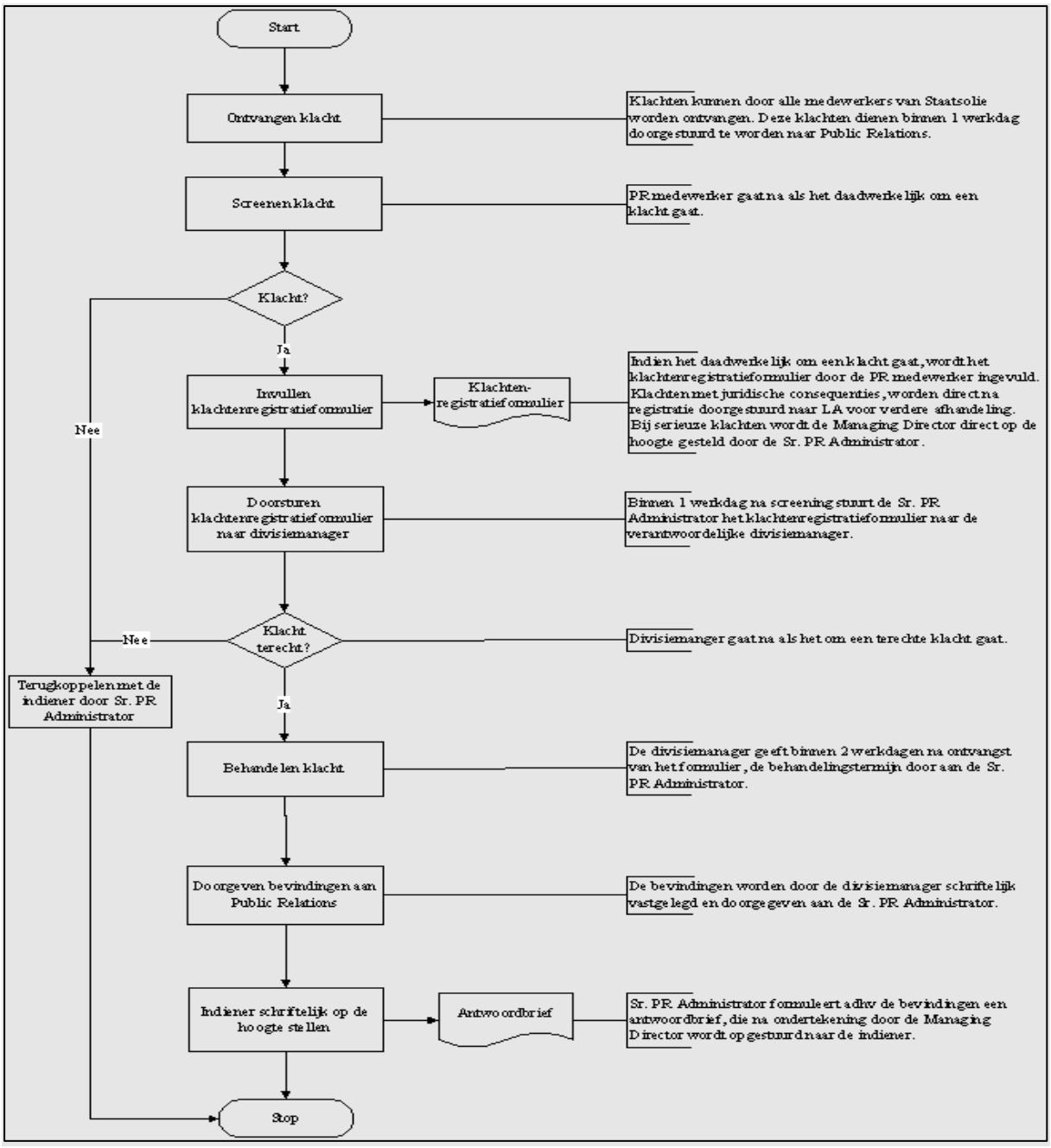


**Figure 24: Overview Grievance Redress Mechanism of Staatsolie**

# 8 Conclusions and Recommendations

This chapter presents the conclusion and recommendation for the limited ESIA study for the Staatsolie 2D Seismic Exploration Program and the Exploration Drilling Program in the Coronie area.

This limited ESIA study has been conducted in accordance with national regulatory requirements (Milieu Raamwet S.B. 2020 no. 97/ Environmental Framework Act S.B. 2020 no. 97) and the guidelines of the National Institute for Environment and Development in Suriname (NIMOS, 2005 and NIMOS 2009), as well as international best practices.

The Staatsolie 2D Seismic Exploration Program and Exploration Drilling Program in the Coronie area have both been classified as Category B-path 2 projects by NIMOS. In consultation with NIMOS, it has been agreed that both projects can be consolidated into a single ESIA report. The ESIA study has been conducted according to the Scoping Report (ILACO, 24 July 2023) approved by NIMOS, which outlined the terms of reference for specialist studies, as well as the approach and methodologies. The ESIA study primarily involved a desk study, complemented by field surveys, measurements (water quality and noise), and stakeholder consultations.

**Environmental and Social baseline**

From the environmental baseline assessment, the following can be stated:

- The plantation area of Coronie falls with a narrow strip along the coast, which has drier conditions. The average rainfall in Coronie is lower compared to Paramaribo.
- The air quality in the study area is good as there are hardly any stationary sources and only few other larger sources of air emissions. Air pollution sources within the area are emissions from local traffic, farm activities and some small facilities with engines (such as generators).
- The highest noise levels were measured in the rural areas along the Oost-Westverbinding due to traffic with relative high speed. Noise levels measured along the Oost-Westverbinding near residents, exceeded the WHO/IFC daytime guideline value of 55 dBA for residential areas. The measurement conducted within the residential area in Totness (not along the Oost-Westverbinding) had a noise level of 49.1 dBA, which is below this guideline. This measurement is considered representative for the Coronie residential areas.
- Within the project area both brackish and freshwater wetlands are found. Water from the Coronie (freshwater) swamp is mainly discharged to the east towards the Coppename River, south to the Wayambo River, west to the Nickerie River and north towards the Atlantic Ocean. The northern swamp water of the Coronie swamp is discharged through drainage structures along the Oost-Westverbinding (culverts, sluices, canals). The area north of the Oost-Westverbinding, between Burnside and Moy, drains through ditches and canals into the canal along the Coronie Dike. The canal along this dike has a sluice (at Totness) to discharge excess water towards the Atlantic Ocean. In the other areas, excess water drains towards the ocean predominantly through mass flow, some small creeks near the ocean and canals which have been dug towards the ocean.
- Based on water quality, four different environments can be identified within the project area, namely brackish to saline coastal swamps, the plantation area with freshwater conditions (brackish water may be present), freshwater swamp and ombrogenous swamp. During the measurements in the freshwater swamp and coastal swamp, no visible contamination and no unnatural odors were observed.
- In the area at proposed drilling location CEP01 and CEP02 parwa forest (black mangrove) is encountered and at location CEP03, freshwater swamp forest. The proposed seismic lines run through open coastal swamps and mangroves, open to closed freshwater ecosystems and the plantation area with agricultural lands and low to high secondary vegetation.

From the socio-economic baseline assessment, the following can be stated:

- The District Coronie is predominantly characterized by extensive brackish and freshwater swamps. Habitation is only present along the Oost-Westverbinding with human activities mainly found in the plantation area (Ingikondre-Burnside) and at Coppenamepunt.

- The various economic activities in the district include agriculture (rice cultivation, horticulture and livestock farming), beekeeping, fishery and mining (shell and sand).
- The main concerns that were raised during the stakeholder consultations include: environmental and property damage, risk of coastal area flooding due to project activities, disruptions to the livelihoods of individuals engaged in agriculture and beekeeping within the project areas and insufficient communication of Staatsolie.

**Potential impacts and mitigation measures**
From the assessment of potential impacts from the 2D Seismic Exploration Program, there is one (1) impact with major significance which can be reduced to moderate after implementation of the proposed mitigation measures. Further, there are four (4) impacts with a moderate significance, which can be effectively reduced to minor after implementation of the proposed mitigation measures. The other impacts are minor or negligible and one (1) is a positive impact.

For the Exploration Drilling Program, there is one (1) impact with major significance which can be reduced to moderate after implementation of the proposed mitigation measures. Further, there are seven (7) impacts with a moderate significance, which can be effectively reduced to minor after implementation of the proposed mitigation measures. The other impacts are minor or negligible and one (1) is a positive impact.

**EMMP**
The several mitigation measures, management and monitoring requirements, including responsibilities are included in the EMMP for each project. The EMMP must be implemented as part of normal operations by effectively incorporating the key components into daily activities, such as including environmental issues in the decision-making process, carrying out operations in accordance with the standard procedures, and maintaining complete records.

**Recommendations**
Based on the findings of the ESIA study the following is recommended:

1. Implement the EMMP during all phases of the project as part of normal operations by effectively incorporating the key components into daily activities.
2. During the planning and preparation phase of each project (prior to the start of physical works such as line clearing for seismic and construction of access route to drilling location) the following must be conducted:
    a. All observations near the well locations and seismic line must be registered.
    b. All required assessments (such as the scouting, hydrology and soil profile assessment) must be conducted.
    c. All landowners must have been identified. Further, all procedures and mitigation measures (where applicable) included in the respective EMMP, such as signing a land use agreement, must have been followed.
3. Maintain lines of communication, according to the Staatsolie Community Relation Policy and SEP (Stakeholder Engagement Plan), with the landowners and residents in the vicinity of the seismic and drilling locations.
4. Ensure that they are aware of the Staatsolie Grievance Redress Mechanism/ complaint procedure and how to utilize it. Further, register and adequately address complaints according to this procedure.
5. Conduct ongoing monitoring and assessment of environmental performance during the projects and take corrective actions in case of non-compliances.

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# 10 Appendices