



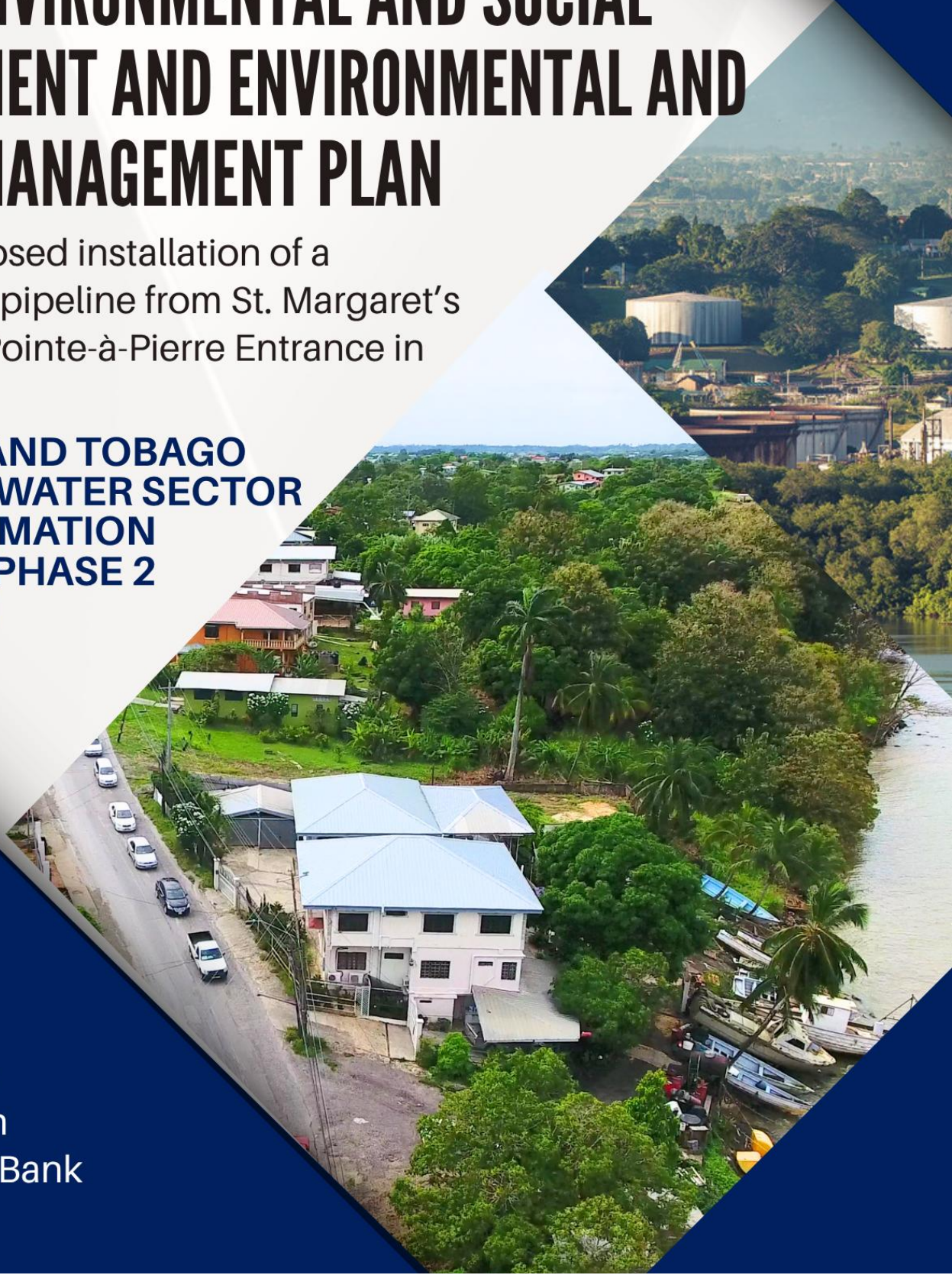
DRAFT ENVIRONMENTAL AND SOCIAL ASSESSMENT AND ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

For the proposed installation of a
transmission pipeline from St. Margaret's
Junction to Pointe-à-Pierre Entrance in
Trinidad

**TRINIDAD AND TOBAGO
NATIONAL WATER SECTOR
TRANSFORMATION
PROGRAM PHASE 2
(TT-L1071)**

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**Prepared for:
Inter-American
Development Bank**



TRINIDAD AND TOBAGO NATIONAL WATER SECTOR TRANSFORMATION PROGRAM
PHASE 2 (TT-L1071)
DISCLOSABLE ESA AND ESMP FOR THE PROPOSED INSTALLATION OF TRANSMISSION
PIPELINES FROM ST. MARGARET'S JUNCTION TO POINTE-À-PIERRE ENTRANCE

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ACRONYMS AND ABBREVIATIONS

CCLIP	Conditional Credit Line for Investment Projects
CEC	Certificate of Environmental Clearance
EMA	Environmental Management Authority
ESA	Environmental and Social Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESPF	Environmental and Social Policy Framework
ESPS	Environmental and Social Performance Standards
IDB	Inter American Development Bank
IMGD	Imperial Million Gallons per Day
MPU	Ministry of Public Utilities
PLC	Programmable Logic Controller
SCADA	Supervisory Control and Data Acquisition
SESA	Strategic Environmental and Social Assessment
WASA	Water and Sewerage Authority
WHO	World Health Organisation
WRA	Water Resources Agency
WTP	Water Treatment Plant

EXECUTIVE SUMMARY

An Environmental and Social Assessment (ESA) and Environmental and Social Management Plan (ESMP) have been prepared for the proposed installation of transmission pipelines extending from St. Margaret's Junction to the Pointe-à-Pierre Entrance along the Southern Main Road corridor in Trinidad. The project is being implemented by the Ministry of Public Utilities (MPU), which will serve as the executing agency and the Water and Sewerage Authority (WASA), which will serve as the sub-executing agency under Phase 2 of the Trinidad and Tobago National Water Sector Transformation Program (TT-L1071), financed by the Inter-American Development Bank (IDB). The ESA provides a comprehensive framework for identifying, assessing, and managing the environmental and social risks associated with the project, while the ESMP establishes the mitigation, monitoring, and institutional measures required to ensure compliance with national regulations and the IDB Environmental and Social Policy Framework (ESPF) and associated Environmental and Social Performance Standards (ESPS).

The project forms part of a broader national strategy to improve the efficiency, reliability, sustainability, and resilience of potable water supply services across Trinidad and Tobago. Despite previous investments under earlier phases of the program, significant challenges persist within the water sector, including intermittent water supply, high levels of non-revenue water, ageing infrastructure, hydraulic bottlenecks, and network inefficiencies. Only a portion of the population currently receives continuous water service, with service levels declining during the dry season, while water losses due to leakage and operational inefficiencies are estimated to range between 40 and 60 percent of total production. The proposed intervention addresses these longstanding challenges through the rehabilitation and upgrading of a critical segment of the Caroni South Transmission System, one of the most important components of Trinidad's potable water distribution network.

Project Scope and Description

The proposed project involves the parallel installation of approximately 3.3–3.4 km of new water transmission and distribution infrastructure between St. Margaret's Junction and the Pointe-à-Pierre Entrance in Trinidad. The primary works include construction of a 600 mm (24-inch) ductile iron transmission pipeline running alongside the existing Caroni South Transmission System, as well as a 200 mm (8-inch) PVC distribution main within the same corridor. The project is intended to address long-standing hydraulic constraints, reconnect an isolated 525 mm water main to restore network redundancy, replace ageing and undersized distribution infrastructure, and improve potable water service reliability to communities served by the Caroni South system. The works form part of a broader national water sector improvement programme aimed at reducing supply interruptions, improving pressure management, increasing transmission capacity, and reducing reliance on emergency water trucking.

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The scope of activities includes detailed hydraulic modelling and system planning to assess existing network deficiencies, forecast future demand, and develop a phased implementation strategy. Construction activities will involve excavation and installation of the new transmission and distribution pipelines, together with all associated infrastructure such as control valves, air release valves, washout facilities, off-take connections, thrust restraints, corrosion protection systems, bridge and culvert crossings, and water service connections. The project will be implemented primarily within existing rights-of-way to minimize environmental and social impacts. In addition, the existing high-leakage distribution main along the corridor will be isolated, decommissioned, and removed from service where necessary. Permanent road reinstatement and restoration works will also be undertaken following pipeline installation.

The primary objective of the project is to eliminate hydraulic constraints, increase bulk water conveyance capacity, and provide operational redundancy within the Caroni South Transmission System. Upon completion, the upgraded infrastructure is expected to increase transmission capacity by approximately 8.3 million imperial gallons per day (MIGD), improve network efficiency, reduce leakage losses, and enhance potable water supply reliability for approximately 60,000 residents across southern Trinidad. The project will also strengthen network resilience, reduce dependence on truck-borne water deliveries, improve pressure stability, and contribute to more equitable and consistent water service for underserved communities supplied through the southern distribution network.

As part of the project planning process, both a preferred pipeline alignment and an alternative route were assessed. The preferred alignment follows existing road reserves and utility corridors along the Southern Main Road corridor and is largely confined to previously disturbed areas. The alternative route extends through areas containing greater concentrations of secondary vegetation and undeveloped land. From both environmental and social perspectives, the preferred alignment was determined to be the most suitable option because it minimizes vegetation clearance, habitat disturbance, construction footprint, land access requirements, and potential impacts on adjacent landowners, businesses, and community infrastructure. The preferred route also reduces construction complexity and limits indirect impacts on environmentally sensitive receptors. Consequently, it represents the alternative with the lowest overall environmental and social risk while achieving the project's technical and operational objectives.

The Existing Environment

The environmental and social baseline assessment indicates that the project corridor traverses a predominantly urbanized and industrialized landscape within the Claxton Bay and Pointe-à-Pierre region. Existing land uses consist primarily of residential communities, commercial establishments, transportation corridors, industrial facilities, utility infrastructure, and fragmented areas of secondary vegetation. The project will largely be constructed within existing road reserves and rights-of-way, thereby minimizing direct impacts on undeveloped land and reducing the need for additional land acquisition.

Ecological conditions within the area of influence are characterized by highly modified habitats resulting from long-standing industrial, transportation, and residential development. Vegetation communities are generally limited to roadside vegetation, fragmented secondary growth, and disturbed habitat patches. No protected areas, Environmentally Sensitive Areas, legally designated conservation areas, or critical habitats were identified within the project footprint or immediate area of influence. While the project corridor is located in proximity to the coastal and marine environment of Claxton Bay, no direct marine works are proposed. Nevertheless, nearby aquatic environments remain environmentally sensitive receptors that could be indirectly affected by sedimentation, runoff, or accidental releases during construction if appropriate controls are not implemented.

The socioeconomic environment is characterized by a mixture of residential, commercial, institutional, and industrial land uses. Communities within the direct and indirect areas of influence include St. Margaret's, Claxton Bay, Plaisance Park, and Pointe-à-Pierre, while the broader beneficiary population extends into areas served by the southern transmission network, including portions of the Couva/Tabaquite/Talparo, San Fernando, Penal/Debe, and Siparia regions. The area includes vulnerable population groups, including elderly persons, persons with disabilities, female-headed households, and lower-income residents who may be more sensitive to temporary disruptions in mobility, access, and utility services during construction activities.

Environmental and Social Impacts and Risks

The report identifies a range of environmental and social impacts and risks, the majority of which are associated with the construction phase of the project. Key environmental impacts include temporary soil disturbance, erosion, sedimentation, localized air emissions, dust generation, construction noise and vibration, waste generation, accidental spills of fuels and lubricants, and potential deterioration of surface water quality resulting from construction runoff. Minor and temporary impacts to roadside vegetation and fragmented habitat patches may also occur where vegetation clearing is required to facilitate pipeline installation.

The principal social impacts are associated with temporary construction-related disturbances. These include traffic congestion, road diversions, restricted access to residences and businesses, utility service interruptions, temporary disruption of commercial activities, occupational health and safety risks, community health and safety concerns associated with open excavations and construction traffic, and nuisance impacts such as dust, noise, and vibration. Temporary economic displacement may also occur where roadside vendors, businesses, or property owners experience short-term restrictions in access during construction. However, these impacts are expected to be localized, temporary, and manageable through the implementation of appropriate mitigation measures and stakeholder engagement processes.

The project is also exposed to a range of natural hazards, including tropical storms, flooding, earthquakes, and, to a lesser extent, landslides. Hazard assessments undertaken as part of the ESA indicate relatively low exposure to tropical cyclone impacts, moderate exposure to seismic activity,

and low exposure to landslide hazards along the preferred alignment. The overall climate and disaster risk profile of the project is considered moderate. The buried nature of the pipeline infrastructure significantly reduces vulnerability to wind-related hazards, while modern engineering design standards, ductile iron pipe materials, and appropriate construction practices will improve resilience to ground movement, flooding, and long-term climate-related stressors.

Environmental and Social Management Plans

To address identified risks and impacts, a comprehensive Environmental and Social Management Plan (ESMP) has been developed. The ESMP establishes mitigation, monitoring, reporting, and corrective action measures to be implemented throughout construction and operation.

The ESMP was structured to comply with the environmental legislation of Trinidad and Tobago and the requirements of the IDB Environmental and Social Policy Framework. Additional requirements beyond national legislation include the implementation of a project-specific Environmental and Social Management System (ESMS), continuous stakeholder engagement throughout the project lifecycle, operation of formal worker and community grievance mechanisms, gender-responsive consultation and employment practices, enhanced labour management procedures, biodiversity protection measures, community health and safety management, cultural heritage chance-find procedures, and regular environmental and social monitoring and reporting to the IDB. These requirements ensure alignment with the IDB Environmental and Social Performance Standards.

Based on the current level of engineering design, significant permanent land acquisition is not anticipated because the preferred alignment is located primarily within existing road reserves and public rights-of-way. Similarly, no physical displacement or residential resettlement is currently expected. Nevertheless, temporary occupation of land may be required for construction staging, equipment access, laydown areas, and material storage. Temporary economic displacement may also occur where construction activities affect access to businesses, residences, vendors, or agricultural activities. To address these potential impacts, the ESMP includes a Land Acquisition and Resettlement Framework consistent with IDB ESPS 5. Should detailed design identify any permanent land acquisition requirements, easements, rights-of-way, or livelihood impacts, site-specific Resettlement Plans and Livelihood Restoration Measures will be prepared and implemented prior to commencement of works.

Implementation of the ESMP will occur through a structured Environmental and Social Management System led by MPU, with responsibilities shared among contractors, supervising engineers, environmental specialists, and relevant regulatory agencies, including the Environmental Management Authority (EMA). Continuous monitoring, reporting, auditing, and adaptive management will be undertaken throughout project implementation to ensure compliance with national legislation and IDB requirements. Stakeholder engagement activities will continue throughout the project lifecycle, supported by a formal Grievance Redress Mechanism to ensure that concerns raised by affected persons are addressed in a timely, transparent, and effective manner.

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In conclusion, the proposed St. Margaret's Junction to Pointe-à-Pierre Transmission Pipeline Project represents a strategically important investment in strengthening Trinidad and Tobago's potable water transmission infrastructure. By eliminating critical hydraulic bottlenecks, increasing transmission capacity, reducing water losses, and enhancing operational resilience, the project will contribute significantly to improved water security, enhanced service delivery, and long-term socio-economic development in southern Trinidad. Although the project presents moderate environmental and social risks, these risks are well understood and can be effectively managed through implementation of the ESMP and compliance with national and IDB requirements. No critical habitats are expected to be affected; no physical resettlement is anticipated and only limited temporary livelihood impacts may occur. Overall, the substantial benefits associated with improved water supply reliability, increased system efficiency, reduced non-revenue water, and enhanced climate resilience are expected to outweigh the temporary and manageable adverse impacts, supporting the Government of Trinidad and Tobago's broader objectives for sustainable and equitable infrastructure development.

1 INTRODUCTION

This Environmental and Social Assessment (ESA) has been prepared for the ***proposed installation of a transmission pipeline from St. Margaret's Junction to Pointe-à-Pierre Entrance***, undertaken by the Water and Sewerage Authority (WASA) with funding support from the Inter-American Development Bank (IDB).

The ESA forms part of a broader environmental and social due diligence process required under the IDB Environmental and Social Policy Framework (ESPF) and relevant Environmental and Social Performance Standards (ESPS 1–10). It provides the analytical foundation to identify, predict, and evaluate the potential environmental and social impacts associated with the design, construction, and operation of the proposed project, and to recommend appropriate mitigation and management measures through a comprehensive Environmental and Social Management Plan (ESMP).

The ESA and ESMP are also supported by a project-specific Environmental and Social Management System (ESMS) to guide WASA's ongoing compliance with national regulatory requirements and IDB safeguards throughout project implementation.

1.1 Objectives

Specifically, this report:

- Describes the proposed project and its site-specific environmental and social context in along the Southern Main Road between Claxton Bay and Pointe-à-Pierre (Trinidad);
- Identifies and evaluates potential positive and adverse impacts during construction, operation, and decommissioning;
- Establishes mitigation and monitoring measures through the ESMP;
- Provides a framework for institutional capacity, stakeholder engagement, and grievance redress;
- Demonstrates compliance with national legislation and international best practice, including IDB's ESPS and relevant Environmental Management Authority (EMA) requirements for the Certificate of Environmental Clearance (CEC).

The ESA essentially functions as both a decision-support tool for regulatory and financing approval and a management instrument for ensuring that the project contributes to sustainable water sector development while avoiding or minimising adverse impacts on communities and ecosystems.

2 Programme and Projects Description

2.1 Programme Background and Justification

2.1.1 Phase 1: National Water Sector Transformation Program (TT-L1055)

In previous years, the National Water Sector Transformation Program (TT-L1055) for Trinidad and Tobago was approved to enhance the efficiency, reliability, and quality of potable water services. The project was launched because potable water is not supplied to all households in Trinidad and Tobago on a 24/7 basis; only 53% of customers receive water on a 24/7 basis in the wet season and 31% in the dry season (Water and Sanitation Division of the IDB, 2020). There is also a high rate of non-revenue water (NRW) lost through leaks, inefficient operations of water treatment plants, and metering and billing issues. NRW is as high as 40-50% and in some cases estimated at 60% of total water produced. The lack of infrastructure in some areas limits the ability to take advantage of abundant water resources to meet dry season demand due to WASA's lack of storage capacity, the ageing infrastructure and bottlenecks in the network inhibit the transmission of water from water-rich areas to water-scarce areas.

With the compounding issues and growing population, Trinidad and Tobago successfully launched and received funding from the Inter-American Development Bank (IDB) through a Conditional Credit Line for Investment Projects (CCLIP) to address some of these major issues. The first operation focused on the North-Western region of Trinidad, including Diego Martin, San Juan/Laventille, and Port of Spain.

The first operation comprised three components:

- Component 1. Water Stabilisation and Improvement: (US\$44 Million)
- Component 2. Support for Water Sector Transformation Plan: (US\$2.74 Million)
- Component 3. Network Optimisation: (US\$31 Million)

In compliance with IDB safeguards, an Environmental and Social Assessment (ESA) and supporting instruments were prepared, including an Environmental and Social Management Plan (ESMP), Strategic Environmental and Social Assessment (SESA), and Environmental and Social Management Framework (ESMF). Funding was granted for this first loan operation.

2.1.2 Phase 2: National Water Sector Transformation Program (TT-L1071)

This current programme represents Phase 2, which is the second loan operation under the CCLIP TT-O0007 – Trinidad and Tobago National Water Sector Transformation Program with funding of US\$235M. This operation is designed to strengthen and build on the objectives and achievements of the first operation, TT-L1055. The General objective of the second operation is to improve the efficiency, quality, sustainability and resilience of potable water supply service and water security in Trinidad and Tobago. This second loan aims to build on the efforts of the first loan operation to ensure long-term sustainability and efficiency in the water sector. The overall objective of the second loan is to continue improving water services in Trinidad and Tobago. The specific objectives of the second

operation are to: (i) enhance the operational efficiency and financial sustainability of WASA; (ii) reduce non-revenue water through targeted investments in pipeline rehabilitation and leak detection; (iii) expand access to potable water services, especially to underserved communities in T&T; and (iv) strengthen regulatory frameworks and governance in the sector.

2.2 Components of the Programme

As outlined in the IDB preparation documents provided, the programme components associated with this loan include:

- **COMPONENT 1: WATER SERVICE IMPROVEMENT AND INFRASTRUCTURE UPGRADE:** This component aims to enhance water service reliability and efficiency through critical infrastructure upgrades. It will finance the development of a comprehensive program to prevent further service decline throughout the country and to ensure access to water, sanitation and hygiene to unserved and underserved households.
- **COMPONENT 2: NETWORK OPTIMISATION AND WATER LOSS REDUCTION:** This component is designed to improve network efficiency by reducing water losses and optimising system performance. Under this component, water loss reduction and monitoring will be improved through (i) the replacement of aged and fragile transmission and distribution networks to reduce water loss and high leakages; and (ii) Continuation of efforts to reduce Non-Revenue Water across Trinidad and Tobago to increase WASA operational efficiency and reliability.
- **COMPONENT 3: CAPACITY BUILDING AND STRENGTHENING REGULATORY FRAMEWORKS:** This component focuses on institutional strengthening to improve the governance, sustainability, and operational efficiency of the water sector. It includes capacity-building programs to modernise utility management practices. Additionally, it will support aspects of regulatory improvements towards strengthening oversight, promoting accountability, and ensuring long-term sector sustainability. In addition, this component will finance the institutional improvements to support the implementation of Integrated Water Resources Management (IWRM) strategies.

2.3 Implementation Arrangements

The Executing Agency for this loan operation will be the Water and Sewerage Authority (WASA), which will be responsible for the overall administration of the proposed operation, including:

- planning, monitoring, evaluating, and supervising the operation;
- conducting procurement for works, goods, consulting and non-consulting services;
- handling loan disbursement requests and maintaining financial records;
- managing work supervision and inspection;
- overseeing environmental and social management;

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- preparing documents such as the multiyear execution plan, annual work plan, procurement plan, semi-annual progress reports, audited financial statements, midterm evaluation, and final evaluation;
- monitoring works and service contracts;
- supervising environmental and social aspects; and
- liaising with the IDB.

Essentially, WASA will implement a project-specific Environmental and Social Management System (ESMS) in accordance with ESPS 1, covering the full lifecycle of the project. The ESMS is a dynamic and continuous process organised around four cycles: Plan, Execute, Verify, and Act.

WASA has been the sub-executing or executing agency for several IDB-funded operations. The most recent of which was the Trinidad and Tobago National Water Sector Transformation Program (TT-L1055) for \$80Mn, currently under execution. Previous projects executed by WASA include the Multi-Phase Wastewater Rehabilitation Program (TT-L1026) for \$246 Mn and the WASA Modernisation and Wastewater Infrastructure Rehabilitation Program (TT-L1018) for \$50 Mn. WASA was a key partner in the recently executed Technical Cooperation, Support for the Preparation of Trinidad and Tobago Water Supply Improvement Program (TT-T1108) for US\$800,000.

2.4 Project Rationale

The water distribution pipeline from St. Margaret's Junction to Pointe-à-Pierre Entrance forms a part of the broader Caroni South Transmission System, which is a critical component of Trinidad's potable water infrastructure that conveys treated water from the Caroni Arena Water Treatment Plant to the southern peninsula. The existing 533mm (21") Ductile Iron pipeline serves as pressure management and supply redundancy infrastructure in the Claxton Bay and surrounding areas. However, a section of the pipeline is currently isolated due to high leakage, resulting in the removal of system resilience and increased operational expenditure. The resulting service interruptions lead to highly intermittent water supply, reducing quality of life, disrupting economic activity, and weakening public confidence in water services. Furthermore, existing water distribution mains are numerous and undersized for the current growth in population.

2.5 Description of the Project

Phase 2 is a country-wide programme, however, this report focuses on the works to be undertaken in St. Margaret's in Trinidad. The proposed projects comprise the construction and upgrading of critical water transmission and distribution infrastructure in Trinidad to support improved potable water service delivery. The works include the installation of a major transmission pipeline corridor extending from St. Margaret's Junction to Pointe-à-Pierre in southwest Trinidad. This intervention is designed to remove hydraulic constraints, improve operational resilience, and facilitate the efficient conveyance of treated water from production facilities to consumers.

2.5.1 Transmission Pipelines from St. Margaret's Junction

This component involves the parallel installation of approximately 3.3–3.4 km of a 600 mm (24-inch) ductile iron transmission main and a 200 mm (8-inch) PVC distribution main between St. Margaret's Junction (10.345916°N, -61.459886°W) and the Pointe-à-Pierre Entrance (10.323968°N, -61.456048°W) (Figure 2-1). The new transmission main will run alongside the existing Caroni South Transmission System and is intended to increase conveyance capacity, provide operational redundancy, and eliminate critical hydraulic bottlenecks affecting water delivery to southern communities. The project will reconnect existing transmission infrastructure, strengthen network resilience, and improve the reliability of potable water supply to approximately 60,000 residents.

Associated works will include installation of control valves, air-release valves, washouts, fittings, corrosion protection systems, bridge and culvert crossings, service connections, pressure testing, disinfection, commissioning, road restoration, and preparation of as-built documentation. Existing aged and high-leakage distribution mains along the corridor will be decommissioned and replaced. The upgraded system will be fully integrated with the Caroni South Transmission System and the San Fernando Booster Station to optimise hydraulic performance and improve water delivery to Siparia and other water-stressed communities. The project is expected to increase transmission capacity by approximately 8.3 MIGD, reduce dependence on truck-borne water deliveries, improve levels of service from highly intermittent supply conditions toward a minimum 24/3 service standard, and enhance long-term system resilience.

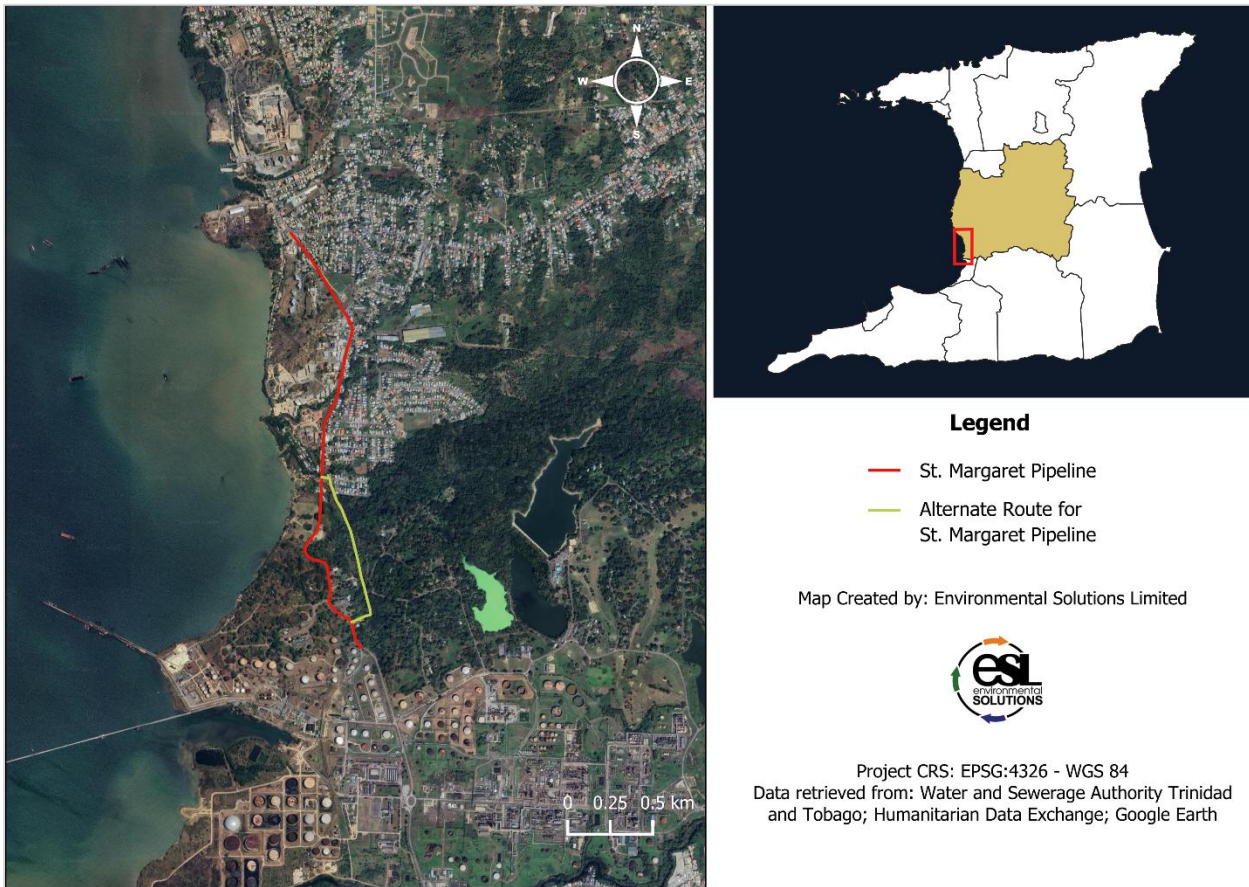


Figure 2-1: Site Location Map showing the proposed route of pipeline to be replaced (including alternate route)

2.6 Project Timelines

Project timeline gantt chart to be provided for the final version of this document.

2.7 Expected Benefits

2.7.1 Transmission Pipelines from St. Margaret's Junction

The installation of the new transmission main between St. Margaret's Junction and Pointe-à-Pierre will significantly strengthen the capacity and resilience of the regional water supply network. The project will increase bulk water conveyance capacity by approximately 8.3 MIGD and remove existing hydraulic bottlenecks within the Caroni South Transmission System. This additional capacity is anticipated to improve the distribution of treated water to southern communities and facilitate more reliable service delivery across the network.

A key benefit of the project will be the provision of operational redundancy through the installation of a parallel transmission main. This redundancy will improve system reliability by enabling continued service during maintenance activities, emergency repairs, or failures within the existing pipeline system. The replacement of ageing and deteriorated pipelines will also reduce leakage and non-revenue water losses, thereby improving system efficiency and reducing operational costs.

The project is expected to improve water supply reliability for approximately 60,000 residents currently affected by intermittent service and water shortages. Enhanced transmission capacity will support more equitable water distribution, reduce dependence on truck-borne water deliveries, and contribute to improved service levels in underserved communities, including areas supplied through the Siparia distribution system. Improved reliability and pressure stability will also enhance service to commercial, institutional, and industrial customers, supporting economic productivity and community well-being.

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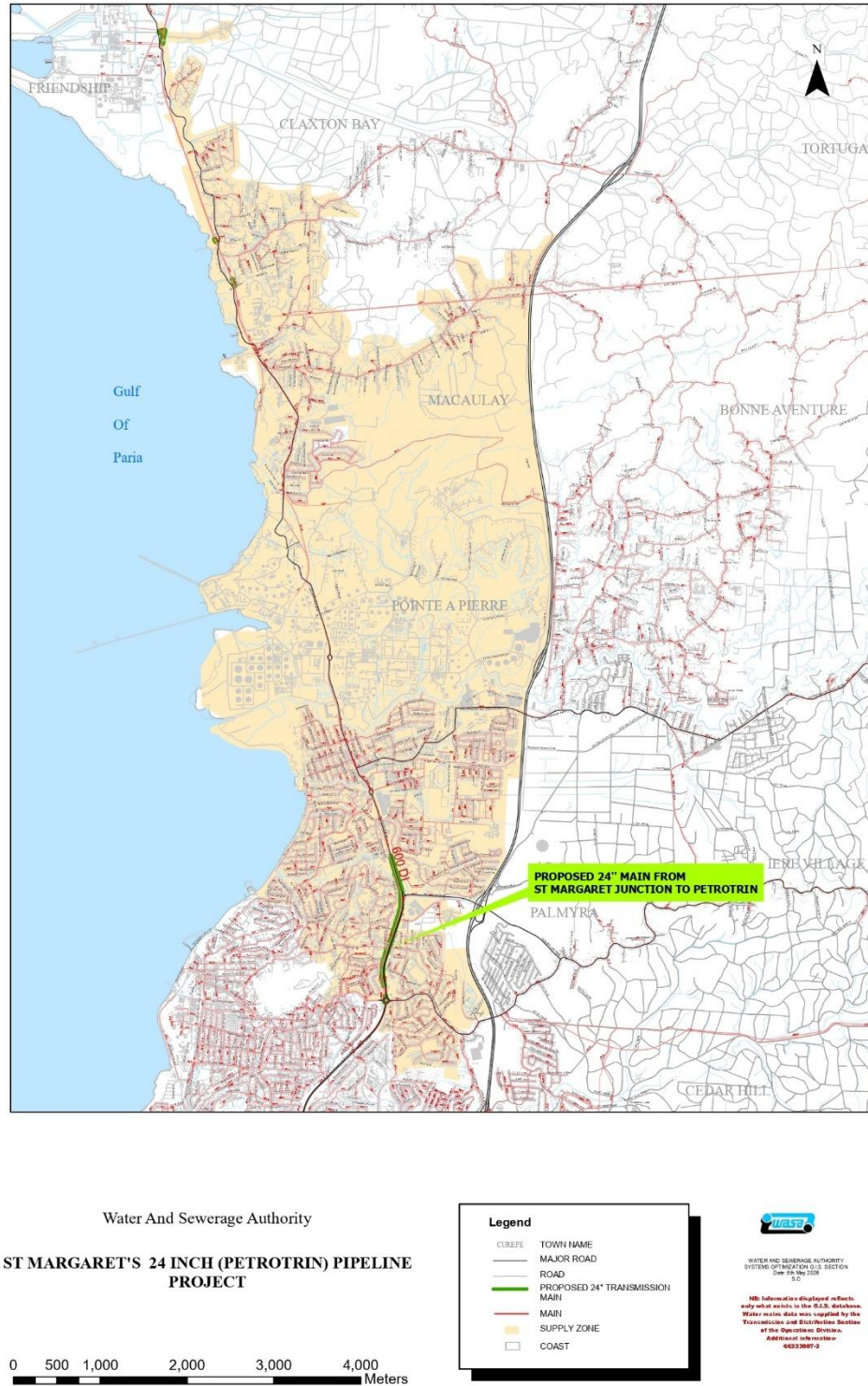


Figure 2-2: Proposed supply zone for the proposed St. Margarets Pipeline project

3 Legal and Institutional Framework

3.1 Legislative Framework

Laws and Regulations	Relevance
ENVIRONMENTAL MANAGEMENT ACT, 2000 (CHAP. 35:05)	Provides the overarching framework for environmental management in Trinidad and Tobago. The projects must comply with environmental protection requirements, pollution prevention measures, and reporting obligations during construction and operation.
CERTIFICATE OF ENVIRONMENTAL CLEARANCE (CEC) RULES, 2001	The transmission pipeline and associated infrastructure may require screening to determine whether a CEC is required before construction commences.
WATER AND SEWERAGE ACT, 1965 (CHAP. 54:40)	Provides the statutory authority for water supply infrastructure development, operation, maintenance, and transmission network improvements undertaken by WASA.
PUBLIC HEALTH ORDINANCE, 1940 (CHAP. 12 No. 4)	Ensures protection of public health through provision of safe potable water and management of sanitation risks during construction and operation.
PUBLIC HEALTH (WATER SUPPLY) REGULATIONS	Establishes potable water quality requirements applicable to the transmission infrastructure supplying drinking water.
OCCUPATIONAL SAFETY AND HEALTH (OSH) ACT, 2004 (AS AMENDED 2006)	Governs worker health and safety during trenching, excavation, pipeline installation, marine works, confined-space entry, electrical installations, chemical handling, and plant operation.
WATER POLLUTION RULES, 2019	Regulates wastewater discharges and water quality protection. Applicable to construction runoff, sediment-laden discharges, hydrostatic testing water, and wastewater generated during construction and operation.
WASTE MANAGEMENT RULES, 2021	Governs management of construction wastes, excavated material, packaging, spent chemicals, sludge, and other wastes generated during project implementation.
AIR POLLUTION RULES, 2014	Applicable to emissions from construction equipment, generators, pumps, vehicles, and standby power systems associated with each project.
NOISE POLLUTION CONTROL RULES, 2001	Regulates construction-related noise from excavation equipment, drilling, pipe laying activities, and pumping stations, including those near residential communities.
TOWN AND COUNTRY PLANNING ACT, 1969 (CHAP. 35:01)	Development approvals may be required for treatment facilities, pump stations, reservoirs, access roads, and other permanent infrastructure.
MUNICIPAL CORPORATIONS ACT, CHAP. 25:04	Relevant for local approvals, road reinstatement, drainage works, traffic management, and coordination with local authorities.
HIGHWAYS ACT, CHAP. 48:01	Applicable where transmission pipelines cross or are installed within highway reserves, road corridors, bridges, and transportation infrastructure.

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Laws and Regulations	Relevance
PUBLIC ROADS ACT, CHAP. 48:50	Regulates road opening permits, reinstatement requirements, and traffic management associated with pipeline installation works.
STATE LANDS ACT, 1918 (CHAP. 57:01)	Applicable where project infrastructure traverses or occupies state-owned lands.
LAND ACQUISITION ACT, CHAP. 58:01	May apply if acquisition of private lands, easements, servitudes, or rights-of-way is required for transmission mains, pumping stations, or ancillary infrastructure.
NATIONAL PARKS AND WILDLIFE ACT, CHAP. 67:01	Relevant where construction activities occur near protected areas, wildlife habitats, forest reserves, or environmentally sensitive ecosystems in northeast Tobago.
FOREST ACT, CHAP. 66:01	Applicable if vegetation clearance or construction activities occur within or adjacent to forest reserves or state forest lands.
CONSERVATION OF WILDLIFE ACT, CHAP. 67:01	Protects wildlife species that may be affected by pipeline installation, vegetation clearance, or construction disturbances.
MARINE AREAS (PRESERVATION AND ENHANCEMENT) ACT, CHAP. 37:02	Relevant for marine works associated with seawater abstraction pipelines, brine outfalls, and activities within coastal and marine environments.
NATIONAL ENVIRONMENTAL POLICY (NEP), 2018	Provides national environmental policy guidance for sustainable development, pollution prevention, biodiversity protection, and climate resilience.
NATIONAL CLIMATE CHANGE POLICY, 2011	Relevant because both projects aim to improve climate resilience of water supply infrastructure and reduce vulnerability to drought and changing hydrological conditions.

3.2 International Conventions and Commitments

Agreement	Relevance
CONVENTION ON BIOLOGICAL DIVERSITY (CBD)	Obligates conservation of biological diversity, sustainable use and benefit sharing. The project must consider all sensitive habitats within the sphere of influence.
CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES (CITES)	Relevant for protection of listed fauna (if encountered) and for controls on any trade/transfer of protected species or specimens found during works or salvage. Requires notifying authorities and following national wildlife regulations.
UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC) & PARIS AGREEMENT	Requires national climate adaptation and mitigation efforts. Relevant to the project's climate-resilient design (flooding, drought), greenhouse gas considerations (generators, energy-efficiency) and inclusion of climate risk considerations.
ROTTERDAM CONVENTION (PRIOR INFORMED CONSENT FOR CERTAIN HAZARDOUS CHEMICALS AND PESTICIDES)	Relevant to import, use and information exchange for pesticides and industrial chemicals. Informs selection, procurement and safe use of chemicals, and national controls on restricted substances.

Agreement	Relevance
STOCKHOLM CONVENTION (PERSISTENT ORGANIC POLLUTANTS - POPs)	Relevant where project activities might mobilize or generate POPs (e.g., contaminated soils) and for safe handling/disposal of POP-containing wastes; supports strict hazardous-waste controls and monitoring.

3.3 IDB Environmental and Social Policy Framework

This section evaluates the relevance of the project components to the Inter-American Development Bank's (IDB) Environmental and Social Performance Standards (ESPS), ensuring compliance with the IDB's Environmental and Social Policy Framework (ESPF).

3.3.1 ESPS 1 – Assessment and Management of Environmental and Social Risks and Impacts

This standard is triggered because both projects involve construction of linear infrastructure, excavation works, pipeline installation, and operation of water supply infrastructure. Environmental and social risks include construction disturbances, community impacts, traffic disruptions, waste generation, occupational health and safety risks, marine impacts, and cumulative impacts. An ESA, ESMP, stakeholder engagement activities, and monitoring programs will be required.

3.3.2 ESPS 2 – Labour and Working Conditions

Construction activities will require direct workers, contractors, subcontractors, and technical personnel. Risks include workplace accidents, excavation hazards, confined-space work, electrical hazards, and working near roadways. Labour management procedures, occupational health and safety measures, worker grievance mechanisms, and compliance with national labour legislation will be required.

3.3.3 ESPS 3 – Resource Efficiency and Pollution Prevention

The projects will consume energy, construction materials, fuels, and water resources. Potential pollution sources include dust, noise, construction runoff, wastewater, hydrostatic testing discharges, fuels, lubricants and solid waste. Resource efficiency measures, pollution prevention controls, waste management procedures, and energy-efficient system designs will be required.

3.3.4 ESPS 4 – Community Health, Safety, and Security

Pipeline installation and network upgrades may affect nearby residents, businesses, road users, and community infrastructure. Risks include traffic disruptions, excavation hazards, noise, dust, temporary service interruptions, and public safety concerns. Operational risks are associated with pipeline installations. Community health and safety management measures will be required.

3.3.5 ESPS 5 – Land Acquisition and Involuntary Resettlement

The transmission pipeline corridor may require temporary or permanent easements, rights-of-way, access arrangements, or acquisition of small parcels of land. Temporary economic displacement could occur where access to businesses, residences, or agricultural lands is affected during

construction and laying of pipelines. Detailed design and land ownership investigations will determine the extent of impacts. If land acquisition occurs, a Resettlement Plan or Livelihood Restoration measures will be required.

3.3.6 ESPS 6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources

Pipeline installation may also result in vegetation clearance and habitat disturbance. The pipeline from St. Margarets runs along Claxton Bay and runoff may contribute to further sedimentation in this marine environment. Biodiversity assessments and mitigation measures will be required.

3.3.7 ESPS 8 – Cultural Heritage

Excavation and trenching activities associated with transmission pipelines may encounter previously unknown archaeological resources, historic features, or cultural materials. Chance-find procedures and consultation with relevant authorities should be incorporated into project planning.

3.3.8 ESPS 9 – Gender Equality

Water supply improvements have direct gender-related benefits by improving household access to reliable potable water and reducing burdens associated with water storage and supply interruptions. Employment opportunities during construction and operation should be provided on an equitable basis, and stakeholder engagement processes should ensure meaningful participation of women and vulnerable groups. Gender-responsive measures should be incorporated into project implementation.

3.3.9 ESPS 10 – Stakeholder Engagement and Information Disclosure

The projects affect multiple stakeholder groups, including residential communities, tourism operators, fishers, businesses, road users, local authorities, utilities, and government agencies. Comprehensive stakeholder engagement, disclosure of project information, consultation processes, and grievance mechanisms will be required throughout project planning, construction, and operation.

4 Environmental and Social Baseline

4.1 Introduction

This chapter presents the environmental and social baseline conditions for the proposed transmission pipeline from St. Margaret's Junction to Pointe-à-Pierre.

Establishing an accurate and comprehensive baseline is essential for assessing potential project-related risk and impacts, identifying environmental and social sensitivities, and developing context-appropriate mitigation and enhancement measures. The baseline describes the key physical, biological, and socio-economic characteristics that define the existing conditions within and around the project locations, forming the reference point against which changes, both positive and adverse, are evaluated.

The findings and conclusions presented in this Environmental and Social Assessment (ESA) are based on the information available at the time of the assessment and are subject to several limitations. The availability of site-specific secondary environmental and social data was limited in some cases, requiring reliance on broader national datasets, publicly available information, and professional judgement to characterise baseline conditions. While reasonable efforts were made to obtain relevant and reliable information, data gaps remain for certain environmental and social parameters.

The assessment was also undertaken within a constrained timeframe, which limited the extent to which additional data collection, verification, and detailed analyses could be completed. Consequently, the study focused on identifying key environmental and social risks and impacts based on the best available information and a proportionate level of assessment commensurate with the project stage.

In addition, the level of detail available for some project components was limited at the time of assessment. In certain cases, project descriptions, design information, construction methodologies, and operational details were preliminary, incomplete, or subject to further refinement. As a result, some impact assessments have been undertaken using reasonable assumptions regarding project activities and footprints. Where uncertainties exist, a precautionary approach has been applied, and recommendations have been made for further assessment, data collection, and management planning during subsequent stages of project design and implementation. These limitations do not preclude the identification of the project's principal environmental and social issues; however, they should be considered when interpreting the assessment findings. The ESA should therefore be regarded as a living document that will require updating as additional project information and baseline data become available.

4.1.1 Area of Influence

The Area of Influence (AoI) of the proposed project encompasses all geographic zones and environmental, socio-economic receptors that may experience direct or indirect impacts from the project's construction, operation, and maintenance activities. In accordance with the Environmental

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Management Authority (EMA), the Inter-American Development Bank's (IDB) Environmental and Social Policy Framework (ESPF) and particularly Performance Standard 1 (Assessment and Management of Environmental and Social Risks and Impacts), the baseline assessment considers the Project Area of Influence (Aol), which includes both direct and indirect zones of influence.

The Direct Area of Influence (DAI) refers to the immediate footprint and surrounding areas of construction and operation activities, including trench alignments, equipment staging areas, laydown zones, work compounds, access routes, and areas where vegetation removal, excavation, or earth movement will occur. This zone experiences the highest likelihood of direct environmental and social impacts such as noise, dust, localised disturbance, road access changes, worker presence, and temporary disruption to community mobility or utilities. The 1km zones of influence used for this study is shown below in Figure 4-1.

The Indirect Area of Influence (IAI) encompasses the broader geographic and social context that may be affected by secondary or induced impacts. These include roadside communities that may experience altered traffic patterns, noise or dust propagation, temporary service interruptions, or changes in access due to construction activities. The IAI also captures social dimensions such as community safety, local businesses and institutions, public health considerations, and vulnerable groups who could be indirectly affected by construction activities or short-term disruptions in water service.

These define the scope of the baseline assessment, ensuring that the environmental and social characteristics relevant to both projects are fully understood and evaluated. This chapter therefore provides a detailed description of the physical environment (climate, hydrology, geology, soils, and natural hazards), the biological environment (flora, fauna, marine and coastal habitats, ecosystems, and sensitive ecological receptors), and the social environment (population, land use, livelihoods, community services, infrastructure, and cultural attributes) for both project locations. Understanding these contextual conditions is fundamental to identifying project risks, designing effective mitigation measures, and safeguarding the well-being of communities and ecosystems during the implementation of both pipeline replacement projects.

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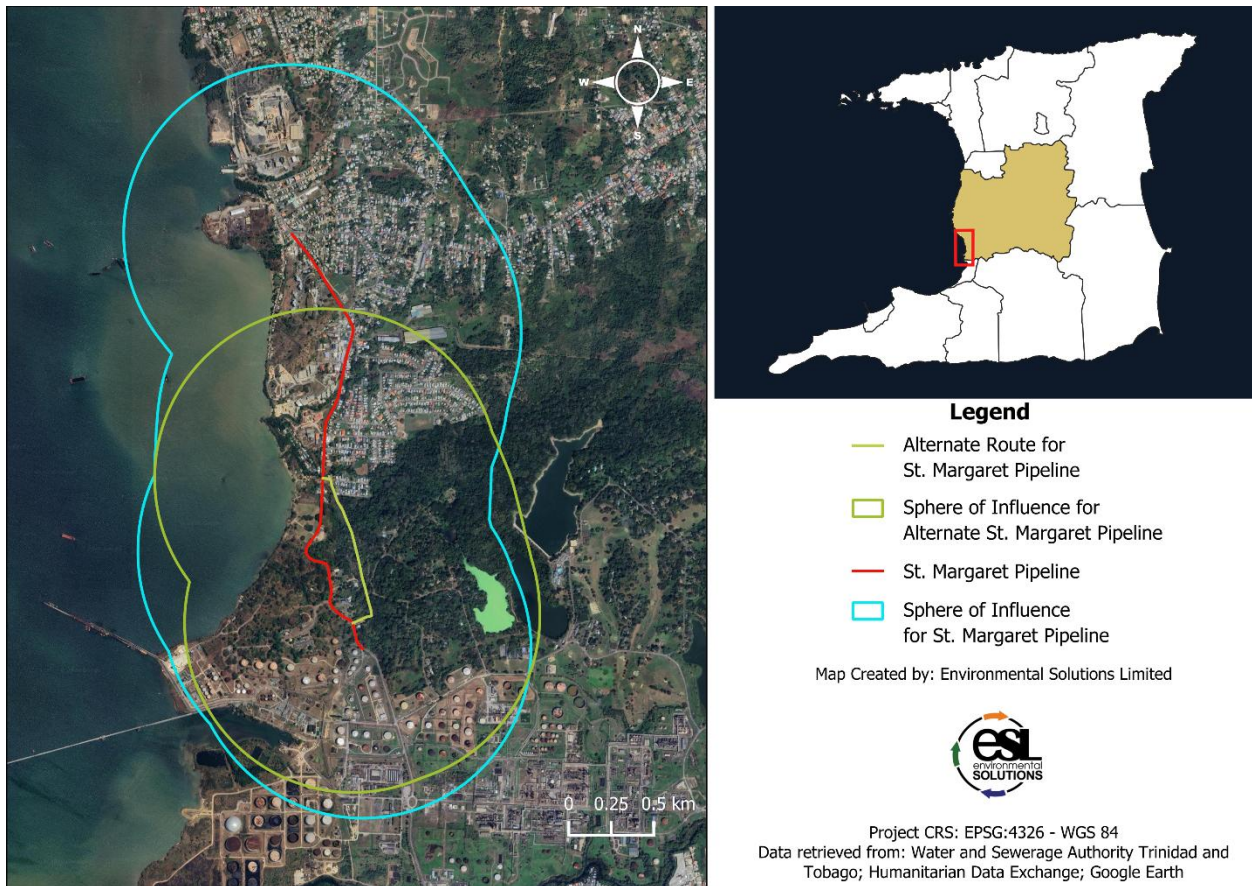


Figure 4-1: 1km Sphere of influence for the St. Margaret's Pipeline and Alternative Route

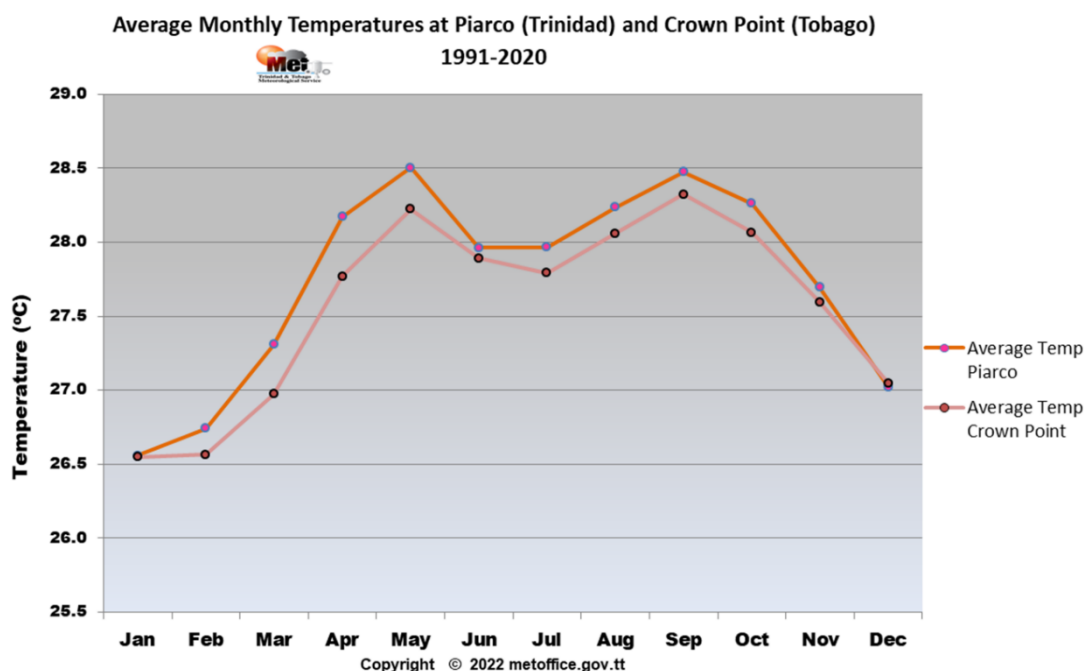
4.2 Physical Environment Baseline

4.2.1 Climate

Trinidad and Tobago experience a tropical maritime climate with well-defined dry and wet seasons. The dry season (January–May) is dominated by moderate to strong trade winds, clear skies, warm days and cooler nights. The wet season (June–December) is hot and humid, with frequent showers and thunderstorms driven by low-level convergence and tropical weather systems (Trinidad and Tobago Meteorological Service, 2025). Late May and December are transitional. Within June–November is the Atlantic hurricane season; Tobago is more directly affected than Trinidad due to its northerly position, though both islands feel peripheral storm impacts (Trinidad and Tobago Meteorological Service, 2025). Inter-island differences arise from land area and topography: Trinidad's larger landmass and Central Range produce somewhat higher rainfall than Tobago's smaller, more mountainous terrain.

TEMPERATURE

Temperatures are high year-round with little variation. The long-term (1971–2000) average annual maximum in Trinidad is about 31.3 °C and minimum about 22.7 °C (mean ~26.5 °C). Seasonally, the warmest months are September (wet season) and March (dry season), reflecting the double-peaked climate. Night-time lows rarely drop below the low 20s °C. Tobago's climate is similar but generally slightly cooler than Trinidad's, owing to higher elevations and trade-wind effects. Nationwide, record highs near 37.8 °C and lows near 16.1 °C have been observed, but such extremes are uncommon.

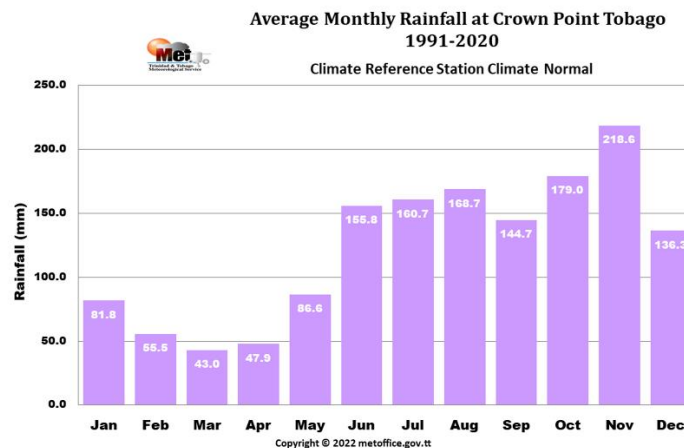


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At the national climate reference stations located at Piarco, Trinidad and Crown Point, Tobago, for the climate reference period 1991 -2020. May and September are the warmest months in terms of daily average temperatures. February is the coolest month.

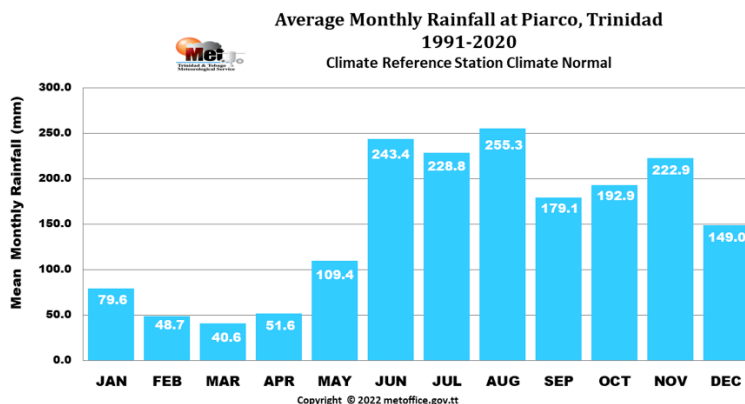
RAINFALL

Average annual rainfall is on the order of 2,100–2,500 mm, with most precipitation falling June–December. Both islands show a bimodal seasonal pattern, typically peaking in early and late wet season (around June and November). Trinidad's highest rainfall tends to occur in the north-central mountains and Central Range, while Tobago's smaller Main Ridge receives on average about 2,800 mm/year. At the reference stations (1991–2020 averages), Piarco (Trinidad) is wettest in August (~255.3 mm) and driest in March (~40.6 mm), whereas Crown Point (Tobago) is wettest in November (~218.6 mm) and driest in March (~43.0 mm). These data illustrate Trinidad's primary wet peak in mid-wet season and Tobago's in late wet season. Extreme monthly totals recorded historically include ~488.4 mm at Piarco in Oct 1988 and ~429.0 mm at Crown Point in Nov 2004. During the dry season, precipitation is much reduced; Trinidad's driest months (Jan–Mar) average ~40 mm/month at Piarco, reflecting the dominance of the subtropical high pressure in driving trade winds.

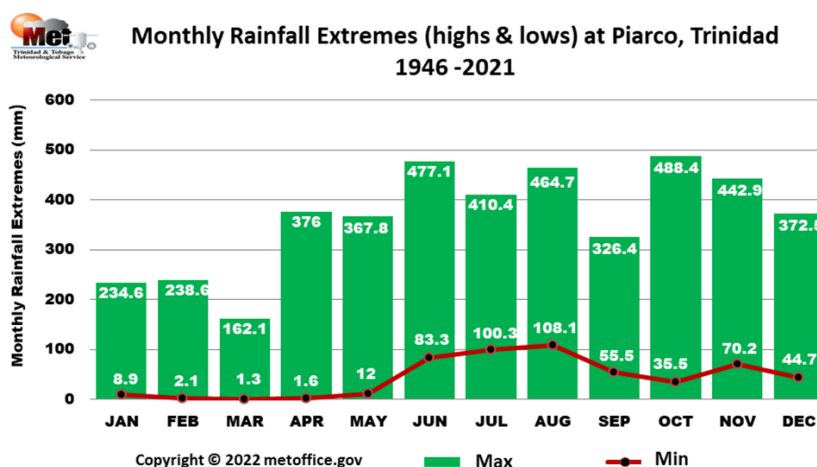


At Crown Point for the climate reference period 1991-2020 November is the wettest month, with an average monthly rainfall total of 218.6 mm, followed by October with 179.0mm. The month of December is usually the driest month of the wet season, with an average rainfall total of 136.3 mm. March is usually the driest month of the year, with an average of 43.0 mm.

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At Piarco for the climate reference period 1991-2020. August is the wettest month, with an average monthly rainfall total of 255.3 mm, followed by June and July. The month of September is usually the driest month of the wet season with 179.1 mm. Sometimes there is a short dry spell in September across the entire country, which may possibly last for one to two weeks or even longer as seen in some years. The driest month of the year is March, with an average of 40.6 mm of rainfall.



The month of October (1988) with 488.4 mm produced the highest monthly rainfall total on record at Piarco between 1946 and 2021. The month of March (1966) with 1.3 mm has produced the lowest monthly rainfall totals

CLIMATE CHANGE PROJECTIONS

Climate models project significant warming and a mixed rainfall response by the late 21st century. Downscaled GCM outputs (HadCM3, SRES A2/B2) indicate regional temperatures could rise ~1.5–2.0 °C by the 2080s (≈0.29 °C/decade) relative to 1980–1999. This warming tends to lengthen the dry season (up to ~8% longer by 2050) and shorten the wet season. Precipitation projections are highly uncertain: a multi-model ensemble suggests up to ~15% annual decline by the 2080s for Trinidad and Tobago, although some models even project increases. If drying trends prevail, more intense and

frequent dry spells and droughts are expected by the century's end. Notably, projected rainfall changes include potential increases in early wet season (June–August) precipitation in T&T.

By contrast, climate variability (e.g. El Niño/La Niña) already causes interannual swings in rainfall and extremes. Local hydrology is also sensitive: heavier downpours (often occurring in shorter bursts) may decrease groundwater recharge and water quality, while longer droughts will stress freshwater supply, increase irrigation demand, and exacerbate saltwater intrusion and ecological stress. Indeed, regional water-resource models (e.g. Arnell 2004) warn of severe future water stress under higher-emission scenarios. Sea-level rise is likewise a concern: measurements suggest north Trinidad is rising ~1 mm/yr and south Trinidad ~4 mm/yr (tectonic influence). Global projections (IPCC AR4, recent studies) indicate ~0.35 m rise by 2090–2099 (A1B) and likely higher with updated estimates. Due to the region's equatorial setting, Caribbean Sea-level increases could be larger than global average. Thus, coastal inundation, storm surges and erosion risks are expected to grow around both Trinidad and Tobago in the coming decades, though with substantial uncertainty.

4.2.2 Topography

Trinidad

Trinidad's terrain includes three east–west orientated ranges separated by plains. The Northern Range reaches up to ~940 m (El Cerro del Aripo) and the Central Range up to ~325 m. South and east of these ranges lie relatively flat or gently rolling lowlands: the western Naparima Plain (between the Central and Southern Ranges) and the eastern Nariva Plain (between the Central and Southern Ranges). The Naparima Mayaro corridor lies largely within these low-lying areas (much of it below ~50 m elevation), with local relief from small hills and river valleys.

The terrain is a product of mature, low-energy geomorphological weathering acting upon soft sedimentary strata (Montserrat Carbonell, 2005). Characterized by a dual macro-topography. The immediate coastal strip features extensive, low-lying alluvial plains, extensive beach-ridge complexes (sand spits), and the southern margins of the Nariva Swamp (Montserrat Carbonell, 2005). Inland, the terrain steps up into the gentle east-northeast trending ridges of the Central Range remnants and the Southern Range flanks, with elevations rarely exceeding 60 m to 80 m (Topographic-maps.com, n.d.).

4.2.3 Geology and Soils

Trinidad

Trinidad is located on the southeastern edge of the Caribbean Plate and the South American Plate margins (Webber, et al., 2011). This plate boundary-zone represents an area of significant Neogene structural deformation. Several east-west strike-slip faults which cut across Trinidad are associated with this plate-boundary margin. The island therefore sits within an active earthquake zone.

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The following analysis is guided by the IDB's Disaster and Climate Change Risk Assessment Methodology with particular focus on wastewater systems. It includes the identification and assessment of criticality and vulnerability within the context of the proposed project (i.e., the potential physical negative effects on the structure, population and services that a failure of the operation could cause due to natural hazards). This process will help to classify the level of disaster risk anticipated. A supporting Disaster Risk Management Plan is provided in Section 6.5.5 to guide the application of mitigative measures for the project.

This step of the Disaster and Climate Change Risk Assessment evaluates the exposure of the proposed pipeline replacement works in St. Margaret's, Trinidad, to natural hazards that may affect the infrastructure during construction and operation. The assessment considers the intensity of each hazard, the probability of occurrence based on historical records, available hazard mapping and climate information, and the degree to which the proposed pipeline alignments and associated infrastructure are exposed to these events. Based on these factors, each hazard is assigned an exposure rating of Low, Moderate, or High. The objective of this analysis is to identify the hazards most likely to affect the project areas and provide the basis for determining the overall disaster risk associated with the proposed pipeline works.

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Trinidad lies in a high cyclone hazard zone. There is a greater than 20% chance of damaging winds from tropical storms in any 10-year period. Storms and hurricanes are defined by the wind speed sustained by the systems. Tropical storms can sustain winds within the range of 63-118 km/h, and a hurricane sustains winds of over 118 km/h at its centre. Wind damage to buildings and infrastructure, and flooding from intense downpours, are the main hazards potential drivers of impact to the pipeline works proposed for each location.

Tropical cyclones bring intense winds, heavy rain and storm surge, all of which have the potential to impact the projects during the construction phase. Also, climate change is proposed to increase cyclone intensity and rainfall (IPCC, 2023). For example, Tropical Storm Bret (June 2017) brought severe flooding that forced the shutdown of multiple water treatment plants (Mendes-Franco, 2017). Any future hurricane or tropical storm could similarly inundate intake canals, damage electrical equipment and cut off power to pumps. Heavy wind-borne debris and floodwaters can significantly impact water system components.

The table below shows the number of historical simulated cyclones per year that make landfall in Trinidad and Tobago between 1951-2014. The most commonly occurring cyclone event that impacts Trinidad and Tobago is tropical storms. When considering major cyclone events (category 3 or higher), the number is significantly lower.

Table 4-1 Total Number of Historical Simulated Tropical Cyclones per Year for Each Category 1951-2014 (World Bank Climate Change Portal)

Cyclone Classification	Global	North Atlantic Ocean	Trinidad and Tobago Exclusive Economic Zone	Trinidad and Tobago (landfalls)
Category 5	4.14	0.24	0.002	0.001
Category 4	10.27	0.74	0.008	0.003
Category 3	11.13	0.99	0.013	0.005
Category 2	10.06	1.05	0.022	0.01
Category 1	18.1	2.18	0.065	0.03
Tropical Storm	47.95	6.76	0.284	0.174
Total	101.65	11.96	0.395	0.223

This is further observed in the graph displayed in Figure 4-3 below which shows the percentage frequency of cyclone events that have affected Trinidad and Tobago in comparison to the global percentage and the North Atlantic percentage. Tropical storms account for 77.85% of the cyclones that made landfall in Trinidad and Tobago while major cyclones accounts for less than 9%. This is indicative of low exposure to major cyclone activity.

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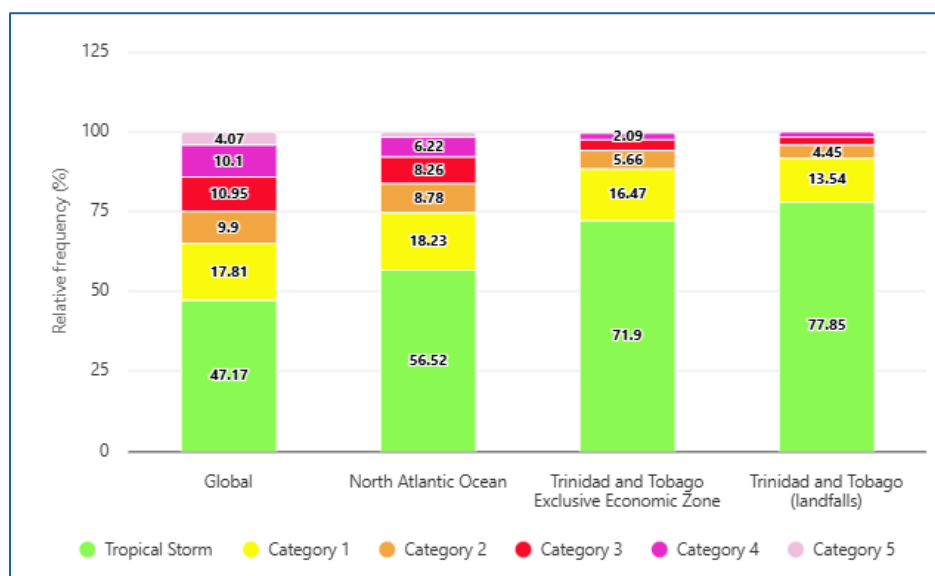


Figure 4-3 Simulated Historical Relative Frequency (Percent) of Cyclone Types 1951-2014 (source: World Bank Climate Change Portal)

In the context of Tobago, during cyclone impact, the areas that record the most significant impact is recorded in the low lying areas along south coast of the island (World Data, 2026). This is further expressed in the below which speaks to the cyclone events that have impacted Trinidad and Tobago between 2019 and 2025 and highlights the most affected cities/areas. According to the table, the community of Scarborough (southern Tobago) is the area most frequently and most significantly impacted by cyclone events.

Table 4-2 Hurricane Impact History and Most affected Areas in Trinidad and Tobago 2019-2025

Cyclone Information	Date of Impact	Most Affected Cities/Areas
Melissa (Tropical Storm) - Max Wind Speed: 40 mph - Max Wind Speed on Land: 35 mph - Diameter: 345 miles - Minimum Pressure: <896 mbar	17–31 October 2025	Scarborough, Petit Valley
Jerry (Tropical Storm) - Max Wind Speed: 63 mph - Diameter: 207 miles - Minimum Pressure: <999 mbar - Closest Approach to Trinidad and Tobago: 385 km NE of Scarborough	4–11 October 2025	No direct landfall. Closest to Scarborough
Beryl (Category 5 Hurricane) Max Wind Speed: 167 mph	26 June–11 July 2024	Scarborough, Petit Valley

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Cyclone Information	Date of Impact	Most Affected Cities/Areas
• Max Wind Speed on Land: 150 mph • Diameter: 226 miles • Eye Diameter: 23 miles • Minimum Pressure: <934 mbar		
Tammy (Category 1 Hurricane) • Max Wind Speed: 86 mph • Diameter: 191 miles • Minimum Pressure: <965 mbar • Closest Approach: 227 km NE of Scarborough	20–31 October 2023	No direct landfall. Closest to Scarborough
Philippe (Tropical Storm) • Max Wind Speed: 58 mph • Diameter: 180 miles • • Minimum Pressure: <998 mbar • Closest Approach: 477 km N of Scarborough	23 September–5 October 2023	No direct landfall. Closest to Scarborough
Franklin (Tropical Storm) • Max Wind Speed: 46 mph • Max Wind Speed on Land: 35 mph • Diameter: 368 miles • Minimum Pressure: <926 mbar	19–29 August 2023	Scarborough, Petit Valley
Gert (Tropical Depression) • Max Wind Speed: 23 mph • Diameter: 276 miles • Minimum Pressure: <1005 mbar • Closest Approach: 328 km N of Scarborough	19–27 August 2023	No direct landfall. Closest to Scarborough
Bret (Tropical Storm) • Max Wind Speed: 69 mph • Max Wind Speed on Land: 60 mph • Diameter: 230 miles • Minimum Pressure: <996 mbar	16–24 June 2023	Scarborough
Julia (Tropical Depression) • Max Wind Speed: 35 mph • Diameter: 276 miles • Minimum Pressure: <982 mbar	6–10 October 2022	No direct landfall. Closest to Point Fortin

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Cyclone Information	Date of Impact	Most Affected Cities/Areas
Closest Approach: 322 km W of Point Fortin		
Fiona (Tropical Storm) - Max Wind Speed: 58 mph - Diameter: 92 miles - Minimum Pressure: <931 mbar - Closest Approach: 481 km N of Scarborough	14–27 September 2022	No direct landfall. Closest to Scarborough
Grace (Tropical Storm) - Max Wind Speed: 40 mph - Diameter: 276 miles - Minimum Pressure: <967 mbar - Closest Approach: 511 km NE of Scarborough	13–21 August 2021	No direct landfall. Closest to Scarborough
Elsa (Category 1 Hurricane) - Max Wind Speed: 86 mph - Max Wind Speed on Land: 81 mph - Diameter: 219 miles - Minimum Pressure: <991 mbar	30 June–10 July 2021	Scarborough
Isaias (Tropical Storm) - Max Wind Speed: 52 mph - Max Wind Speed on Land: 46 mph - Diameter: 483 miles - Minimum Pressure: <986 mbar	28 July–5 August 2020	Scarborough
Gonzalo (Tropical Storm) - Max Wind Speed: 40 mph - Diameter: 230 miles - Minimum Pressure: <997 mbar	20–25 July 2020	Scarborough, Sangre Grande, Petit Valley
Dorian (Tropical Storm) - Max Wind Speed: 60 mph - Diameter: 69 miles - Minimum Pressure: <910 mbar - Closest Approach: 209 km NE of Scarborough	24 August–5 September 2019	No direct landfall. Closest to Scarborough

St. Margaret's Pipeline

The proposed St. Margaret's Pipeline Replacement is located along the western coastal corridor of Trinidad, extending through an established residential and urbanized area. Given its proximity to the coastline, the pipeline alignment may be exposed to the effects of tropical storms and hurricanes, including high winds, intense rainfall, localized flooding, and coastal weather conditions. The Hazard exposure map in Figure 4-4, however, the proposed works primarily involve the replacement and installation of buried pipeline infrastructure within existing rights-of-way and developed corridors, reducing the susceptibility of the asset to direct wind damage. While the likelihood of a major hurricane directly impacting Trinidad remains relatively low, tropical storm activity represents a more probable hazard. Through the implementation of appropriate engineering design standards and construction practices, the potential impacts of cyclonic events can be effectively managed. Consequently, the proposed development is considered to have a **low to moderate exposure** to the impacts of tropical cyclones and hurricanes.

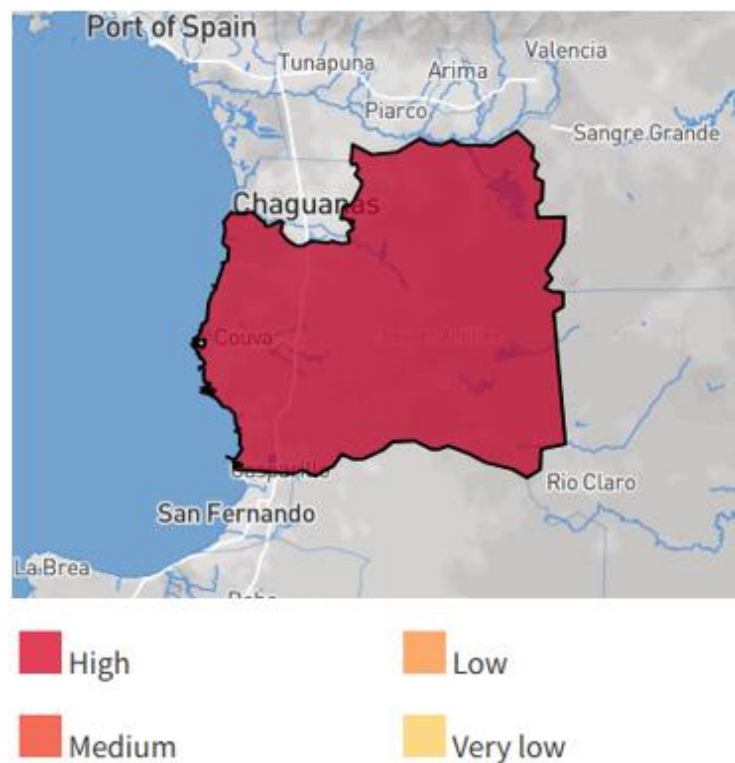


Figure 4-4 Cyclone Hazard Exposure Map - St. Margaret's Pipeline (Couva Region)
(source: World Bank ThinkHazard Portal)

EARTHQUAKE AND LANDSLIDE

St. Margaret's Pipeline

Earthquakes

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The Trinidad and Tobago region is one of the more seismically active areas within the Eastern Caribbean, recording an average of approximately 260 earthquakes of magnitude greater than 2.0 annually. Seismic activity is associated with the interaction of the Caribbean and South American tectonic plates and has historically affected both Trinidad and Tobago. Tobago, in particular, has experienced several moderate-magnitude earthquakes, including events of magnitude 5.6 and 6.1 that resulted in localized damage and ground disturbance in parts of the island (UWI Seismic Research Centre, 2025).

According to the World Bank ThinkHazard Portal (2026), Tobago is classified as having moderate exposure to earthquake hazards, indicating a 10% probability of potentially damaging earthquake shaking occurring within the next 50 years. Earthquake-related impacts on pipeline infrastructure may include ground shaking, differential settlement, joint displacement, localized slope failures, and pipeline rupture resulting in water losses and temporary service disruptions.

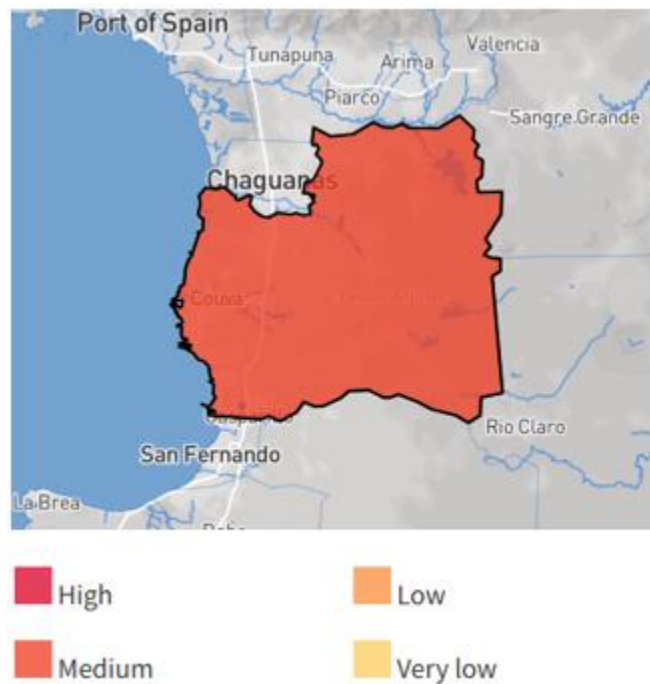


Figure 4-5 Earthquake Exposure Map - St. Margaret's Pipeline (Couva Region)
(source: World Bank ThinkHazard Platform)

The proposed St. Margaret's Pipeline Replacement Project traverses a developed coastal corridor in southwestern Tobago. While the alignment does not pass through areas known for severe seismic instability, earthquake-induced ground movement could affect buried pipeline infrastructure and associated appurtenances. The proposed pipeline will be designed and constructed in accordance with applicable engineering standards to withstand anticipated seismic loads, and any damaged sections can be isolated and repaired to minimize service disruptions. Given the regional seismic

setting and the nature of the proposed works, the St. Margaret's Pipeline Replacement Project is considered to have moderate exposure to earthquake hazards.

Landslides

Landslides represent a potential hazard to pipeline infrastructure in areas characterized by sloping terrain, unstable soils, and prolonged periods of intense rainfall. Slope failures may be triggered by heavy precipitation, soil saturation, erosion, excavation activities, or seismic events, resulting in damage to buried pipelines, disruption of access routes, and localized service interruptions.

According to the World Bank ThinkHazard Portal (2026), the project location has a low exposure to landslide hazards, although susceptibility varies considerably across the island.

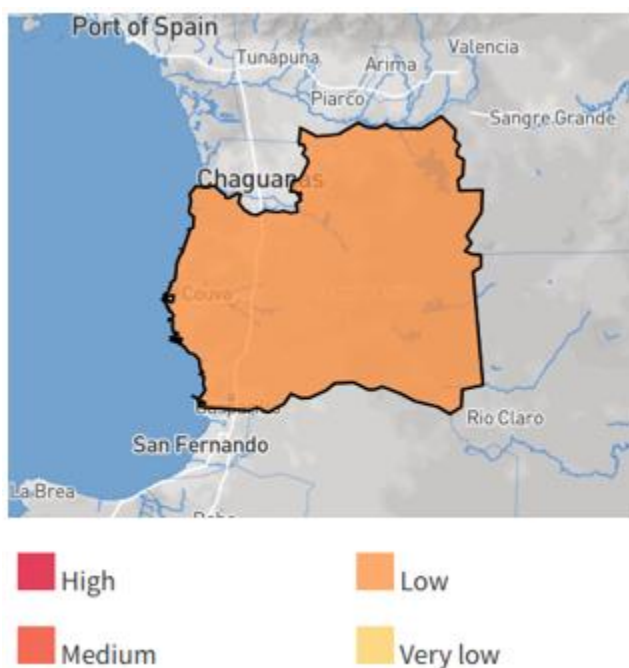


Figure 4-6 Landslide Exposure Map - St. Margaret's Pipeline (Couva Region)

(source: World Bank ThinkHazard Platform)

The proposed St. Margaret's Pipeline Replacement Project is located within the southwestern portion of Trinidad and traverses a corridor consisting primarily of developed residential areas, road reserves, and moderately sloping terrain. Although the project area is less susceptible to landslides, rainfall-induced erosion may occur during periods of intense precipitation, particularly where excavation activities are undertaken along sloping sections of the route.

The principal landslide-related hazards relevant to the project include localized slope failures, erosion of excavated slopes and embankments, and soil movement resulting from prolonged rainfall events. Appropriate engineering controls, including erosion and sediment control measures, proper

drainage management, and careful excavation practices, will be incorporated into the design and construction phases to reduce the likelihood and consequences of slope instability. Given the flat topography of the project corridor, the St. Margaret's Pipeline Replacement Project is considered to have low exposure to landslide hazards.

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EXPOSURE

St. Margaret's pipeline

Based on the hazard assessment undertaken for the proposed St. Margaret's Transmission Main Replacement Project, the natural hazards considered most likely to affect the project are tropical cyclones and hurricanes, earthquakes, and landslides. The proposed works comprise the installation of approximately 3.3 km of 600 mm (24-inch) ductile iron transmission pipeline and a 200 mm (8-inch) PVC distribution pipeline extending from St. Margaret's Junction to the Pointe-à-Pierre Entrance.

The project corridor is located within an established transportation and utility corridor in western Trinidad and is not directly exposed to coastal inundation or storm surge hazards. However, heavy rainfall associated with tropical storm events may result in localized flooding, erosion, and temporary construction disruptions. Earthquakes remain a regional hazard due to the tectonic setting of Trinidad and Tobago, while localized slope instability and embankment erosion may occur during periods of intense or prolonged rainfall. Based on the hazard assessment, the project is considered to have an overall Moderate exposure to natural hazards.

Table 4-3 Project Exposure Summary - St. Margaret's Pipeline

Hazard	Level of Exposure	Justification
Tropical Cyclones and Hurricanes	Low	Major hurricanes rarely affect Trinidad and Tobago directly. While tropical storms may produce heavy rainfall and localized flooding, the buried nature of the pipeline infrastructure reduces vulnerability to direct wind damage and storm impacts.
Earthquakes	Moderate	Trinidad is located within a seismically active region and may experience damaging earthquake shaking. Potential impacts include differential settlement, ground deformation, displacement of pipeline joints, and localized damage to the transmission and distribution network.
Landslides	Low	Although the project area is not located within one of Trinidad's highest landslide susceptibility zones, localized erosion, and embankment failures may occur during periods of prolonged rainfall, particularly where excavation activities disturb existing ground conditions.

SENSITIVITY

Sensitivity describes the degree to which the performance and functionality of the water transmission system may be affected when exposed to natural hazards. Transmission mains are particularly sensitive to hazards that result in ground movement, slope instability, or infrastructure damage because failures may interrupt the conveyance of treated water to multiple downstream communities.

St. Margaret's Pipeline

The existing transmission main is more than fifty years old, has exceeded its design life, and is currently subject to frequent breaks and water losses associated with fluctuating pressures within the network. While the replacement infrastructure will be constructed using modern materials and engineering standards, damage resulting from earthquakes, erosion, or slope instability could still lead to service interruptions and operational disruptions. Consequently, the project is considered to have a Moderate sensitivity to natural hazard impacts.

4.2.4.2 Step 2: Criticality and Vulnerability

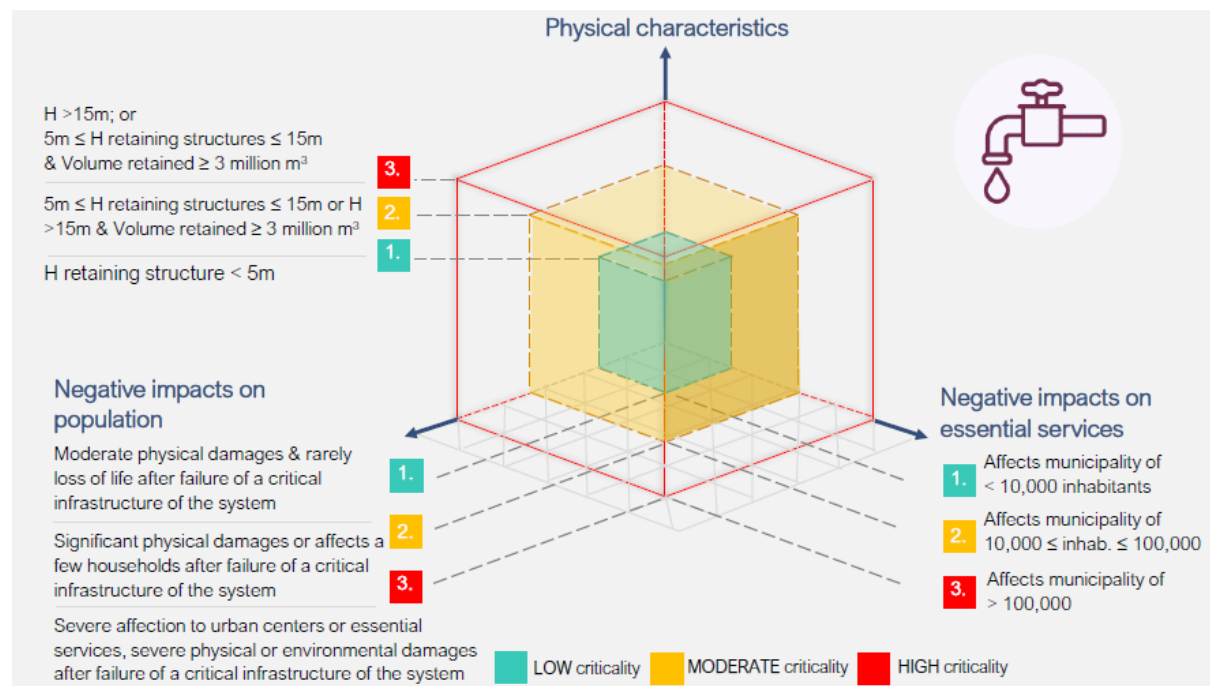


Figure 4-7 Criticality Chart

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KEY COMPONENT	LOW	MODERATE	HIGH
DIMENSION 1: LOSS OF ESSENTIAL SERVICES			
		St. Margaret's Pipeline: The proposed transmission and distribution pipelines form part of the potable water supply network serving communities along the project corridor. Failure of the infrastructure could result in temporary reductions in water supply reliability, water losses, and service disruptions until repairs are completed.	
DIMENSION 2: IMPACT ON POPULATION			
	St. Margaret's Pipeline: Failure of the proposed pipelines is not expected to result in direct loss of life. The primary impacts would be temporary service disruptions, localized flooding resulting from pipeline rupture, traffic disruptions during repair works, and potential damage to adjacent utilities.		
DIMENSION 3: PHYSICAL CHARACTERISTICS			

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	St. Margaret's Pipeline: Moderate: The project comprises approximately 3.3 km of 600 mm ductile iron transmission main and 200 mm PVC distribution main operating within an active pressurized water distribution network. The system forms an important component of the regional water supply infrastructure and is subject to fluctuating operating pressures.		
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4.2.4.3 Step 3: Diagnostic Narrative

St. Margaret's Pipeline

The project area has notable exposure to the following hazards:

- Tropical Cyclones and Hurricanes
- Earthquakes
- Landslides

For this operation, Tropical Cyclones and Hurricanes and Landslides are classified as Low, while Earthquakes are classified as Moderate. The criticality and vulnerability of the infrastructure component of the project is classified as Moderate following the criteria shown in the criticality chart: (i) physical characteristics are Low; (ii) the level of Impact on Population is Low; and (iii) the level of Impact on Service Functionality is Moderate. Therefore, the overall criticality is rated as Moderate.

The proposed replacement of approximately 3.3 km of transmission and distribution pipelines between St. Margaret's Junction and the Pointe-à-Pierre Entrance is not expected to increase existing natural hazard conditions or vulnerability to surrounding communities and the environment. The project primarily involves the replacement of aging infrastructure that has exceeded its design life and currently contributes to water losses through frequent breaks and leakage within the pressurized distribution network.

The proposed intervention is intended to improve the resilience, reliability, and operational performance of the water supply system through the replacement of deteriorated infrastructure with modern ductile iron and PVC pipelines capable of withstanding anticipated operating pressures and service demands. The project does not involve the construction of major water storage facilities, dams, flood control structures, or other infrastructure that would significantly alter existing hazard conditions or increase disaster risk to nearby populations.

Considering the hazard levels identified, the criticality and vulnerability estimated for the infrastructure interventions, and the negligible level of risk exacerbation associated with the proposed works, a Moderate Risk classification has been determined.

The following design considerations aimed at managing the risks were identified: replacement of aging pipelines with durable ductile iron and PVC pipe materials; design of the system to accommodate operating pressures within the network; implementation of erosion and sediment control measures during construction; incorporation of appropriate drainage provisions; protection of utility and roadway crossings; application of modern construction standards; and implementation of routine inspection and maintenance programmes during operation.

The narrative concludes that for this Moderate Risk operation there is no need to continue to a complete qualitative risk assessment for the operation, Step 4 of the Disaster and Climate Change Risk Assessment Methodology (DCCRAM), as there are no significant gaps, appropriate measures

have been identified and documented in a DRMP, and it is possible to attain a tolerable risk level from these.

4.3 Biological Environment Baseline

The biological environment baseline presented in this chapter provides a preliminary characterisation of the terrestrial, freshwater, coastal, and marine ecosystems within the project's area of influence based solely on secondary data sources. Information was compiled from published literature, government reports, previous environmental studies, biodiversity databases, protected area management plans, and satellite imagery to identify known habitats, species, protected areas, and ecological sensitivities relevant to the project. Nevertheless, the available information provides a sufficient basis for identifying key biodiversity considerations and informing the preliminary assessment of potential impacts in accordance with IDB Environmental and Social Performance Standard (ESPS) 6, while highlighting areas where additional field verification may be required during subsequent stages of project development.

4.3.1 Transmission Pipeline from St. Margaret's Junction

The proposed 3.3–3.4 km of a 600 mm (24-inch) ductile iron transmission main and a 200 mm (8-inch) PVC distribution main will be installed primarily within the existing road reserve along the Southern Main Road, extending from the intersection with St. Margaret's Road to the entrance of the Liquid Fuels Company of Trinidad and Tobago. The project corridor traverses a predominantly urbanised and industrialised section of the Claxton Bay coastal plain, where natural habitats have been substantially modified by historical development. Under ESPS 6, the project area may be classified as a **modified habitat**. Based on previous work conducted by WASA, it is estimated that the width of the right-of-way for the installation of the pipeline may be between 6-10 m, resulting in approximately 34,000 m² of land area to be impacted during construction, some of which may include roadside vegetation growing along the easement. Within the project's area of influence, the principal ecological receptors comprise nearshore marine environments associated with Claxton Bay and fragmented patches of secondary vegetation occurring along road verges, undeveloped lots, and drainage corridors. Given that the pipeline will largely be installed within an existing roadway corridor, direct impacts on terrestrial vegetation and natural habitats are expected to be limited. No extensive areas of natural vegetation were observed along the proposed trenching route during site reconnaissance, and habitat connectivity within the corridor is already highly fragmented by existing infrastructure and development.

The alignment is located within approximately 500 m of the coastline at its closest point and therefore falls within the wider area of influence of the Claxton Bay marine ecosystem. While no direct marine works are proposed, construction activities have the potential to generate sediment-laden runoff, particularly during periods of heavy rainfall. Such runoff may enter nearby drainage channels that discharge into the bay, potentially contributing to localised increases in turbidity and sedimentation. Observations from site visits and review of recent satellite imagery indicate that the receiving marine environment is already subject to chronic sediment inputs from existing stormwater outfalls and drainage infrastructure. Consequently, the marine ecosystem is likely to be operating under a degree of existing anthropogenic stress. Notwithstanding, the ecological sensitivity of the receiving environment cannot be fully assessed without targeted marine baseline investigations.

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Further studies should therefore be undertaken to characterise benthic habitats, fisheries resources, marine flora and fauna, and any ecologically sensitive communities that may occur within the project's zone of influence, consistent with the requirements of IDB ESPS 6.

1 km of an alternative pipeline alignment has also been proposed that would extend beyond the existing roadway corridor and traverse a larger area of secondary vegetation (see teal line in Figure 4-8) which may be classified as a **natural habitat** under ESPS 6. Unlike the other proposed route, implementation of this alternative would require clearing and several trees and other types of vegetation as well as ground disturbance within previously undeveloped areas. Based on previous work conducted by WASA, it is estimated that the width of the right-of-way for the installation of the pipeline may be between 6-10 m, resulting in approximately 10,000 m² of secondary vegetation cleared during construction. Nevertheless, the alternative alignment would likely result in greater direct impacts on terrestrial vegetation, increased habitat fragmentation, and a higher likelihood of disturbing resident wildlife species. Consequently, from an ecological perspective, the preferred alignment within the existing road reserve represents the lower-impact option, subject to confirmation through detailed design and ecological field assessments.

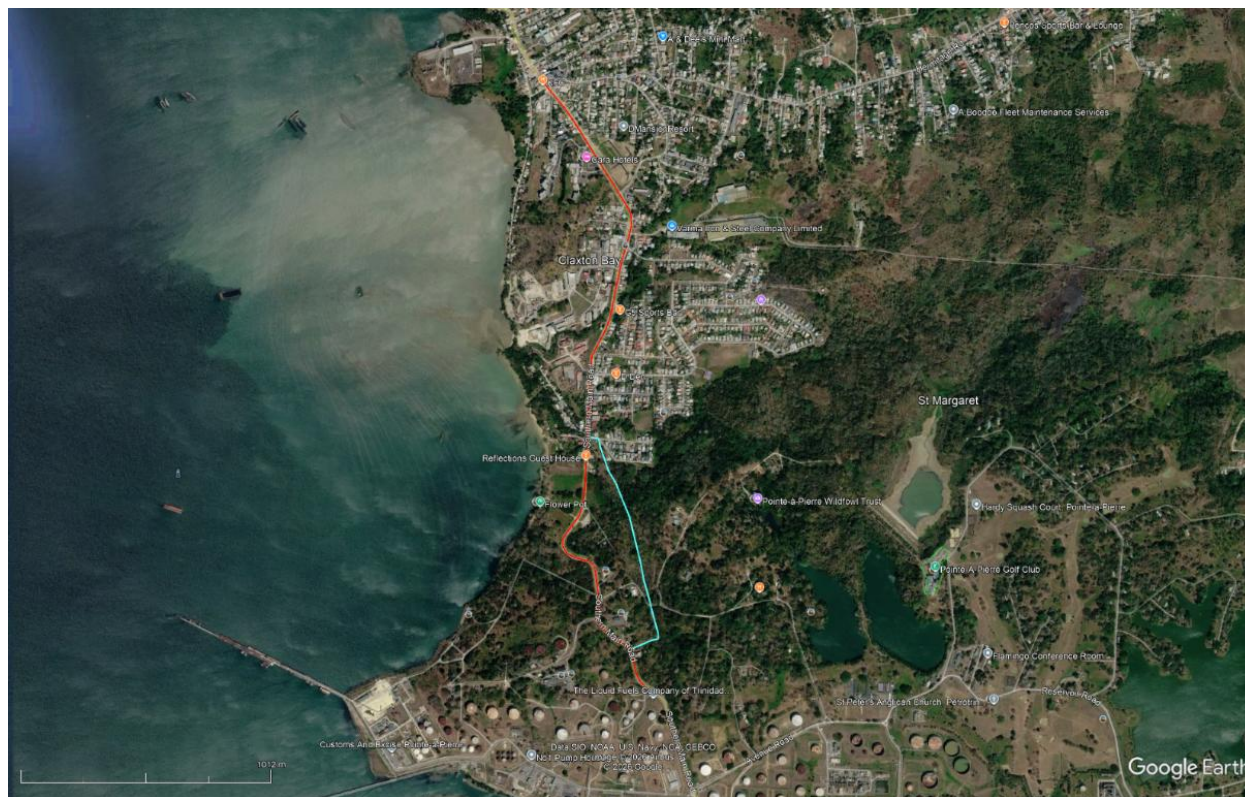


Figure 4-8: Proposed route of the St. Margarets pipeline replacement (including alternate alignment)

4.4 Socioeconomic Environment Baseline

4.4.1 Social Area of Influence - St. Margaret's Junction to the Pointe-à-Pierre Entrance (Petrotrin)

The Social Area of Influence (SAoI) for the parallel installation of the 600 mm transmission pipeline and 200 mm distribution pipeline from St. Margaret's Junction to the Pointe-à-Pierre Entrance is guided by the project footprint, route options, construction access requirements, and the wider service area associated with the Caroni South Transmission System. It captures receptors that may experience direct, mainly construction-related effects, as well as wider communities and institutions that may benefit from improved water-supply reliability, pressure management, system redundancy, reduced leakage, and reduced dependence on truck-borne water.

The project involves approximately 3.3–3.4 km of 600 mm ductile iron transmission main and approximately 3.3 km of 200 mm PVC distribution main. The transmission main will run parallel to existing Caroni South transmission infrastructure, while the distribution main will replace aged and undersized mains along the corridor. Associated works include pipeline appurtenances, bridge and culvert crossings, service connections, testing, disinfection, commissioning, road reinstatement, line painting, geo-tagging, and as-built drawings. Works are expected to occur mainly within existing rights-of-way, limiting the potential for extensive land acquisition but concentrating temporary construction effects along the pipeline and access corridors.

Table 1: Definition of SAoI and Main Receptors

Area	Proposed Definition	Main Receptors
S-DAoI	The direct project footprint includes the proposed and alternate pipeline corridors from St. Margaret's Junction to the Pointe-à-Pierre Entrance; excavation and trenching areas; road shoulders; reinstatement areas; bridge and culvert crossings; laydown and staging areas; temporary traffic management areas; access routes; and the directly affected communities of St. Margaret, Plaisance Park, and Trintoc/Pointe-à-Pierre.	Residents and households near the corridor; road users; pedestrians; public transport users; nearby businesses and workplaces; community facilities; utility operators; workers and contractors; vulnerable persons; and households or institutions affected by construction access, trenching, reinstatement, traffic management, or temporary service disruption.
S-IAoI	The wider service, administrative, and beneficiary area that may experience indirect or system-level effects from improved transmission capacity, redundancy, pressure management, leakage reduction, and service reliability. This includes Couva/Tabaquite/Talparo, City of San Fernando, Siparia, and Penal/Debe.	Households, businesses, public institutions, schools, health facilities, emergency services, local authorities, community organisations, vulnerable water users, and wider beneficiary communities connected to, or affected by, the Caroni South Transmission System and downstream distribution arrangements.

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4.4.2 Social Direct Area of Influence

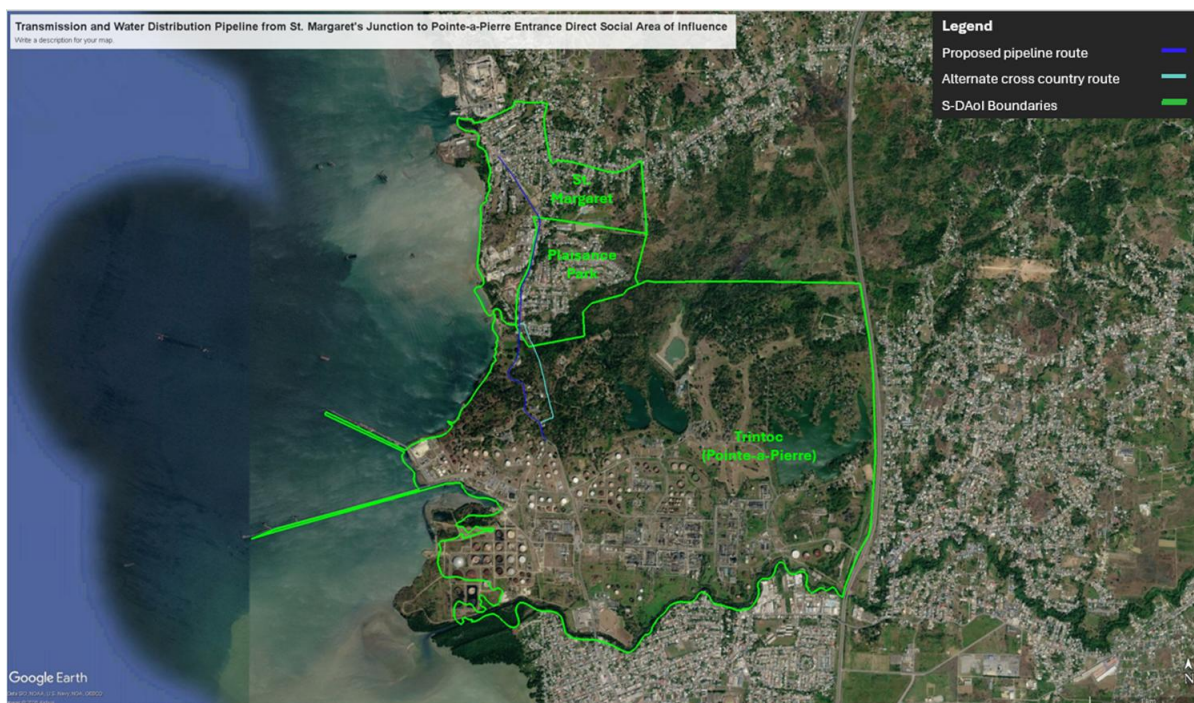


Figure 1: Social Direct Area of Influence Boundaries for St. Margaret's Junction to Pointe-à-Pierre Entrance Pipelines

The S-DAoI is conservatively defined to include both the proposed and alternate routes until the preferred alignment is confirmed. Direct effects are expected to be temporary and construction-related, including noise, dust, vibration, excavation activity, construction traffic, movement of workers and equipment, trenching, pipe-laying, backfilling, compaction, pressure testing, road reinstatement, temporary access disruption, and community health and safety risks. Short-term employment and procurement opportunities may also arise during construction.

Spatial review indicates that receptors are unevenly distributed across the S-DAoI. The proposed red route passes through or near established residential and mixed-use areas in St. Margaret and Plaisance Park before continuing toward the Pointe-à-Pierre entrance, making these areas more sensitive to construction nuisance, traffic disruption, pedestrian safety risks, and temporary access constraints. The alternate cyan route diverges east from the Southern Main Road near Tulip Avenue and continues southward through a less densely settled, more vegetated section of the Trintoc/Pointe-à-Pierre area before rejoining the corridor. Although this alignment appears to have lower residential exposure, it may involve greater interaction with vegetated land, land users, access tracks, drainage features, and construction access through less built-up areas.

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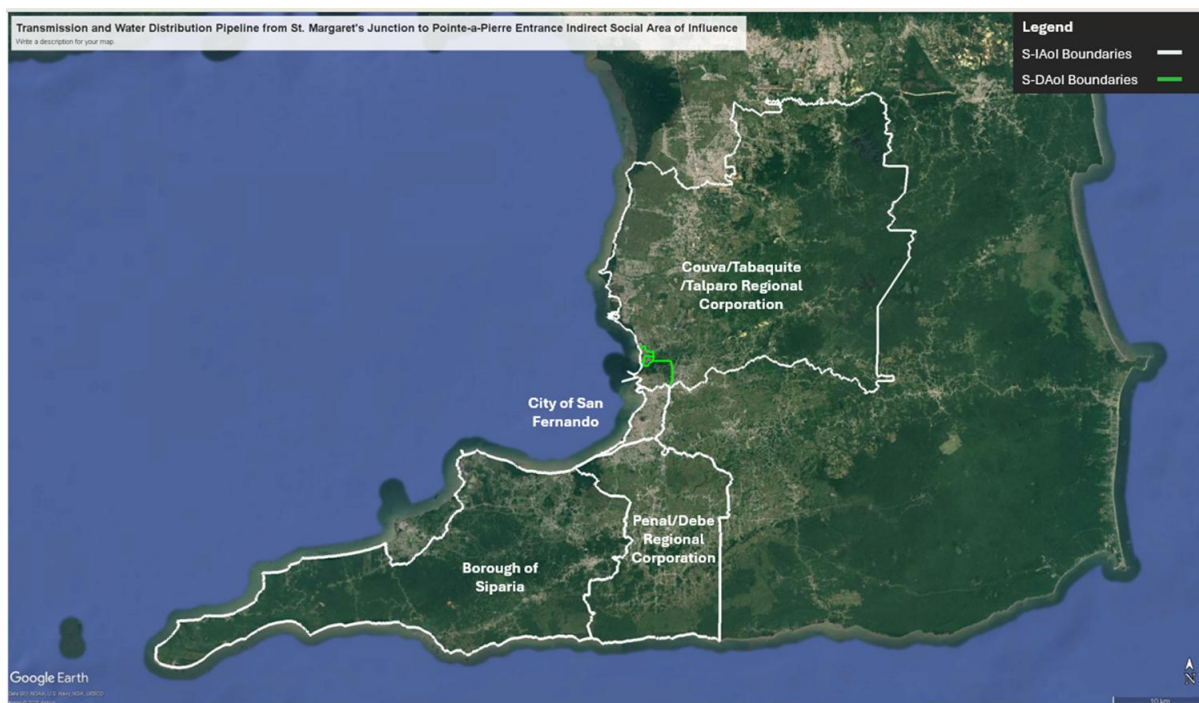


Figure 2: Social Indirect Area of Influence Boundaries for St. Margaret's Junction to Pointe-à-Pierre Entrance Pipelines

4.4.3 Social Indirect Area of Influence

The S-IAoI reflects the wider system served or influenced by the Caroni South Transmission System and associated distribution improvements. The project is intended to reconnect the existing 525 mm main to the proposed 600 mm transmission pipeline, remove hydraulic bottlenecks, replace aged and undersized 200 mm distribution mains, improve levels of service to a minimum target of 24/3, reduce reliance on truck-borne water, and strengthen resilience and redundancy for existing and future demand. Hydraulic reconfiguration is also expected to improve flow redistribution toward Siparia and other water-stressed communities, while increasing throughput to the San Fernando Booster.

Although water-sector planning, financing, development, and regulation are primarily undertaken by national institutions, the S-IAoI is defined at the municipal level because municipal boundaries provide a practical administrative framework for identifying affected communities, institutions, and service beneficiaries. The project's wider social effects, including improvements in water reliability, pressure management, emergency water supply arrangements, and community services, are experienced across municipal jurisdictions and involve stakeholders who operate within these administrative areas. Municipal corporations also have responsibilities for local roads, drains, garbage collection, community facilities, public health and sanitation, and truck-borne water, making them important stakeholders in project coordination, community engagement, and the assessment of indirect and cumulative social effects.

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Wider benefits in the S-IAol are expected to include improved water availability, more stable pressure, reduced leakage and non-revenue water, improved operational flexibility during maintenance or network disruptions, reduced dependence on emergency trucking, and stronger resilience of the potable water system. Implementation will require coordination among WASA, the contractor, municipal authorities, traffic and road agencies, utility operators, industrial stakeholders in Pointe-à-Pierre/Trintoc, and directly affected communities. Key coordination issues include traffic and access management, drainage, construction waste and excavated material management, disaster preparedness, public communication, community health and safety, service disruption notices, stakeholder engagement, emergency response, road reinstatement, and grievance management.

Parallel Installation of 3.3 km 600mm (24") Ductile Iron Transmission Pipeline Pointe-à-Pierre; and 200mm (8") PVC Water Distribution Pipeline from St. Margaret's Junction to Pointe-à-Pierre Entrance.

4.4.4 Demographic and Social Structure

4.4.4.1 Population and Housing Characteristics

The S-Aol is situated within a wider southern and south-central municipal context that contains a substantial share of Trinidad and Tobago's population, while the directly affected communities form a much smaller and more localised settlement area along the pipeline corridor. In 2011, the S-IAol recorded a total population of 403,589 persons, representing 30.4 percent of the national population (Central Statistical Office of Trinidad and Tobago, 2012a). Couva/Tabaquite/Talparo accounted for the largest share of the S-IAol population, with 178,410 persons, or 44.2 percent of the S-IAol. Penal/Debe and Siparia each accounted for just over one-fifth of the S-IAol population, at 22.1 percent and 21.5 percent, respectively, while the City of San Fernando accounted for 12.1 percent. The non-institutional population was very close to the total population across the S-IAol, indicating that the area was overwhelmingly composed of residents in private households rather than institutional settings.

Table 2: Key S-Aol Population Indicators, 2011

Administrative Area	Total Population	Population Density
Trinidad and Tobago	1,328,019	259.0
S-IAol	403,589	272.1
Couva/Tabaquite/Talparo	178,410	246.8
Penal/Debe	89,392	363.4
Siparia	86,949	175.7
City of San Fernando	48,838	2570.4
S-DAol	4,564	401.0
St. Margaret	2,335	1805.9
Plaisance Park	1,769	2181.5
Trintoc (Pointe-à-Pierre)	460	49.6

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Source: Central Statistical Office of Trinidad and Tobago. (2012). Trinidad and Tobago 2011 Population and Housing Census: Demographic Report.

The S-DAol recorded a total population of 4,564 persons in 2011, equivalent to 2.6 percent of the population of Couva/Tabaquite/Talparo. Population within the S-DAol was concentrated mainly in St. Margaret and Plaisance Park. St. Margaret accounted for 2,335 persons, or 51.2 percent of the S-DAol population, while Plaisance Park accounted for 1,769 persons, or 38.8 percent. Trintoc (Pointe-à-Pierre) had a much smaller residential population of 460 persons, representing 10.1 percent of the S-DAol. This distribution suggests that the residential receptors within the directly affected area are concentrated primarily around St. Margaret and Plaisance Park, while Trintoc reflects a lower-population area associated with the wider Pointe-à-Pierre industrial setting.

Population density varied sharply across the S-Aol, reflecting the contrast between urban, suburban, rural, and industrial land-use contexts. The S-IAol had an overall population density of 272.1 persons per km², slightly above the national density of 259.0 persons per km². Within the S-IAol, the City of San Fernando was the most densely populated area, at 2,570.4 persons per km², while Siparia was the least dense, at 175.7 persons per km². The S-DAol had a higher overall density than the S-IAol, at 401.0 persons per km², although this average masks strong community-level differences. Plaisance Park and St. Margaret were comparatively dense, at 2,181.5 and 1,805.9 persons per km², respectively, while Trintoc (Pointe-à-Pierre) recorded a much lower density of 49.6 persons per km², as it accounted for most of the S-DAol land area but a small share of its population.

Table 3: Key S-Aol Household Indicators, 2011

Administrative Area	Household Count	Average Household Size
Trinidad and Tobago	401,373	3.3
S-IAol	119,124	3.4
Couva/Tabaquite/Talparo	51,822	3.4
Penal/Debe	26,067	3.4
Siparia	26,125	3.3
City of San Fernando	15,110	3.2
S-DAol	1,424	3.2
St. Margaret	725	3.2
Plaisance Park	575	3.1
Trintoc (Pointe-à-Pierre)	124	3.7

Source: Central Statistical Office of Trinidad and Tobago. (2012). Trinidad and Tobago 2011 Population and Housing Census: Demographic Report.

Household data reinforce the relatively concentrated residential character of St. Margaret and Plaisance Park within the directly affected area. In 2011, the S-IAol recorded 119,124 households, representing 29.7 percent of national households. Couva/Tabaquite/Talparo accounted for 51,822

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households, or 43.5 percent of the S-IAoI total, followed by Siparia and Penal/Debe, each with about 21.9 percent. The S-DAoI recorded 1,424 households, equivalent to approximately 2.7 percent of households in Couva/Tabaquite/Talparo. St. Margaret accounted for 725 households, or 50.9 percent of S-DAoI households, while Plaisance Park accounted for 575 households, or 40.4 percent. Trintoc (Pointe-à-Pierre) accounted for 124 households, or 8.7 percent.

Average household size in the S-IAoI was 3.4 persons, slightly above the national average of 3.3 persons. The S-DAoI average was lower, at 3.2 persons per household, although Trintoc (Pointe-à-Pierre) recorded a larger average household size of 3.7 persons compared with 3.2 in St. Margaret and 3.1 in Plaisance Park. Household-size distribution also shows some internal variation. Small households of two to three persons were the largest category in the S-DAoI, accounting for 42.2 percent of households, while single-person households accounted for 18.6 percent. Medium households of four to six persons accounted for 34.0 percent, and large households of more than six persons accounted for 5.2 percent. Plaisance Park had the strongest small-household profile, while Trintoc (Pointe-à-Pierre) had a higher share of medium and large households than the other directly affected communities.

The demographic and household profile points to a directly affected area where potential community exposure is likely to be concentrated in St. Margaret and Plaisance Park, given their larger residential populations, higher densities, and greater number of households. Trintoc (Pointe-à-Pierre) has a smaller residential base but a comparatively larger household size, which may warrant field verification given its industrial land-use context and smaller population base. These conditions provide an important baseline for understanding the distribution of residential receptors, household sensitivity, and community-level engagement needs along the proposed pipeline route.

4.4.4.2 Age and Gender Composition

The S-DAoI had a slightly older age profile than the wider S-IAoI and national population, although the pattern varied noticeably between the directly affected communities. In 2011, the working-age population accounted for 69.7 percent of the S-DAoI, slightly below the S-IAoI share of 71.6 percent and the national share of 70.5 percent (Central Statistical Office of Trinidad and Tobago, 2012a). Children under 15 years accounted for 19.1 percent of the S-DAoI, compared with 20.0 percent in the S-IAoI and 20.6 percent nationally. Older adults aged 65 years and over made up 11.2 percent of the S-DAoI, above both the S-IAoI figure of 8.4 percent and the national figure of 8.9 percent.

Table 4: Key Age and Sex Composition Indicators, 2011

Administrative Area	Age Group (%)			Total Age Dependency Ratio	Median Age (yrs)	Sex Ratio
	Children <15 yrs	Working Age	Older Adults 65+ yrs			

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		15–64 yrs				
Trinidad and Tobago	20.6	70.5	8.9	41.9	32.6	100.3
S-IAoI	20.0	71.6	8.4	39.7	32.9	102.6
Couva/Tabaquite/Talparo	20.4	72.3	7.3	38.3	32.4	103.6
Penal/Debe	19.2	72.7	8.1	37.6	33.2	103.5
Siparia	20.5	70.4	9.1	42.1	32.3	104.2
City of San Fernando	19.0	69.1	12.0	44.8	34.7	94.9
S-DAoI	19.1	69.7	11.2	43.5	35.3	97.9
St. Margaret	20.9	69.5	9.6	43.8	33.4	104.9
Plaisance Park	16.1	68.3	15.6	46.5	39.1	93.0
Trintoc (Pointe-à-Pierre)	21.3	76.0	2.7	31.6	32.8	83.6

Source: Central Statistical Office of Trinidad and Tobago. (2012). Trinidad and Tobago 2011 Population and Housing Census: Demographic Report.

The older age profile of the S-DAoI was driven mainly by Plaisance Park. Plaisance Park recorded the highest median age among the directly affected communities, at 39.1 years, and the highest share of older adults, at 15.6 percent. It also had the lowest child share, at 16.1 percent, and the lowest share of persons under 35 years, at 45.0 percent. St. Margaret had a more balanced age structure, with a median age of 33.4 years, a child share of 20.9 percent, and older adults accounting for 9.6 percent. Trintoc (Pointe-à-Pierre) recorded a younger profile overall, with a median age of 32.8 years, the highest working-age share in the S-DAoI at 76.0 percent, and a very low older-adult share of 2.7 percent. Given Trintoc's small population, these community-level proportions should be interpreted with caution and would require field verification if used to assess household vulnerability at a fine scale.

Age dependency was also higher in the S-DAoI than in the wider S-IAoI, reflecting the relatively higher share of older residents in parts of the directly affected area. The S-DAoI recorded a total age dependency ratio of 43.5 dependants per 100 working-age persons, compared with 39.7 in the S-IAoI and 41.9 nationally. Plaisance Park had the highest total dependency ratio among the directly affected communities, at 46.5, driven mainly by an aged dependency ratio of 22.9. St. Margaret recorded a similar total dependency ratio of 43.8, but with a stronger child-dependency component. Trintoc (Pointe-à-Pierre) recorded the lowest dependency ratio, at 31.6, consistent with its larger working-age share and smaller older-adult population.

The gender profile of the S-DAoI was more female-weighted than the wider S-IAoI. Males accounted for 49.5 percent of the S-DAoI population, compared with 50.6 percent in the S-IAoI and 50.1 percent nationally. The S-DAoI sex ratio was 97.9 males per 100 females, while the S-IAoI recorded 102.6 males per 100 females. At the community level, St. Margaret had a slight male majority, with a sex ratio of 104.9, while Plaisance Park and Trintoc (Pointe-à-Pierre) had female-majority populations, with sex ratios of 93.0 and 83.6, respectively. The female-weighted profile was most evident among older adults in St. Margaret and Plaisance Park, where women made up the majority of the older

population. Trintoc recorded a male majority among older adults, but the very small older-adult population limits the reliability of this pattern as a baseline indicator.

The S-DAol therefore combines a generally mature age structure with important community-level differences. Plaisance Park appears more sensitive to age-related vulnerability because of its older population and higher aged dependency, while St. Margaret has a broader household and child-dependency profile. Trintoc (Pointe-à-Pierre) is more strongly working-age in composition but has a small residential base. This age and gender profile is relevant to understanding household sensitivity to construction disturbance, temporary access constraints, communication needs, and the design of engagement approaches for residents who may be older, less mobile, or dependent on working-age household members.

4.4.4.3 Vulnerable Groups

Vulnerability within the S-Aol is shaped by the combined effects of age, disability, health status, household structure, income, service access, and exposure to environmental or infrastructure-related stressors. Within the S-DAol, the most relevant demographic vulnerability factors are the presence of older residents, children, persons with disabilities, and households that may have limited support or mobility. At the wider S-IAol level, vulnerability is uneven, with parts of the area showing higher sensitivity linked to chronic illness, disability, poverty, water and information access, drainage, flooding, and constraints in wider municipal coping capacity.

Older persons are a key vulnerable group in the directly affected area, particularly in Plaisance Park. As noted in the Age and Gender Composition Section, older adults aged 65 years and over accounted for 11.2 percent of the S-DAol population, exceeding the S-IAol and national figures. Plaisance Park had the highest older-adult share among the directly affected communities, at 15.6 percent, and the highest median age, at 39.1 years. Age-related sensitivity is most evident in Plaisance Park but remains relevant across the wider directly affected area. Although St. Margaret had a lower older-adult share, its larger population means that it may still contain a notable number of older residents. This group may be more affected by temporary access restrictions, pedestrian safety risks, noise, dust, and changes in daily movement patterns during construction.

Health-related vulnerability is more pronounced among older residents across the S-IAol. In 2011, chronic illness prevalence in the general population ranged from 18.9 percent in Siparia to 22.1 percent in the City of San Fernando, but was substantially higher among persons over 60 years, ranging from 51.5 percent in San Fernando to 59.8 percent in Penal/Debe (Central Statistical Office of Trinidad and Tobago, 2012a). Couva/Tabaquite/Talparo, the municipality within which the S-DAol is located, recorded a chronic illness prevalence of 21.5 percent overall and 58.1 percent among persons over 60 years. Among older adults, the main reported conditions were hypertension, diabetes and arthritis. These municipal-level indicators provide a useful proxy for health sensitivity in the S-DAol, particularly where older residents may be more affected by dust, noise, heat, mobility

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constraints, temporary changes in access, or disruptions to routine travel for health care and daily needs.

Children also form an important receptor group, although the S-DAol did not show a notably high child-dependency profile compared with the wider S-IAol. Children under 15 years accounted for 19.1 percent of the S-DAol population, with St. Margaret and Trintoc (Pointe-à-Pierre) recording higher child shares than Plaisance Park. Regional child living-arrangement data provide a useful proxy for the wider southern context. In the South West region, 60.3 percent of children were living with both parents in 2022, compared with 51.0 percent nationally, while 26.9 percent lived with their mother only, 7.2 percent with their father only, and 5.3 percent with neither parent (Central Statistical Office, 2023). The South West profile therefore appears somewhat less exposed than the national pattern to single-parent or no-parent living arrangements, but a minority of children remain in household circumstances that may carry higher social or caregiving sensitivity.

Persons with disabilities are present across both the S-IAol and S-DAol, with community-level differences relevant to access and communication needs. In 2011, the S-IAol recorded 16,792 persons with disabilities, representing 32.1 percent of all persons with disabilities nationally, with a disability prevalence of 4.5 percent compared with 4.3 percent nationally (Central Statistical Office of Trinidad and Tobago, 2012a). Prevalence was highest in Siparia and Penal/Debe, at 5.1 percent and 5.0 percent, respectively, followed by the City of San Fernando at 4.4 percent and Couva/Tabaquite/Talparo at 4.0 percent.

Within the S-DAol, 191 persons with disabilities were recorded, with St. Margaret accounting for 56.5 percent, Plaisance Park for 40.5 percent and Trintoc (Pointe-à-Pierre) for 3.0 percent. Disability prevalence within the S-DAol was highest in St. Margaret, at 5.5 percent, followed by Plaisance Park at 4.7 percent and Trintoc at about 1.5 percent. Disability in the S-DAol was mainly associated with seeing (45.2%) and mobility-related limitations (38.1%). St. Margaret had a particularly high share of seeing limitations among persons with disabilities (62.1%), while Plaisance Park recorded a higher share of walking limitations (52.9%).

Municipal risk and vulnerability indicators provide useful S-IAol context but should not be read as direct community-level conditions for the S-DAol. Couva/Tabaquite/Talparo was assessed as having very high multi-hazard exposure and moderate vulnerability, with environmental stress as a key driver and reported household concerns related to drainage and flooding (Pacific Disaster Center (PDC Global), 2020). Penal/Debe recorded very low coping capacity, while Siparia recorded high vulnerability, driven in part by clean-water and information-access vulnerabilities. Higher poverty levels may contribute to increased social vulnerability and reduced capacity to prepare for, respond to, and recover from hazards; in this context, Siparia had the highest poverty rate among the S-IAol municipalities at 27.7 percent (Kairi Consultants Limited, 2007).

The vulnerability profile of the S-Aol is therefore mixed rather than uniform. St. Margaret is important because it has the largest residential and disability-affected population in the immediate area, while Plaisance Park is important because of its older age structure and greater mobility-related sensitivity.

4.4.5 Sociocultural Context

4.4.5.1 Ethnic Composition

The S-Aol reflects the ethnic diversity of southern and central Trinidad, although the S-IAol and S-DAol had different ethnic profiles. In 2011, the S-IAol was more strongly East Indian than the national population, with East Indian persons accounting for 57.1 percent of the non-institutional population, compared with 37.8 percent nationally. African persons accounted for 23.3 percent of the S-IAol population, below the national share of 36.5 percent, while persons of mixed ethnicity accounted for 18.9 percent when the mixed African/East Indian and mixed other categories are combined (Central Statistical Office of Trinidad and Tobago, 2012a).

Municipal-level differences show that the S-IAol is not culturally uniform. Penal/Debe had the strongest East Indian profile, at 75.1 percent, followed by Couva/Tabaquite/Talparo, at 60.6 percent. Siparia was more mixed, with East Indian persons accounting for 45.1 percent and African persons for 32.7 percent. The City of San Fernando had a more plural urban profile, with African persons accounting for 38.3 percent, East Indian persons for 32.6 percent, and mixed other persons for 18.6 percent.

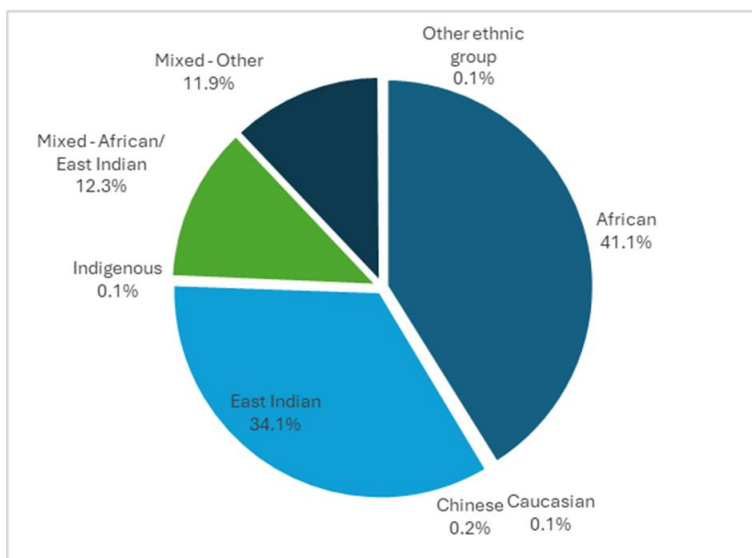


Figure 3: Ethnic Composition of S-DAol, 2011

Source: Central Statistical Office of Trinidad and Tobago. (2012). Trinidad and Tobago 2011 Population and Housing Census: Demographic Report.

The S-DAol had a more balanced ethnic composition than the wider S-IAol. African persons accounted for the largest share of the S-DAol population, at 41.1 percent, followed by East Indian

persons at 34.1 percent. Persons of mixed ethnicity accounted for a combined 24.2 percent, comprising 12.3 percent mixed African/East Indian and 11.9 percent mixed other. Other ethnic groups each accounted for less than one percent of the S-DAol population.

Community-level differences within the S-DAol were also evident. Plaisance Park had the strongest African profile, with African persons accounting for 47.3 percent of the community population, compared with 23.6 percent East Indian and 28.4 percent mixed ethnicity. St. Margaret was more evenly divided between East Indian and African residents, at 41.8 percent and 37.8 percent, respectively, with mixed ethnicity accounting for 20.0 percent. Trintoc (Pointe-à-Pierre) also had a broadly mixed profile, with East Indian persons accounting for 36.7 percent, African persons for 34.0 percent, and mixed other persons for 20.8 percent, although these proportions should be interpreted cautiously given the community's small population base.

The ethnic composition of the S-DAol points to a socially mixed directly affected area rather than a single dominant community identity. Local social networks, community representation, religious and cultural institutions, and engagement pathways may therefore vary across St. Margaret, Plaisance Park and Trintoc (Pointe-à-Pierre).

4.4.5.2 Religious Composition

The S-DAol had a stronger Christian profile than the wider S-IAol, while the S-IAol reflected the larger East Indian and Hindu presence typical of much of south and central Trinidad. In 2011, Christians accounted for 72.8 percent of the S-DAol population, compared with 53.8 percent in the S-IAol and 66.1 percent nationally. Protestants accounted for 46.0 percent of the S-DAol population, above both the S-IAol share of 36.0 percent and the national share of 40.2 percent. Hinduism was the second largest broad affiliation in the S-DAol, at 16.8 percent, but was less prominent than in the S-IAol, where Hindus accounted for 32.7 percent of the population (Central Statistical Office of Trinidad and Tobago, 2012a).

Religious composition varied substantially across the S-IAol municipalities. Penal/Debe had the strongest Hindu profile, at 46.9 percent, followed by Couva/Tabaquite/Talparo at 34.3 percent and Siparia at 25.9 percent. The City of San Fernando had the strongest Christian profile, with Christians accounting for 74.4 percent of the population and Roman Catholics alone accounting for 26.8 percent. Protestant denominations were also most prominent in San Fernando and Siparia, at 46.0 percent and 39.4 percent, respectively.

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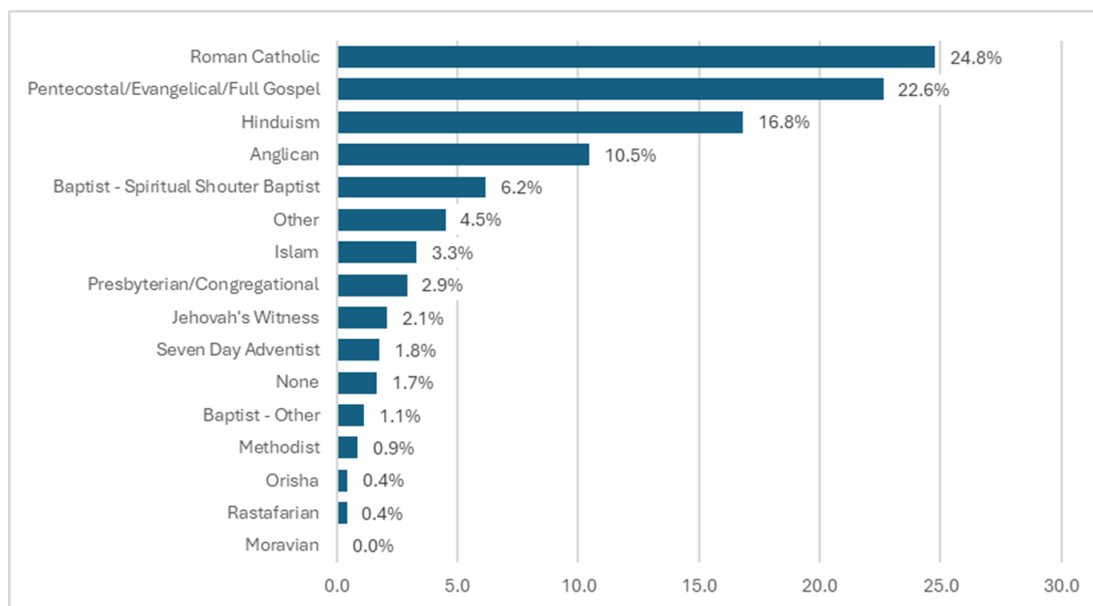


Figure 4: Religious Composition of S-DAol, 2011

Source: Central Statistical Office of Trinidad and Tobago. (2012). Trinidad and Tobago 2011 Population and Housing Census: Demographic Report.

Within the S-DAol, Roman Catholics accounted for the largest single affiliation, at 24.8 percent, followed by Pentecostal/Evangelical/Full Gospel at 22.6 percent, Hinduism at 16.8 percent, Anglican at 10.5 percent, Spiritual Shouter Baptist at 6.2 percent and Islam at 3.3 percent. Community-level differences were also evident. Plaisance Park had the strongest Christian profile, with Christians accounting for 82.0 percent of the population and Roman Catholics alone accounting for 34.8 percent. St. Margaret was more religiously mixed, with Christians accounting for 67.0 percent and Hindus for 22.9 percent, and had the highest Pentecostal/Evangelical/Full Gospel share in the S-DAol, at 24.5 percent. Trintoc (Pointe-à-Pierre) had a smaller but more plural profile, with Christians accounting for 65.2 percent, Hindus for 13.5 percent and Muslims for 12.6 percent; these proportions should be interpreted cautiously because of the community's small population base.

The religious profile of the S-DAol suggests that engagement may intersect with a range of faith-based networks, particularly Christian denominations in Plaisance Park and St. Margaret, while Hindu and Muslim residents remain part of the local social fabric. Religious institutions and informal faith-based networks may therefore be important channels for understanding community concerns, sharing information and recognising culturally appropriate timing for engagement activities.

4.4.5.3 Safety and Security

Safety and security conditions within the S-Aol are best understood through crime patterns reported for the Southern Police Division, which provides the most relevant available crime baseline for the S-DAol communities of St. Margaret, Plaisance Park and Trintoc (Pointe-à-Pierre), all of which fall within

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the Division's jurisdiction. The data are reported at the divisional rather than community level and should therefore be interpreted as the broader policing context for the S-DAoI, rather than as crime conditions specific to each directly affected community.

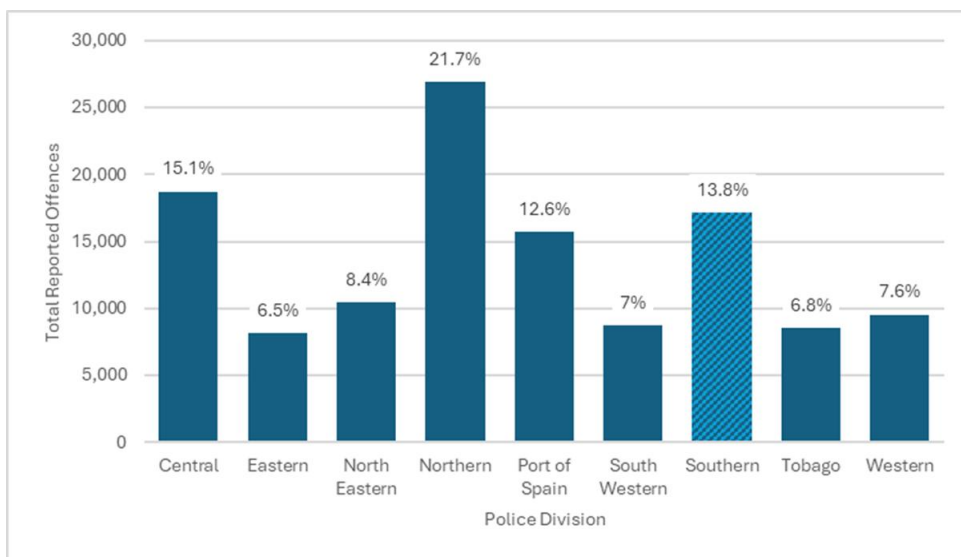


Figure 5: 2015-2025 Total Reported Crime by Police Division

Source: Crime and Problem Analysis Branch of the Trinidad and Tobago Police Service. (2025). Total Crime by Division Report

Between January 2015 and December 2025, the Southern Division recorded 17,181 reported offences, representing 13.8 percent of all reported offences nationally (Crime and Problem Analysis Branch of the Trinidad and Tobago Police Service, 2025). Property-related and violent offences dominated the divisional profile, together accounting for 72.0 percent of all reported offences over the period (Crime and Problem Analysis Branch of the Trinidad and Tobago Police Service, 2026). Property crime was the largest broad category, with 6,643 reported offences (38.7%). The main property-crime categories were burglaries and break-ins, with 2,317 incidents (13.5%); general larceny, with 1,896 incidents (11.0%); and motor-vehicle larceny, with 1,209 incidents (7.0%).

Violence and violent crime accounted for 5,723 reported offences (33.3%). Robbery was the largest single offence category, with 4,006 reported incidents (23.3%). Other serious violent offences included woundings and shootings, with 863 incidents, and murders, with 672 incidents, over the review period. Firearm-related offences were also prominent, with possession of firearms and ammunition accounting for 1,697 reported cases (9.9%). Sexual offences, comprising rape, incest and sexual offences together with serious indecency, totalled 1,153 incidents (6.7%). Narcotics offences totalled 763 incidents (4.4%), while other offences totalled 1,202 incidents (7.0%).

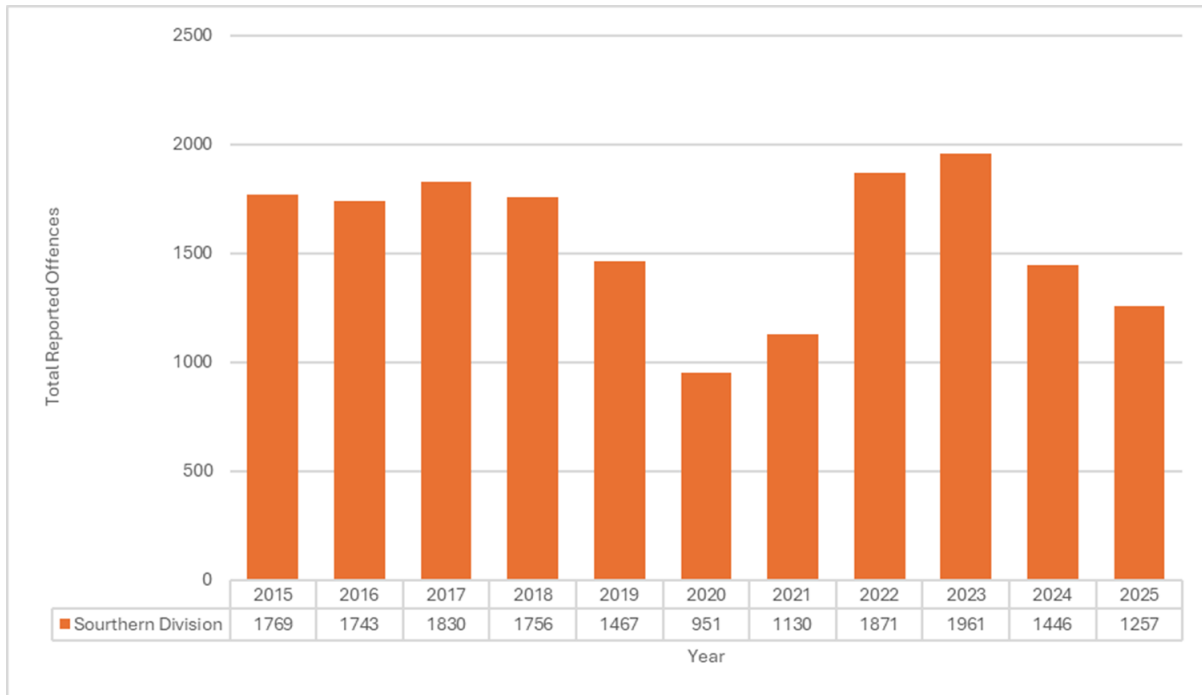


Figure 6: Yearly Total Reported Crime in Southern Division, 2015 - 2025

Source: Crime and Problem Analysis Branch of the Trinidad and Tobago Police Service. (2025). Total Crime by Division Report

Reported crime varied over time rather than following a single linear trend. Annual reported offences remained relatively high between 2015 and 2018, ranging from 1,743 to 1,830 offences, before declining to 1,467 in 2019. Reported offences fell more sharply in 2020 to 951 and remained lower in 2021 at 1,130, coinciding with the COVID-19 period, when public health restrictions, altered mobility patterns, and changes in reporting or enforcement activity may have influenced recorded crime levels. Reported offences then increased to 1,871 in 2022, peaked at 1,961 in 2023, and declined to 1,446 in 2024 and 1,257 in 2025.

Changes in the composition of offences were also evident over the review period. Reported robberies declined from 509 incidents in 2015 to 185 in 2021, increased during 2022 and 2023, and then fell to 179 in 2025. Burglaries and break-ins showed a similar downward trend, decreasing from 352 incidents in 2015 to 135 in 2025. Firearm possession offences increased after 2016, with annual reported cases ranging between 118 and 232 from 2020 to 2025. Sexual offences also rose after 2021, peaking at 259 incidents in 2023 before declining to 125 in 2024 and increasing slightly to 146 in 2025. These trends should be interpreted with caution, as reported crime levels reflect not only underlying patterns of offending but also factors such as reporting behaviour, policing activity, mobility conditions, offence classification practices and enforcement priorities.

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The safety and security baseline, therefore, places the S-DAol within a Southern Division policing context, where property crime, robbery, firearm-related offences, and sexual offences are important recorded crime categories. As community-level crime statistics are not available, these divisional trends cannot be directly attributed to St. Margaret, Plaisance Park or Trintoc (Pointe-à-Pierre). They nevertheless provide useful context for understanding routine movement, temporary works, materials and equipment storage, and access along the project corridor.

4.4.6 Socioeconomic Conditions

4.4.6.1 Educational Landscape

Educational attainment across the S-IAol was broadly comparable to national patterns at the secondary level, although progression to tertiary education was slightly lower. In 2011, 62.1 percent of persons with schooling in the S-IAol had attained at least secondary education, compared with 62.9 percent nationally (Central Statistical Office of Trinidad and Tobago, 2012a). Tertiary education was attained by 14.6 percent of the S-IAol population, below the national figure of 15.8 percent. Within the S-IAol, the City of San Fernando recorded the strongest educational profile, with 69.6 percent attaining at least secondary education and 22.2 percent attaining tertiary education. Tertiary attainment was lower in Couva/Tabaquite/Talparo (13.8%), Penal/Debe (15.0%) and Siparia (11.9%).

Table 5: Key Education Indicators for S-Aol, 2011

Administrative Area	Educational Attainment (%)		Educational Qualifications (%)	
	Secondary and Above	Tertiary	None	GCE 'O'/CXC Gen/SC
Trinidad and Tobago	62.9	15.8	55.1	21.5
S-IAol	62.1	14.6	55.5	22.3
Couva/Tabaquite/Talparo	60.5	13.8	56.6	22.2
Penal/Debe	62.0	15.0	56.4	20.7
Siparia	61.2	11.9	56.8	22.8
City of San Fernando	69.6	22.2	46.9	24.3
S-DAol	65.1	17.4	51.3	24.9
St. Margaret	59.2	9.4	64.8	23.7
Plaisance Park	69.3	20.2	39.1	28.7
Trintoc (Pointe-à-Pierre)	79.4	46.7	25.1	15.6

Source: Central Statistical Office of Trinidad and Tobago. (2012). Trinidad and Tobago 2011 Population and Housing Census: Demographic Report.

The S-DAol recorded a slightly stronger education profile than the wider S-IAol, although outcomes varied across the directly affected communities. In 2011, 65.1 percent of persons with schooling in the S-DAol had attained at least secondary education, exceeding both the S-IAol and national figures. Tertiary attainment was also higher, at 17.4 percent. Secondary education was the most common highest level attained in the S-DAol (44.1%), followed by primary education (30.4%). Tertiary

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university education accounted for 9.7 percent, while tertiary non-university education accounted for 7.4 percent.

Community-level differences were pronounced. St. Margaret recorded the weakest educational profile in the S-DAol, with 59.2 percent attaining at least secondary education and 9.4 percent attaining tertiary education. Primary education was comparatively more common in St. Margaret (36.7%), and 64.8 percent of residents reported having no educational qualification. Plaisance Park recorded stronger outcomes, with 69.3 percent attaining at least secondary education and 20.2 percent attaining tertiary education. Its qualification profile was also stronger, with 39.1 percent reporting no educational qualification and 28.7 percent holding GCE 'O' Level/CXC General/School Certificate qualifications.

Trintoc (Pointe-à-Pierre) had the strongest educational attainment and qualification profile in the S-DAol, although its small population base means the figures should be interpreted cautiously. In 2011, 79.4 percent of persons with schooling had attained at least secondary education, while 46.7 percent had attained tertiary education. The community also recorded relatively high shares of residents with tertiary university education (32.1%), tertiary non-university education (13.8%), diplomas or equivalent certificates of achievement (15.9%), bachelor's degrees (12.4%) and master's degrees (8.6%). Only 25.1 percent reported no educational qualification, substantially below the S-DAol and S-IAol averages.

Gender differences in educational outcomes were evident, particularly at the tertiary level. Across the S-IAol, females were more likely than males to have attained tertiary education, at 16.0 percent compared with 13.3 percent. The same pattern was observed in the S-DAol, where tertiary attainment was 18.6 percent among females and 16.2 percent among males. St. Margaret showed a particularly clear gender difference, with tertiary attainment among females at 11.4 percent, compared with 7.6 percent among males. Plaisance Park also recorded higher female tertiary attainment. Trintoc (Pointe-à-Pierre) differed from the wider pattern, with male tertiary attainment reported at 52.0 percent compared with 42.2 percent among females.

While participation in formal schooling was widespread, formal certification remained limited across much of the S-Aol. In the S-IAol, 55.5 percent of the non-institutional population reported no educational qualification, broadly similar to the national figure of 55.1 percent. The S-DAol recorded a lower no-qualification share (51.3%), although this masks substantial variation among communities. St. Margaret had a notably high no-qualification share, while Plaisance Park and Trintoc (Pointe-à-Pierre) recorded stronger qualification profiles. Across both the S-IAol and S-DAol, the main formal qualification was GCE 'O' Level/CXC General/School Certificate, held by 22.3 percent and 24.9 percent of the population, respectively.

Overall, the S-DAol presents a mixed education profile. Plaisance Park and Trintoc (Pointe-à-Pierre) show stronger educational attainment and qualification outcomes, while St. Margaret has a larger share of residents concentrated at the primary level and without formal qualifications. These

differences help to frame local employment prospects, access to project-related information, capacity to engage with technical communications and the distribution of skills within the directly affected communities.

4.4.6.2 Local Economy and Livelihoods

The S-IAol economy is multi-nodal, with different municipalities contributing distinct economic functions within the wider southern and south-central corridor. The main economic drivers are energy and industrial activity, transport and logistics, urban commerce and services, agriculture and food production, construction, public services, fisheries, and eco-, heritage and cultural tourism. These sectors are spatially uneven, with industrial and logistics activity concentrated around Couva/Point Lisas and Pointe-à-Pierre, higher-order services concentrated in San Fernando, and agriculture, food production, fisheries, and tourism-related assets more prominent in Penal/Debe and Siparia (Kairi Consultants Limited, 2016c, 2016b, 2016a, 2016; Pacific Disaster Center (PDC Global), 2020).

Couva/Tabaquite/Talparo forms the main industrial and logistics anchor within the S-IAol. Its west-central location, access to the Uriah Butler Highway, Sir Solomon Hochoy Highway, Southern Main Road, and Point Lisas port facilities support its role in energy-related production, industrial processing, manufacturing, construction supply chains, transport and distribution. The Point Lisas Industrial Estate and port functions remain central to the municipality's higher-value production base, while the more rural Tabaquite and Talparo areas retain stronger links to agriculture and food production. The municipality's strategic sectors include energy, agriculture and food, eco- and cultural tourism and creative industries, and commerce and distribution (Kairi Consultants Limited, 2016a).

San Fernando is the principal urban service and commercial hub of the S-IAol. Historically, the city's economic role was linked to the oil and asphalt industries, but its position shifted as offshore energy activity expanded and Point Lisas emerged as a major processing and export hub. The city nevertheless remains a central market and service node for southern Trinidad, with economic functions linked to retail and distribution, public administration, finance, health, education, transport, cultural activity, construction and professional services. San Fernando's strategic sectors include energy, agriculture and food, cultural tourism, and commerce and distribution, while its wider service role is reinforced by its location along major southern transport corridors (Kairi Consultants Limited, 2016; Pacific Disaster Center (PDC Global), 2020).

Penal/Debe has a rural-residential and agricultural economic structure, with stronger commuting and service linkages in its northern areas and a more agriculture-oriented profile in its southern and rural communities. Agriculture and food production remain central economic drivers, particularly fruit and vegetable production and processing. The municipality's livelihood base is also supported by construction, transport, local services, commerce and distribution, and eco- and cultural tourism potential. Penal/Debe's strategic sectors are therefore concentrated around agriculture and food,

industrial and commercial activity, eco- and cultural tourism, and commerce and distribution (Kairi Consultants Limited, 2016c).

Siparia has a diversified but spatially uneven economy shaped by energy, industrial activity, agriculture, fisheries, coastal resources and tourism-related assets. Economic activity includes onshore oil production in the Palo Seco and Forest Reserve areas, offshore oil production, mining and industrial operations at La Brea and Brighton, marine fishing along the south-western and southern coasts, and agricultural production across central parts of the municipality. The municipality's coastal and cultural assets support fisheries, domestic recreation, eco-tourism, heritage tourism and cultural tourism, with beaches, wetlands, forest reserves, wildlife habitats, archaeological resources and religious-cultural events forming part of the wider economic landscape. Strategic sectors identified for Siparia include energy, agriculture and food, eco-, heritage and cultural tourism, and commerce and distribution (All-inclusive Project Development Services Limited, 2010; Kairi Consultants Limited, 2016b).

The S-IAol economic profile therefore reflects functional interdependence between industrial nodes, urban service centres, agricultural areas, coastal resources and transport corridors. Couva/Tabaquite/Talparo and San Fernando serve as the primary hubs for industrial, logistics, commercial, and service activities, whereas Penal/Debe and Siparia focus on sectors such as agriculture, food production, fisheries, energy, and tourism. This profile is relevant to understanding how construction-related traffic, access changes, service interruptions and labour or procurement opportunities may be experienced across the wider municipal setting.

4.4.6.3 Business Profile

The S-Aol business environment is best understood through the wider S-IAol establishment profile, with the Pointe-a-Pierre ward serving as a proxy for business activity in the locality surrounding the S-DAol. In 2018, the S-IAol recorded 7,369 business establishments, representing 28.3 percent of the national total (Central Statistics Office Trinidad and Tobago, 2018). Couva/Tabaquite/Talparo accounted for the largest share, with 2,981 establishments (40.5%), followed by the City of San Fernando with 1,882 establishments (25.5%), Penal/Debe with 1,426 establishments, and Siparia with 1,080 establishments.

The S-IAol business base was strongly concentrated in mini-micro, micro and small establishments, although the CSO employment bands do not align exactly with standard enterprise-size thresholds. Among establishments with available employment-size data, the zero-to-one employee band, used as a proxy for mini-micro establishments, accounted for 44.5 percent of S-IAol establishments. Establishments with two to four employees accounted for 21.6 percent, while those with five to 24 employees accounted for 21.1 percent. Together, these bands represented 87.1 percent of S-IAol establishments with available employment-size data. Establishments with 25 or more employees totalled 458 (8.7%), and no S-IAol establishments were recorded in the 1,000-and-over employment-size category.

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The establishment profile varied across municipalities. San Fernando had the most diversified employment-size structure, with 52.0 percent of establishments in the zero-to-four employee range, compared with 70.7 percent in Couva/Tabaquite/Talparo, 68.7 percent in Penal/Debe and 76.8 percent in Siparia. San Fernando also had the highest share of establishments in the five-to-24 employee range, at 28.5 percent. In keeping with having the largest business base, Couva/Tabaquite/Talparo recorded the largest number of establishments with 25 or more employees, at 193, compared with 151 in San Fernando, 66 in Penal/Debe and 48 in Siparia. This suggests that, despite the predominance of smaller establishments across the S-IAol, Couva/Tabaquite/Talparo and San Fernando contained the strongest concentration of medium- and large-scale business activity.

The Pointe-a-Pierre ward provides a useful locality-level proxy for business activity around the S-DAol. In 2023, the ward recorded 17,710 businesses across all location types, comprising 13,642 fixed businesses (77.0%), 3,515 businesses operated at residences (19.8%), 364 mobile businesses (2.1%), and 189 businesses with location not stated (1.1%) (Central Statistics Office of Trinidad and Tobago, 2023). The industry profile was led by community, social and personal services, with 5,819 businesses (32.9%), followed by construction with 3,701 businesses (20.9%), wholesale and retail trade, restaurants and hotels with 3,225 businesses (18.2%), finance, insurance, real estate and business services with 1,473 businesses (8.3%), and other manufacturing with 1,386 businesses (7.8%). Petroleum and gas production, refining and related services accounted for 365 businesses, while agriculture, forestry, hunting and fishing accounted for 643 businesses.

The Pointe-à-Pierre ward profile also indicates a mixed business-size structure, with a notable concentration of larger establishments. Businesses with 10 or more persons accounted for the largest share, at 9,500 businesses (53.9%). Establishments with six to nine persons accounted for 1,574 businesses (8.9%), while those with five persons accounted for 923 businesses (5.2%). Smaller businesses with three or fewer employees together represented 2,015 businesses (11.4%). A further 3,604 businesses (20.4%) reported no persons, suggesting a sizeable share of self-employment and entrepreneurship.

The business profile of the S-Aol therefore points to a broad but small-establishment-oriented enterprise base, with larger and more diverse activity concentrated mainly in Couva/Tabaquite/Talparo and San Fernando. The Pointe-a-Pierre ward profile suggests that the locality surrounding the S-DAol contains a substantial and varied business base, including fixed, residence-based and mobile businesses. Field verification would be required to confirm the type, scale, operating status and frontage sensitivity of businesses directly along the pipeline corridor, particularly where access, traffic, parking, deliveries, customer movement or temporary service disruption may affect day-to-day operations.

4.4.6.4 Labour Market Conditions

Labour force conditions in the S-DAol are best interpreted using the 2023 dataset from the Continuous Survey of the Population for the ward of Pointe-à-Pierre, within which St. Margaret, Plaisance Park, and Trintoc (Pointe-à-Pierre) are located. The data provide a more recent ward-level labour market profile than the 2011 Census, although they are not disaggregated to the directly affected communities and should therefore be used as a proxy rather than as a precise community-level estimate.

In 2023, the Pointe-à-Pierre ward recorded a labour force of 19,840 persons, comprising 17,717 employed and 2,123 unemployed. This represented an unemployment rate of 10.7 percent. Men accounted for 57.3 percent of the labour force and 65.3 percent of unemployed persons, with a male unemployment rate of 12.2 percent. Women accounted for 42.7 percent of the labour force and recorded a lower unemployment rate of 8.7 percent. The gender profile therefore suggests a labour market with higher male participation or labour force presence, but also higher male exposure to unemployment (Central Statistics Office of Trinidad and Tobago, 2023).

Unemployment was concentrated in specific age groups rather than being evenly distributed across the labour force. Young people aged 15 to 24 accounted for 920 unemployed persons, or 43.3 percent of all unemployed persons in the ward, despite representing 14.4 percent of the total labour force. The unemployment rate was particularly high among persons aged 15 to 19 years, at 75.2 percent, and among persons aged 20 to 24 years, at 25.9 percent. Other age groups with relatively high unemployment rates included persons aged 30 to 34 years (16.8%), 50 to 54 years (13.8%), and 55 to 59 years (12.5%). These figures suggest that youth unemployment, together with some mid- to later-working-age labour market vulnerability, is an important feature of the ward-level employment context.

Employment in the Pointe-à-Pierre ward was concentrated mainly in private enterprise, own-account work and government employment. The occupational table recorded 17,712 employed persons, of whom 9,578 were employed in private enterprise (54.1%), 3,424 were own-account workers (19.3%), and 3,047 were employed by central or local government (17.2%). Statutory boards accounted for 741 employed persons (4.2%), employers for 646 persons (3.6%), and learners and apprentices for 276 persons (1.6%).

The occupational structure points to a labour market with a strong base in craft, clerical, elementary, service, technical and operational work. Craft and related workers formed the largest occupational group, with 3,139 employed persons (17.7%), followed by clerks with 2,853 persons (16.1%), elementary occupations with 2,497 persons (14.1%), and service, shop sale workers and defence force occupations with 2,312 persons (13.1%). Legislators, senior officials and managers accounted for 10.4 percent of employment, plant and machine operators and assemblers for 9.4 percent, technicians and associate professionals for 9.8 percent, and professionals for 7.3 percent.

The type-of-worker profile varied by occupation. Private enterprise employment was especially important among plant and machine operators and assemblers, clerks, service and shop sales workers, elementary workers, and craft and related workers. Own-account work was concentrated mainly among craft and related workers, legislators, senior officials, and managers, while government employment was more prominent among professionals, clerks, service workers, and defence-related occupations. Agricultural, forestry and fishery workers formed a small occupational category, with 367 employed persons, all recorded as own-account workers.

The labour force profile of the Pointe-à-Pierre ward points to a mixed employment base shaped by private-sector work, government employment, own-account activity, craft and technical occupations, clerical and service work, and elementary occupations. Youth unemployment is a notable feature of the ward-level profile, while own-account and small-scale work suggests that some households may depend on flexible or self-directed income sources. For the S-DAoI, these conditions are relevant to understanding household sensitivity to construction-related access changes, commuting disruption, temporary service interruptions, and potential local interest in short-term employment or procurement opportunities associated with the project.

4.4.6.5 Incidence of Poverty

Poverty in the S-AoI appears moderate to uneven in national comparative terms, with stronger deprivation indicators in parts of the wider S-IAoI than in the directly affected communities. Household-level economic vulnerability remains relevant where low income intersects with limited savings, transport constraints, health needs, caregiving responsibilities, insecure employment, or dependence on small-scale and own-account livelihoods. The available poverty data include income-based indicators from the 2005 Analysis of the Trinidad and Tobago Survey of Living Conditions and multidimensional indicators based on the 2011 Population and Housing Census and published in the Trinidad and Tobago Human Development Atlas 2012. These datasets capture different aspects of deprivation and should be treated as complementary rather than directly comparable.

Income-based indicators show that poverty was uneven across the S-IAoI. Siparia had the highest income-poverty profile, accounting for 15.1 percent of the national poor population and recording a regional poverty rate of 27.7 percent. Its disparity ratio of 1.7 indicates that its share of the national poor population was substantially higher than its share of the national sample population. Couva/Tabaquite/Talparo accounted for 7.4 percent of the national poor population and recorded a poverty rate of 10.5 percent, while Penal/Debe accounted for 3.7 percent and recorded a poverty rate of 12.0 percent. The City of San Fernando accounted for 2.8 percent and recorded a poverty rate of 11.2 percent. Disparity ratios below 1.0 in Couva/Tabaquite/Talparo, Penal/Debe and San Fernando indicate that these municipalities were not disproportionately represented among the poor relative to their sample population shares, although poverty remained present in each area (Kairi Consultants Limited, 2007).

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Multidimensional poverty indicators provide a broader view of deprivation across health, education and standard of living. Penal/Debe recorded the highest MPI among the S-IAol municipalities, at 0.020, followed by Couva/Tabaquite/Talparo at 0.018; both were above the national MPI of 0.017 (Central Statistical Office of Trinidad and Tobago, 2012b). Penal/Debe also recorded the highest multidimensional poverty headcount ratio in the S-IAol, at 7.2 percent, followed by Couva/Tabaquite/Talparo at 6.8 percent. Siparia recorded a lower MPI of 0.013 and a headcount ratio of 5.0 percent, while the City of San Fernando recorded the lowest MPI and headcount ratio nationally, at 0.007 and 2.7 percent, respectively.

The number of persons affected by multidimensional poverty was highest in Couva/Tabaquite/Talparo, with 12,331 multidimensionally poor persons, compared with 6,991 in Penal/Debe, 4,565 in Siparia and 1,465 in the City of San Fernando. Poverty intensity among the multidimensionally poor was highest in Penal/Debe, at 28.1 percent, followed by Siparia at 26.5 percent, Couva/Tabaquite/Talparo at 26.1 percent, and San Fernando at 24.8 percent. Health deprivation was highest in Penal/Debe and Couva/Tabaquite/Talparo, while Siparia recorded the highest education and standard-of-living deprivation scores nationally. Poverty-related vulnerability across the S-IAol is therefore shaped not only by the share of persons who are poor, but also by the dimensions through which deprivation is experienced.

At the community level, poverty is assessed using a basic needs index derived from the 2000 Population and Housing Census and reported in the 2005 Survey of Living Conditions. The index incorporates housing conditions, household amenities, educational attainment of the household head, overcrowding and household employment rates (Kairi Consultants Limited, 2007). The S-DAol communities were not concentrated among the most deprived communities nationally, although St. Margaret appears more socio-economically sensitive than Plaisance Park and Pointe-à-Pierre. St. Margaret recorded a poverty score of 47 and ranked 238th-poorest out of 585 communities, matching the national median score. Plaisance Park and Pointe-à-Pierre fall above the third quartile of 52, indicating comparatively lower deprivation by this measure. Plaisance Park recorded a score of 55 and ranked 488th poorest, while Pointe-à-Pierre recorded a score of 68 and ranked 563rd poorest.

Taken together, the income-based and multidimensional indicators point to moderate but uneven economic vulnerability across the S-Aol. Siparia shows stronger income-poverty and living-standard vulnerability, while Penal/Debe and Couva/Tabaquite/Talparo show higher multidimensional poverty indicators. Within the S-DAol, St. Margaret appears more sensitive than Plaisance Park and Pointe-à-Pierre based on the available basic needs scores. Poverty-related sensitivity is likely to vary more by household circumstance than by community-wide deprivation alone, particularly among low-income households, unemployed or underemployed workers, own-account workers, households without reliable transport, older residents, persons with disabilities, and households managing health, caregiving or housing constraints.

4.4.6.6 Cultural Heritage and Archaeological Resources

The cultural heritage context of the S-AoI reflects the layered historical development of south and south-central Trinidad, including Indigenous and colonial settlement, agricultural estates, religious and civic institutions, historic transport corridors, industrial development, ecological conservation and living cultural traditions. Cultural heritage includes tangible resources, such as monuments, historic buildings, landscapes, artefacts, archaeological sites, historic infrastructure and natural features of cultural or scientific interest, as well as intangible resources, including traditions, beliefs, festivals, oral histories, music, foodways, rituals and other practices embedded in community identity.

Cultural heritage and archaeological resources are managed within the national heritage framework established under the National Trust of Trinidad and Tobago Act, Chap. 40:53. The National Trust of Trinidad and Tobago is responsible for identifying, recording and formally listing monuments, sites and places of national significance, including assets of historic, scientific, cultural or archaeological value. Formally listed heritage properties are protected under the Act against unauthorised alteration, damage, injury, or defacement, while the National Trust heritage inventory also includes assets of heritage interest that may not yet have completed the formal listing process.

Heritage resources are unevenly distributed across the S-IAoI. San Fernando's heritage context is linked to its long-standing role as the principal administrative, commercial and transport hub of south Trinidad, with associations including San Fernando Hill, Harris Promenade, the San Fernando Wharf, historic religious buildings, pan yards, mas camps and the Southern Academy for the Performing Arts. Couva/Tabaquite/Talparo contains a diverse heritage and cultural-tourism landscape shaped by religious, plantation-era, industrial, ecological, railway and landmark assets. These municipal resources provide regional context, but the most directly relevant heritage considerations are the assets located within or near the proposed pipeline corridor.

Four National Trust heritage-inventory assets are located within the S-DAoI: the Pointe-à-Pierre Wild Fowl Trust and Pointe-à-Pierre Train Station in Trintoc (Pointe-à-Pierre), the Pointe-à-Pierre Railway Bridge in Plaisance Park, and the Claxton Bay Maiden in St. Margaret. Their presence indicates that the directly affected area is not only a residential and industrial corridor, but also contains recognised natural heritage, railway heritage, industrial history and landmark features. These assets may be sensitive to ground disturbance, vibration, changes in access, construction traffic, and changes in the setting or visibility of heritage places.

The Pointe-à-Pierre Wild Fowl Trust is the most prominent natural heritage asset in the S-DAoI. Located on Bon Accord Road in Pointe-à-Pierre, it is an inland freshwater wetland habitat within the Petrotrin oil fields and the wider petrochemical and oil-refining landscape. Founded in 1966, the reserve supports avian protection, wetland conservation, environmental education and public awareness. The site includes two lakes, nature trails, a learning centre, a guest house, approximately

40 tree species and protected avian species. The National Trust identifies it as a Grade C natural heritage asset that is privately owned and has limited public access.

The Pointe-à-Pierre Train Station reflects the historic importance of railway access to Pointe-à-Pierre, Claxton Bay and the refinery area. The railway passed through Pointe-à-Pierre in 1882, and the station was built in 1885, improving public access to the district and later supporting movement to and from the Pointe-à-Pierre oil refinery after its establishment in 1917. The station served refinery workers and supported the movement of materials, goods and equipment. The National Trust identifies the site as cultural heritage, with railway and oil-industry features, public ownership and limited public accessibility.

The Pointe-à-Pierre Railway Bridge in Plaisance Park is recorded on the National Trust heritage inventory as a cultural heritage asset at Isaac Avenue in Pointe-à-Pierre, within Couva/Tabaquite/Talparo. Although the inventory provides limited descriptive information, the bridge forms part of the wider railway heritage landscape associated with the former Trinidad Government Railway and the movement of people, materials and goods through the Pointe-à-Pierre and Claxton Bay area.

The Claxton Bay Maiden is recorded in the National Trust heritage inventory as a cultural heritage landmark near the Solomon Hochoy Highway, at the Claxton Bay exit. It is publicly owned, fully accessible, and associated with East Indian and Spanish cultural heritage. Within the S-DAoI, it provides a visible heritage reference point associated with St. Margaret and the Claxton Bay corridor.

The wider S-IAoI heritage context is also important, particularly in Siparia and Penal/Debe. Recorded heritage assets are more concentrated in Siparia, which has 33 recorded heritage assets, comprising 26 cultural sites, one mixed site and six natural sites, compared with Penal/Debe's 12 recorded heritage assets, comprising 11 cultural sites and one natural site. Siparia's heritage profile is shaped by archaeological resources, religious traditions, coastal landscapes, natural heritage, industrial history and cultural events, including Banwari Trace, the Pitch Lake, La Brea Vieja, oil and asphalt industrial heritage, the Cedros Peninsula, beaches, forests, wildlife reserves, rivers and swamps (All-inclusive Project Development Services Limited, 2010; Kairi Consultants Limited, 2016b). Its intangible cultural heritage is closely linked to religious observance, music, festivals and community identity, including La Divina Pastora/Soparee Mai, Siparia Fete, Labour Day celebrations, Carnival, and the municipality's association with Daisy Voisin and parang traditions (All-inclusive Project Development Services Limited, 2010; Kairi Consultants Limited, 2016c, 2016b; Parliament of Trinidad and Tobago, 2015).

Penal/Debe's recorded heritage profile is smaller but remains relevant to the wider S-IAoI. Its cultural and environmental context is associated with agricultural settlement, religious and community institutions, the Oropouche Lagoon and natural features such as mud volcanoes. Eco- and cultural tourism form part of the municipality's local development potential, while the Dignity/Digity Mud

Volcano and Bunsee Trace Mud Volcano are among its notable natural and cultural landscape features (Kairi Consultants Limited, 2016c; Parliament of Trinidad and Tobago, 2015).

Archaeological resources are most clearly documented in the wider south-western Trinidad context, particularly through known assets such as Banwari Trace and other sites of historical and pre-Columbian significance in the broader Siparia area. No project-specific archaeological survey evidence has been provided to date for the proposed pipeline alignment, and the works are expected to occur along an existing road and industrial access corridor where prior disturbance from roads, utilities, drainage and industrial infrastructure is likely. However, the presence of National Trust heritage-inventory assets within the S-DAol means that heritage sensitivity remains part of the existing baseline, particularly near Bon Accord Road, the Petrotrin compound, Isaac Avenue, St. Margaret and the Claxton Bay access corridor.

The cultural heritage and archaeological baseline for the S-Aol is characterised by recognised heritage assets within the S-DAol and a wider S-IAol setting with significant industrial, religious, ecological, archaeological and cultural associations. Trintoc (Pointe-à-Pierre) is most closely associated with refinery, railway and ecological heritage; Plaisance Park contains railway-related heritage; and St. Margaret is associated with the Claxton Bay Maiden landmark. The wider Siparia and Penal/Debe context adds archaeological, religious, festival, natural heritage and cultural-tourism significance to the S-Aol.

4.4.7 Natural and Built Resources and Use

4.4.7.1 Land Ownership and Tenure

Land ownership and tenure in the S-Aol reflect a mixed southern and south-central land-use context, combining private and family landholding, State and public land, leasehold arrangements, road and utility corridors, industrial estates, agricultural lands, coastal areas, and pockets of informal occupation. For the S-DAol, the most relevant tenure considerations are associated with established residential communities, the Pointe-à-Pierre industrial setting, public road and utility corridors, and nearby coastal and transport infrastructure.

State and public land interests are important in Couva/Tabaquite/Talparo because of the municipality's industrial, coastal, infrastructure and natural-resource functions. The municipality contains light and heavy industrial parks, the Point Lisas industrial and port complex, former sugarcane lands, agricultural areas, large sporting facilities, forested areas, mangrove swamps, reservoirs, river systems, rural settlements and compact urban development. Land-use patterns are spatially differentiated, with more intensive urban and industrial development west of the Solomon Hochoy Highway and a stronger rural, forested and mixed-agricultural character east of the highway (Kairi Consultants Limited, 2016a). Within this context, the Pointe-à-Pierre and Claxton Bay corridor is influenced by public roads, industrial access, utility infrastructure, railway heritage, petroleum-sector lands and coastal resources.

Agricultural land-use data provide wider S-IAoI context but are not direct indicators of land tenure in the S-DAoI. In 2004, Couva/Tabaquite/Talparo recorded 20,753.4 ha of agricultural land use, of which 11,610.8 ha were cultivated croplands and 4,542.6 ha were classified as all other lands. Penal/Debe recorded 7,498.1 ha of agricultural land use, with 4,192.3 ha under cultivated croplands, while Siparia recorded 6,006.0 ha, with 3,152.2 ha under cultivated croplands. The City of San Fernando recorded only 8.5 ha, reflecting its more urbanised land-use profile. These figures reinforce the contrast between the agricultural and mixed rural-residential components of the wider S-IAoI and the more urban, industrial and corridor-based setting of the S-DAoI (Central Statistical Office of Trinidad and Tobago, 2004).

Private and family landholding is the dominant reported tenure arrangement among households that owned their dwelling unit in both the wider S-IAoI and the S-DAoI. Across the S-IAoI, 63.4 percent of owner-occupier households occupied owned or family land. The share was highest in the City of San Fernando (68.3%) and Penal/Debe (67.7%), followed by Couva/Tabaquite/Talparo (64.2%) and Siparia (55.5%). Private rental of land was most prominent in Siparia (25.2%), while government-leased land was especially prominent in the City of San Fernando (19.4%). Squatted land accounted for 5.6 percent of owner-occupier households across the S-IAoI, with the highest shares in Siparia (7.2%), the City of San Fernando (6.3%) and Couva/Tabaquite/Talparo (5.9%) (Central Statistical Office of Trinidad and Tobago, 2012a).

The S-DAoI recorded a stronger owned or family land profile than the wider S-IAoI. Among owner-occupier households, 78.1 percent occupied owned or family land, compared with 63.4 percent across the S-IAoI. Privately rented land accounted for 8.7 percent, leased private land for 4.2 percent, squatted land for 6.1 percent, and other tenure categories each accounted for less than one percent except “don’t know” responses, which accounted for 0.7 percent. The relatively high owned or family land share suggests a more established residential tenure profile in the directly affected area, although this does not confirm parcel title, road reserve boundaries, encroachments, or tenure conditions affecting non-residential land.

Community-level differences within the S-DAoI are important. Plaisance Park recorded the highest share of owner-occupier households on owned or family land, at 87.0 percent, followed by Trintoc (Pointe-à-Pierre) at 81.5 percent and St. Margaret at 71.1 percent. St. Margaret had the highest private rented land share, at 15.1 percent, and the highest reported squatted land share, at 10.8 percent. Plaisance Park recorded no reported squatted land among owner-occupier households but had a higher leased private land share, at 9.3 percent. Trintoc (Pointe-à-Pierre) recorded 7.4 percent rent-free occupation and 3.7 percent squatted land. These differences suggest that St. Margaret may have the more tenure-sensitive residential profile within the S-DAoI, while Plaisance Park and Trintoc appear more strongly weighted toward owned or family land among dwelling owners.

Informal settlement data provide wider municipal context for tenure insecurity, although they should not be read as evidence of informal occupation within the specific pipeline footprint. The available Land Settlement Agency listing identifies numerous informal settlement sites across

Couva/Tabaquite/Talparo, including areas in Couva, California, Carlsen Field, San Rafael, Longdenville, Claxton Bay, Point Lisas, Preysal and other communities. Sites in the wider corridor include Springvale in Claxton Bay, Teak Village in Claxton Bay, Savanetta in Point Lisas, and several settlements in Couva, California and Carli Bay. There are no site in the provided list is explicitly identified as St. Margaret, Plaisance Park or Trintoc (Pointe-à-Pierre). The presence of informal settlements in the wider municipality nevertheless indicates that tenure insecurity and unplanned occupation form part of the broader land-administration context (Land Settlement Agency, n.d.).

For the S-DAol, land ownership and tenure are therefore characterised by a predominantly owned or family land residential profile, combined with public road and utility corridors, industrial land uses, and some reported tenure sensitivity, particularly in St. Margaret. The proposed pipeline route is understood to follow an existing road and industrial access corridor, where land-use conditions are likely to be shaped by public infrastructure, road reserves, utility easements and adjacent private or institutional properties. Available data do not confirm any direct land acquisition, displacement, or project-related tenure impact. Site-level verification would be required to confirm parcel boundaries, encroachments, informal use, access arrangements, and any sensitive land uses along the directly affected sections of St. Margaret, Plaisance Park and Trintoc (Pointe-à-Pierre).

4.4.8 Access to Infrastructure

4.4.8.1 Education

Access to education in the S-Aol is supported by a broad network of early childhood, primary, secondary, technical/vocational and tertiary institutions across the education districts serving Couva/Tabaquite/Talparo, Penal/Debe, Siparia and the City of San Fernando. The S-DAol communities of St. Margaret, Plaisance Park and Trintoc (Pointe-à-Pierre) fall within a wider education catchment linked primarily to the Victoria Education District, with additional access to facilities in the Caroni and St. Patrick districts through the wider S-IAol. Education access is therefore shaped by school location and road connectivity to Claxton Bay, Pointe-à-Pierre, Marabella, San Fernando, Couva, Penal, Siparia and other surrounding service centres.

At the early childhood level, the S-DAol appears to depend mainly on nearby provision in the wider Claxton Bay and south-central catchment rather than facilities located within each directly affected community. Springvale Government ECCE is located on Mt. Pleasant Road, Springvale, Claxton Bay, while additional ECCE centres are available in La Romaine, San Fernando, Gasparillo, Tabaquite, Debe, Penal and Siparia (Ministry of Education, 2025). Across the relevant districts, there are 32 ECCE centres in Caroni, 25 in Victoria and 13 in St. Patrick, indicating that early childhood provision is available within the wider S-Aol but may require short road-based travel for some S-DAol households.

Primary education is more directly available within and near the S-DAol. St. Margaret's Government Primary School is located on St. Margaret's Old Road in St. Margaret's Village, while Pointe-à-Pierre Government Primary School is located on Station Road, Pointe-à-Pierre. Pointe-à-Pierre Government

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Special School is also located in Bonne Aventure Park, providing specialised education infrastructure within the wider direct-area catchment. Nearby primary schools include Claxton Bay Junior Anglican and Claxton Bay Senior Anglican on Cedar Hill Road, together with schools in Union Village, Macaulay, Marabella, La Romaine, San Fernando, Gasparillo and surrounding communities (Ministry of Education, 2022a). At the district level, primary provision is extensive, with 74 primary schools in Caroni, 87 in Victoria and 61 in St. Patrick.

Secondary education is more centralised and depends more heavily on travel to larger settlements and service centres. The nearest directly relevant secondary facility is Union Claxton Bay Secondary School in Union Village, Claxton Bay. Other accessible schools in the wider catchment include Marabella North Secondary, Marabella South Secondary, La Romaine Secondary, Gasparillo Secondary and several San Fernando secondary schools. The broader S-IAoI also includes secondary schools in Couva, Carapichaima, Preysal, Penal, Debe, Siparia and Point Fortin, depending on household location, school placement and travel arrangements (Ministry of Education, 2022b). At the district level, the relevant secondary network includes 22 schools in Caroni, 30 in Victoria and 15 in St. Patrick.

The Schools of Focus initiative provides additional context on targeted support needs within parts of the school network serving the S-AoI. Within the wider direct-area catchment, Claxton Bay Senior Anglican is listed among the primary Schools of Focus, while Union Claxton Bay Secondary is listed among the secondary Schools of Focus (Ministry of Education, n.d.). The initiative also includes schools in the wider S-IAoI, including Couva South Government in Caroni, Siparia East Secondary and Siparia West Secondary in St. Patrick, and other schools in Victoria. Their inclusion does not describe the performance of all schools serving the S-DAoI, but it indicates that some schools in the wider catchment have been identified for targeted educational support.

Post-secondary, tertiary and technical/vocational education opportunities are concentrated mainly outside the immediate S-DAoI but remain available within the wider S-IAoI. Public tertiary and technical/vocational provision across the relevant districts includes 17 institutions in Caroni, 14 in Victoria and 9 in St. Patrick, associated with institutions and programmes such as COSTAATT, MIC-IT, NESC, UTT, UWI and YTEPP. For S-DAoI residents, access to these opportunities would generally depend on travel to San Fernando, Couva, Chaguanas, Penal, Siparia or other larger centres, as well as affordability, entry requirements, household income and transport availability.

The education infrastructure profile of the S-DAoI is strongest at the primary level, with St. Margaret and Pointe-à-Pierre having direct or nearby access to primary and special education facilities. ECCE and secondary education are available within the wider catchment but may require travel to Springvale, Claxton Bay, Marabella, La Romaine, San Fernando or other nearby centres. Tertiary and technical/vocational education are more strongly concentrated in larger urban and service nodes across the S-IAoI. This profile is relevant to daily student movement, school-related traffic, pedestrian safety, household dependence on road access, and the timing of temporary access or traffic disruption along the pipeline corridor.

4.4.8.2 Health

Access to health services in the S-Aol is organised through the South-West Regional Health Authority (SWRHA), which provides primary and secondary public health care across south-west Trinidad. The SWRHA catchment extends from Freeport to Icacos, Moruga and Tabaquite, and includes hospitals, district health facilities, health centres, outreach centres and extended care facilities. For the S-DAol communities of St. Margaret, Plaisance Park and Trintoc (Pointe-à-Pierre), access to health care is shaped by proximity to Claxton Bay, Marabella, Couva and San Fernando, with higher-order emergency, diagnostic, inpatient and specialist services concentrated outside the immediate area.

Primary health care is available near the S-DAol through the Claxton Bay Health Centre on the Southern Main Road, the most directly relevant public primary care point for St. Margaret and the nearby Claxton Bay/Pointe-à-Pierre communities. Additional facilities in the wider catchment include Marabella Health Centre, La Romaine Health Centre, Gasparillo Health Centre, South Oropouche Health Centre, Roy Joseph Health Centre in San Fernando, Pleasantville Health Centre and Couva District Health Facility. These facilities provide several primary- and district-level access points within the wider road-based service catchment, although practical access depends on transport availability, travel time, service hours, household resources, and the urgency of care.

District-level and emergency health care are more centralised. Couva District Health Facility provides district-level services on the Couva/Tabaquite/Talparo side of the S-IAol, while Siparia District Health Facility serves the wider Siparia area. The SWRHA also administers Princes Town District Health Facility, which forms part of the wider south Trinidad service network. District health facilities provide a higher level of care than standard health centres and may include emergency services, diagnostics, specialist sessions and extended hours, making them important access points for residents requiring more than routine primary care but not necessarily hospital-level.

Hospital-based and specialist care for the S-Aol is concentrated mainly in San Fernando and Point Fortin. San Fernando General/Teaching Hospital, on Independence Avenue in San Fernando, is the principal hospital facility for the wider southern catchment and provides emergency, outpatient, diagnostic, pharmacy, intensive care, high-dependency, medical, paediatric and surgical services. Point Fortin Hospital also forms part of the SWRHA hospital network and provides emergency, specialised, surgical, general medicine, burns, paediatric, mortuary, inpatient and outpatient clinic services. For S-DAol residents, San Fernando is the more immediate higher-order health service centre, while Point Fortin is more relevant to the wider south-western S-IAol context.

Health access across the wider S-IAol varies by municipality and settlement type. San Fernando has the strongest concentration of higher-order health infrastructure, while Couva/Tabaquite/Talparo is served by Couva District Health Facility and health centres in communities such as Couva, Claxton Bay, Freeport, Gasparillo, Gran Couva, Tabaquite, Todd's Road and Williamsville. Penal/Debe is served by facilities including Penal Health Centre, Penal Rock Road Health Centre, Debe Health Centre and Rochard Douglas Health Centre. Siparia has access to Siparia District Health Facility and

health centres in Fyzabad, Palo Seco, Santa Flora, Erin, Cedros, Icacos, La Brea, Guapo and South Oropouche. The wider network is extensive, but access remains dependent on road conditions, travel distance and reliable transport.

The health profile described earlier in the baseline makes access to health services particularly relevant for older adults, persons with disabilities and persons with chronic illnesses. Municipal-level data show high chronic illness prevalence among persons over 60 years across the S-IAoI, with hypertension, diabetes and arthritis among the main reported conditions. These conditions can increase dependence on routine health visits, access to medication, reliable transport, stable household utilities, and timely information during disruptions to roads, services, or daily movement.

The S-DAoI health infrastructure profile therefore reflects reasonable proximity to primary care through Claxton Bay and nearby facilities, with higher-order services available mainly through Couva and San Fernando. St. Margaret and Plaisance Park are likely to depend most directly on facilities in Claxton Bay, Marabella, Couva, and San Fernando, while Trintoc (Pointe-à-Pierre) is similarly linked to service routes in Pointe-à-Pierre, Marabella, and San Fernando. The available facility data do not confirm current capacity, staffing, waiting times, ambulance response times, service quality, transport costs or household-level barriers to care. These conditions are relevant to routine health-related movement, sensitivity among older or chronically ill residents, and the maintenance of access to health facilities during temporary traffic disruptions or changes in access along the pipeline corridor.

4.4.8.3 Community and Recreational

Community and recreational facilities in the S-AoI are provided through a network of regional complexes, community centres, civic facilities, recreation grounds, swimming pools and indoor sporting facilities. These facilities support community meetings, social gatherings, training, public information sharing, cultural activities, recreation and sport, and are therefore relevant to social cohesion, local communication and community participation.

The S-DAoI has direct access to community infrastructure through the Plaisance Park Regional Complex on Long Circular Road, Plaisance Park, Pointe-à-Pierre, and St. Margaret's Community Centre in St. Margaret's Village, Claxton Bay. Nearby facilities in the wider Victoria West catchment include community centres in Macaulay, Marabella, La Romaine, Gasparillo, Pleasantville, Union, Vistabella and San Fernando, while Couva/Tabaquite/Talparo is served by facilities in communities such as Couva, Balmain, Lisas Gardens, Springvale, Union Village, Tabaquite and Waterloo.

Recreational access is also supported by wider district and regional facilities, including the Southern Regional Indoor Sport Arena in Pleasantville, the Couva Community Swimming Pool, the Cocoyea Community Swimming Pool, and other facilities in Siparia, Point Fortin, Chaguanas and Mayaro. For the S-DAoI, practical access to these facilities depends on road connectivity, transport availability, programme schedules, affordability and household time constraints.

The community and recreational facility profile indicates that the S-DAol is not isolated from formal community infrastructure, with particularly direct provision in Plaisance Park and St. Margaret. These facilities may serve as important local reference points for community information, meetings and recreational activity, while access to wider sport and recreation facilities depends more heavily on travel to larger service centres.

4.4.8.4 Water and Sanitation

Water and sanitation access across the S-Aol is generally supported by formal infrastructure, although water source, supply frequency and sanitation arrangements vary between the wider S-IAol and the directly affected communities. The S-DAol recorded stronger access to public pipe-borne water and more frequent public supply than the wider S-IAol, while sanitation was dominated by water closets linked to septic tanks. Trintoc (Pointe-à-Pierre) differs from St. Margaret and Plaisance Park in its much greater reliance on private piped water.

Across the S-IAol, public pipe-borne water was the dominant household source in 2011. Public supply to the dwelling accounted for 70.3 percent of households, while 13.2 percent relied on public supply to the yard, and 2.6 percent used a public standpipe. Together, public pipe-borne sources accounted for approximately 86.1 percent of household water supply. Direct in-dwelling access was strongest in the City of San Fernando (93.4%) and Couva/Tabaquite/Talparo (75.1%). Penal/Debe and Siparia recorded lower in-dwelling access, at 58.1 percent and 58.3 percent, respectively, with greater reliance on yard connections, private catchments and other sources (Central Statistical Office of Trinidad and Tobago, 2012a).

Public water-supply frequency also varied across the S-IAol. Among households connected to public supply, 29.8 percent received water daily, 41.5 percent received water three or more times weekly, and 26.5 percent received water once or twice weekly. Couva/Tabaquite/Talparo recorded the strongest daily supply profile, at 41.9 percent. Penal/Debe had the weakest daily supply profile (12.8%) and the highest once-or-twice-weekly supply share (42.4%), while Siparia also had a relatively intermittent profile, with 35.9 percent receiving public supply once or twice weekly.

Within the S-DAol, access to public pipe-borne water was stronger than the S-IAol average. Public supply to the dwelling accounted for 83.9 percent of households, while 6.7 percent relied on public supply to the yard and 0.6 percent used a public standpipe. Public pipe-borne sources therefore accounted for approximately 91.2 percent of household water supply in the directly affected area. This profile was driven mainly by St. Margaret and Plaisance Park, where public pipe-borne sources accounted for approximately 96.5 percent and 99.8 percent of households, respectively. St. Margaret recorded 86.8 percent of households with public supply to the dwelling, while Plaisance Park recorded 95.4 percent.

Trintoc (Pointe-à-Pierre) recorded a distinct water-source profile. Only 13.8 percent of households reported public pipe-borne water to the dwelling, and 7.3 percent reported public supply to the yard. By contrast, 68.8 percent reported private piped water to the dwelling, while 6.4 percent relied on

truck-borne supply and 3.7 percent on private catchment. This pattern likely reflects the community's industrial and residential estate context, but the nature of these private supply arrangements would require field verification.

The S-DAol also recorded stronger public water-supply frequency than the wider S-IAol. Among households connected to public supply, 73.8 percent received water daily, 19.5 percent received water three or more times weekly, and 6.1 percent received water once or twice weekly. St. Margaret had the strongest daily supply profile, at 87.9 percent. Plaisance Park also recorded relatively favourable supply frequency, with 57.9 percent receiving water daily and 30.5 percent receiving water three or more times weekly. Trintoc again differed from the other S-DAol communities, with 27.3 percent receiving public supply daily, 45.5 percent receiving supply three or more times weekly, and 27.3 percent receiving supply once or twice weekly; this should be read alongside its greater reliance on private piped water.

Sanitation in the S-Aol was dominated by water closets linked to septic tanks, with sewer connections concentrated mainly in the City of San Fernando. Across the S-IAol, 73.2 percent of households used water closets linked to septic tanks, 15.3 percent used water closets linked to sewer systems, and 11.4 percent relied on pit latrines. Sewer connection was highest in the City of San Fernando (53.3%), reflecting its more urban infrastructure profile. Septic tank use was dominant in Couva/Tabaquite/Talparo (76.8%), Penal/Debe (80.0%) and Siparia (76.9%), while pit latrine use was highest in Siparia (17.0%) (Central Statistical Office of Trinidad and Tobago, 2012a).

Within the S-DAol, access to sanitation was more strongly dependent on septic tanks than in the wider S-IAol. In 2011, 83.0 percent of households used water closets linked to septic tanks, 11.4 percent were connected to sewer systems, and 5.5 percent relied on pit latrines. Plaisance Park and Trintoc recorded the strongest septic-tank profiles, at 86.3 percent and 88.1 percent, respectively. St. Margaret recorded a lower septic-tank share (79.5%) and the highest pit-latrine share within the S-DAol (10.6%). Sewer connection was modest across all three communities, ranging from 9.8 percent in St. Margaret to 13.5 percent in Plaisance Park and 11.0 percent in Trintoc.

The S-DAol water and sanitation profile is stronger than the wider municipal context in terms of public pipe-borne coverage and daily supply, particularly in St. Margaret and Plaisance Park. Trintoc is the main exception, with household water access dominated by private piped supply and a more varied frequency of public supply among those connected to the public system. Sanitation is largely septic tank-based, with limited sewer connections and residual pit latrine use, particularly in St. Margaret. These conditions are relevant to household sensitivity to temporary service interruptions, drainage or excavation-related disturbance, sanitation maintenance access, and differences in dependence on public and private water systems along the pipeline corridor.

4.4.8.5 Electricity

Electricity access across the S-Aol is high and broadly consistent with national patterns of near-universal household electrification. Household lighting sources provide a useful proxy for basic

electricity access, although they do not measure supply reliability, outage frequency, affordability, or the condition of household electrical connections.

Across the S-IAoI, 98.0 percent of households used electricity as their main source of lighting in 2011 (Central Statistical Office of Trinidad and Tobago, 2012a). Electricity use was high in all four municipalities, ranging from 96.4 percent in Siparia to 99.4 percent in the City of San Fernando. Couva/Tabaquite/Talparo, Penal/Debe and San Fernando all recorded electricity use above 98 percent, while Siparia recorded the highest reliance on kerosene, at 3.2 percent. Across the S-IAoI, kerosene accounted for 1.7 percent of household lighting and other sources for 0.3 percent, while gas and solar energy were negligible as primary lighting sources.

The S-DAoI recorded even higher reliance on electricity than the wider S-IAoI. In 2011, 99.4 percent of households used electricity as their main lighting source, while 0.6 percent used kerosene. Electricity use was nearly universal across all directly affected communities, at 100.0 percent in Trintoc (Pointe-à-Pierre), 99.8 percent in Plaisance Park and 98.9 percent in St. Margaret. St. Margaret was the only S-DAoI community with a residual kerosene share, at 1.1 percent.

The electricity profile of the S-DAoI therefore indicates strong basic household electrification and limited reliance on non-electric lighting sources. Remaining gaps appear small and are most evident in St. Margaret. Although the data do not confirm service reliability, near-universal electricity use suggests that most households in the immediate area depend on the electrical supply for daily routines, refrigeration, communication, home-based work, small-business activity, water storage or pumping arrangements, and access to digital or broadcast information during temporary disruptions.

4.4.8.6 Information and Communication Technologies

Information and communication technology (ICT) access across the S-AoI is relevant to household communication, education, work, business activity, access to public services, emergency information and stakeholder engagement. ICT access is shaped by infrastructure, affordability, device ownership, digital skills, confidence in online services, age, disability, education and household income. The 2021 Digital Inclusion Survey provides a useful baseline by distinguishing between ICT development, measured through the ICT Development Index (IDI), and broader digital inclusion, measured through the Digital Inclusion Index (DII), which includes access, participation and usage, trust and confidence, and digital readiness (Kairi Consultants Limited, 2022).

Nationally, Trinidad and Tobago recorded an IDI score of 7.86 in 2021, up from 5.55 in 2013, while the national DII score stood at 4.24. Approximately 74.0 percent of households reported a working fixed Internet subscription, mobile phone ownership stood at 83.9 percent, and mobile cellular network coverage was reported at 100.0 percent. These indicators point to broad ICT access but not universal digital inclusion, particularly where households lack fixed Internet access, devices, digital skills, or confidence in online platforms.

Digital inclusion varied across the S-IAol. San Fernando recorded the strongest ICT profile, with an IDI score of 8.05 and a DII score of 4.67, followed by Siparia, which recorded a DII score of 4.61 and an IDI score of 7.82. Couva/Tabaquite/Talparo recorded an IDI score equal to the national score, at 7.86, but a lower DII score of 4.09. Penal/Debe had the weakest S-IAol profile, with an IDI score of 7.66 and a DII score of 3.91. Municipal resilience data also identify Couva/Tabaquite/Talparo as having the fourth-lowest communications capacity nationally, with stronger ICT access in industrial, commercial and urban areas but less reliable service in some remote and rural locations. Penal/Debe recorded the lowest communications capacity ranking nationally (Pacific Disaster Center (PDC Global), 2020).

Within the S-DAol, St. Margaret and Plaisance Park recorded stronger digital access and inclusion than Trintoc (Pointe-à-Pierre). St. Margaret recorded an IDI score of 8.31 and a DII score of 4.59, while Plaisance Park recorded an IDI score of 8.11 and a relatively strong DII score of 5.27. Trintoc recorded a lower IDI score of 7.23 and a DII score of 4.30. Given Trintoc's small residential base and industrial setting, these estimates should be interpreted with caution and would require field verification to confirm actual household connectivity, mobile coverage, and communication practices.

ICT access in the S-DAol appears generally adequate for many households, but not uniform. Plaisance Park and St. Margaret appear better positioned for digital communication and online participation, while Trintoc may require closer attention because of its weaker ICT development score. Across all three communities, older persons, persons with disabilities, low-income households, households without reliable devices or fixed Internet, and residents with lower digital literacy may be less able to rely exclusively on online communication. Mobile phones, WhatsApp, social media and digital notices are likely to be important channels, but printed notices, community-based announcements and direct engagement remain relevant for reaching less digitally connected households.

4.4.8.7 Transportation

Transportation access across the S-Aol is primarily road-based and shaped by national highways, older main roads, industrial access routes, residential streets, public transport routes and pedestrian movement. The S-DAol communities of St. Margaret, Plaisance Park and Trintoc (Pointe-à-Pierre) are located within a corridor where residential access, industrial traffic, school and work commuting, utility infrastructure and local movement overlap, making transport access an important baseline issue for daily mobility and sensitivity to temporary disruption.

At the wider S-IAol level, regional access is structured around the Uriah Butler Highway, Solomon Hochoy Highway and Southern Main Road, which connect Couva/Tabaquite/Talparo, San Fernando, Penal/Debe, Siparia and other south and south-central areas. Couva/Tabaquite/Talparo benefits from direct north-south highway access, while the Southern Main Road provides an important surface-route connection through established communities and commercial areas. The Point Lisas industrial port also supports access to the municipality, while rural eastern and south-eastern areas

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depend on roads such as Caparo Valley–Brasso Road and Tabaquite–Rio Claro Road (Kairi Consultants Limited, 2016a).

The S-DAoI falls within the more developed western Couva/Tabaquite/Talparo corridor, including Claxton Bay and Pointe-à-Pierre, where traffic conditions reflect residential movement, industrial access, port-related activity, schools, commerce and utility-related traffic. The St. Margaret's Junction to Pointe-à-Pierre access corridor links the direct area to the Southern Main Road, Claxton Bay, Plaisance Park, Trintoc, San Fernando and the wider Couva/Pointe Lisas industrial area. Road users are likely to include private vehicles, taxis, maxi-taxis, school transport, pedestrians, service vehicles, utility vehicles and industrial or contractor traffic.

Community-level transport sensitivity differs across the S-DAoI. St. Margaret has the largest residential population in the direct area and is located around a junction that likely serves residents, schools, roadside activity and through-traffic. Plaisance Park has a more compact residential profile and depends on local roads linking households to Claxton Bay, Pointe-à-Pierre, San Fernando and wider service centres. Trintoc has a smaller residential base but is closely linked to the industrial and refinery landscape, where access may be shaped by estate roads, controlled entrances and institutional land-use arrangements.

Public and shared transport are likely to be important for households without private vehicles, students, older persons, persons with disabilities, workers and residents travelling to health, education and commercial services. The S-DAoI's location along established south Trinidad road corridors suggests access to taxis, maxi-taxis and other road-based public transport options, although available data do not confirm service frequency, route coverage, waiting times, fares, operating hours or accessibility for persons with mobility limitations.

Pedestrian access is also relevant because the corridor includes residential streets, schools, small businesses, community facilities, public transport stops and industrial access points. Residents may walk to schools, shops, places of worship, bus and taxi stops, neighbours and local services. Older persons, children, persons with disabilities and households without private vehicles may be more sensitive where road shoulders, sidewalks, crossings, lighting or drainage are limited.

Drainage, flooding and road conditions form part of the wider transport-access context. Couva/Tabaquite/Talparo has very high multi-hazard exposure and moderate vulnerability, with drainage and flooding identified in the municipal risk profile (Pacific Disaster Center (PDC Global), 2020). Although these indicators should not be read as direct conditions in St. Margaret, Plaisance Park or Trintoc, they provide context for how rainfall, drainage constraints and road conditions may affect local movement, construction access and traffic management.

The transportation profile of the S-DAoI reflects a corridor where residential mobility, industrial access, dependence on public transport, pedestrian movement, and utility infrastructure overlap. Local sensitivity is likely to be greatest where daily movement depends on specific junctions, frontage access, school and work travel routes, and access to health, education and commercial

services. These conditions are relevant to temporary lane restrictions, excavation works, contractor traffic, public transport stopping patterns, and short-term access constraints along the pipeline corridor.

4.4.9 Institutional Stakeholder Landscape

The institutional stakeholder landscape for the St. Margaret's Junction to Pointe-à-Pierre pipeline works is shaped by national water-sector institutions, municipal authorities, statutory service providers, public safety agencies, community organisations, faith-based networks, schools, businesses, and informal resident structures operating within the S-DAoI and wider S-IAoI. These institutions are relevant to the baseline because the proposed works are located along an active road and industrial access corridor, where water infrastructure, local roads, drainage, traffic movement, public communication, community safety, business access and service continuity intersect.

4.4.9.1 Government

WASA is the principal water-sector stakeholder for the proposed transmission and distribution pipeline works. Its role is central to potable water transmission, distribution, network operation, customer communication, outage notices, repairs, reinstatement and complaint handling. For the S-DAoI, this role is particularly important because the works involve a 600 mm ductile iron transmission pipeline to Pointe-à-Pierre and a 200 mm PVC distribution pipeline from St. Margaret's Junction to the Pointe-à-Pierre entrance.

Local government oversight is provided mainly by the Couva/Tabaquite/Talparo Regional Corporation, within which St. Margaret, Plaisance Park and Trintoc (Pointe-à-Pierre) are located. The Corporation is relevant to local roads, drains, minor infrastructure maintenance, waste management, public health support, community facilities, disaster management and community-level coordination. It also provides an important interface between residents, councillors, municipal officers and national agencies where concerns relate to access, drainage, traffic, public health, local facilities or community disruption. Penal/Debe, Siparia and San Fernando are also relevant to the wider S-IAoI service, commuting and coordination context.

Roads, traffic and transport institutions are important because the works are corridor-based and may affect the Southern Main Road, St. Margaret's Junction, Pointe-à-Pierre access routes, local streets, school routes, business frontage and industrial traffic. The ministry responsible for works and transport, together with relevant traffic and highway authorities, forms part of the institutional setting for road-use approvals, traffic management, road reinstatement, signage, diversions and road safety.

Public safety and emergency response institutions include the Trinidad and Tobago Police Service, the Trinidad and Tobago Fire Service, municipal disaster management structures and the Office of Disaster Preparedness and Management. These agencies are relevant to traffic control, public safety, emergency access, industrial risk, road safety, flooding, severe weather, utility disruption and incident response. The St. Margaret's Police Station and Southern Police Division provide the most directly relevant policing context for the S-DAoI.

Environmental, planning, health and heritage institutions have issue-specific relevance. The Environmental Management Authority is relevant to environmental permitting and compliance where applicable, while the Town and Country Planning Division and land administration agencies may be relevant to land-use permissions, road reserves, public lands, utility corridors or encroachments. The South-West Regional Health Authority is relevant to public health service access, and the National Trust of Trinidad and Tobago is relevant because four heritage-inventory assets are located within the S-DAol: the Pointe-à-Pierre Wild Fowl Trust, Pointe-à-Pierre Train Station, Pointe-à-Pierre Railway Bridge and Claxton Bay Maiden.

4.4.9.2 *Civil Society*

Civil society stakeholders in the S-Aol include community-based organisations, residents' groups, faith-based institutions, school communities, parent networks, sport and cultural groups, small business networks, transport operators and informal resident networks. These actors influence how information circulates locally, how concerns are raised, and how residents organise around access, safety, utilities, community facilities and daily movement.

Within the S-DAol, civil society is likely to be organised mainly around settlement-level and corridor-based networks rather than large formal non-governmental organisations. St. Margaret's larger residential population suggests a stronger base of resident networks, school-related networks, places of worship and informal community leadership. Plaisance Park may rely more on neighbourhood-level communication and nearby Claxton Bay/Pointe-à-Pierre networks, while Trintoc's smaller residential base and industrial-residential context may shape stakeholder interaction through estate access, worker movement, institutional land-use arrangements, and proximity to heritage and environmental assets.

Faith-based institutions are also relevant given the S-DAol's diverse religious profile, with Christian denominations forming the largest broad affiliation and Hindu and Muslim residents also present. Churches, temples, mosques and related networks may support information sharing, social support and community mobilisation, particularly among residents less connected to digital communication channels.

Schools, community facilities and local businesses form part of the wider stakeholder landscape. St. Margaret's Government Primary School, Pointe-à-Pierre Government Primary School, Pointe-à-Pierre Government Special School, Claxton Bay schools and Union Claxton Bay Secondary are relevant to student movement, parent communication and traffic safety. Community and recreational facilities in the Claxton Bay, Pointe-à-Pierre, Couva and San Fernando catchment may provide spaces for local outreach. Business and livelihood stakeholders, including small shops, service providers, transport operators, vendors, home-based businesses and industrial contractors, may be sensitive to changes in access, customer movement, deliveries, parking, frontage visibility and temporary service interruptions along the corridor.

4.4.9.3 *Participation and Consultation Mechanisms*

Community participation in the S-AoI is likely to occur through formal local government channels, direct communication with WASA, public meetings, school and faith-based networks, community groups, councillor representation, business networks, and informal resident communication. In pipeline and utility contexts, participation is typically issue-driven, with residents raising concerns around water supply, road works, drainage, traffic, reinstatement, construction safety, dust, noise, service notices and access to homes or businesses.

In the S-DAoI, residents are likely to use local representatives, the Couva/Tabaquite/Talparo Regional Corporation, WASA customer channels, the police, and other public agencies to raise issues related to service disruptions, road safety, drainage, access, and reinstatement. Wider coordination with San Fernando, Penal/Debe, and Siparia institutions may be relevant where traffic, commuting, water service effects, or stakeholder interests extend beyond the direct corridor.

Digital communication is likely to be important, particularly through mobile phones, WhatsApp, social media and online notices. However, uneven digital inclusion means that older persons, persons with disabilities, low-income households and residents without reliable internet or digital skills may be less effectively reached through online channels alone. Printed notices, direct outreach, community announcements and coordination through trusted local institutions remain necessary.

The institutional stakeholder landscape reflects a corridor where water-sector governance, municipal coordination, public safety, road management, community networks, heritage interests, schools, businesses and residents overlap. Key institutional relationships are likely to involve WASA, the Couva/Tabaquite/Talparo Regional Corporation, road and traffic authorities, the Southern Division of the Trinidad and Tobago Police Service, nearby schools, health and emergency services, community and faith-based networks, and local businesses.

5 Environmental and Social Impacts and Risks

5.1 Assessment of Impacts and Risks

The main goal of the Impacts and Risk Assessment is to identify the environmental and social impacts associated with the Project at and around the sites of interest, focusing on both positive and negative impacts and risks as well as bio-physical, chemical, social, economic and cultural components of the environment including, but not limited to:

- Effects on wildlife, terrestrial and marine biodiversity;
- Effects on existing or proposed protected areas or other sites of conservation or special management interest;
- Effects on surrounding communities (residential and commercial activities); and
- Effects on livelihoods.

Table 5-1: Defining the nature of the potential impacts

Term	Definition
Positive Impact (Benefit)	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Negative Impact	An impact that is considered to represent an adverse change from the baseline or introduces a new undesirable factor.
Direct Impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (e.g. between occupation of a site and serviced communities).
Indirect Impact	Impacts that result from other activities that are encouraged to happen as a consequence of the Project (e.g. in-migration for employment placing a demand on resources).
Cumulative Impact	Impacts that act together with other impacts (including those from concurrent or planned future third-party activities) to affect the same resources and/or receptors as the Project.

Table 5-2: Impact Rating Table

Criteria Used for Impact Rating	
Extent	• On-site – Limited to within the site boundaries • Local – impacts that affect an area in a radius of 2km around the sites; • Regional – impacts that affect regionally important resources or are experienced at traditional authority or district scale; • National – impacts that affect nationally important resources or affect an area that is nationally important/ or have macro-economic consequences; • Transboundary/International – impacts that extend beyond country borders or affect internationally important resources.

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Criteria Used for Impact Rating

Duration	• Temporary – impacts are predicted to be of short duration and intermittent/occasional; • Short-term – impacts that are predicted to last only for the duration of the construction period; • Long-term – impacts that will continue for the life of the Project, but ceases when the Project stops operating; • Permanent – impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.
Probability	• Unlikely – The impact is unlikely to occur. • Likely – The impact is likely to occur under most conditions. • Definite – The impact will occur.
Magnitude	• Magnitude can be considered in terms of the sensitivity of the receptor: ○ Negligible – the impact is not detectable; ○ Low – the impact affects the environment in such a way that natural functions and processes are not affected; ○ Moderate – where the affected environment is altered but natural functions and processes continue, albeit in a modified way; ○ High – where natural functions or processes are altered to the extent that it will temporarily or permanently cease.

Table 5-3: Impact Significance or Severity Criteria

Significance Criteria

Negligible Significance	An impact of negligible significance is where a resource or receptor will not be affected in any way by a particular activity, or the predicted effect is deemed to be imperceptible or indistinguishable from natural background levels.
Low Significance	An impact of low significance is one where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value.
Moderate Significance	An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that “moderate” impacts have to be reduced to “minor” impacts, but that moderate impacts are being managed effectively and efficiently.
High Significance	An impact of high significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. A goal of the ESIA process is to get to a position where the Project does not have any major residual negative impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a development. It is then the function of

Significance Criteria

regulators and stakeholders to weigh such negative factors against the positive factors, such as employment, in coming to a decision on the Project.

5.1.1 The Construction Phase

The construction of the proposed pipeline installation has the potential to generate a range of temporary environmental and social impacts that are typical of infrastructure development projects. The significance of these impacts will depend on the scale of the facility, the sensitivity of the surrounding environment, the duration of construction activities, and the effectiveness of mitigation measures implemented during project execution. While most construction-related impacts are expected to be localised and temporary, careful management will be required to ensure compliance with national environmental regulations and the Inter-American Development Bank (IDB) Environmental and Social Performance Standards (ESPS).

One of the primary ecological impacts will be associated with site preparation activities, including grading, excavation, and earthworks required for the construction of treatment facilities, storage tanks, and associated infrastructure. Although the pipeline works are focused in the roadway, which is already free of trees and natural vegetation of value, the localised habitat disturbance can potentially impact surrounding forested habitats which common wildlife species utilise for foraging, shelter, or movement. If construction occurs near watercourses or other ecologically sensitive habitats, there is a risk of disrupting aquatic and riparian ecosystems. Habitat disturbance may also temporarily displace birds, reptiles, amphibians, and small mammals from the construction area. Although these impacts are expected to be localised, they could be more significant if sensitive species or habitats occur within the project's area of influence.

Earthworks and excavation activities may increase the potential for soil erosion and sediment transport, particularly during periods of intense rainfall. The site is surrounded by undulating/hilly terrain, therefore, sediment-laden runoff could enter nearby streams, drainage channels, or downstream coastal environments, resulting in reduced water quality, increased turbidity, and temporary impacts on aquatic habitats and species. Construction activities involving heavy machinery may also generate dust, noise, and vibration, causing temporary disturbances to both terrestrial wildlife and nearby communities. Night-time lighting, if required, could further affect nocturnal species by altering natural movement patterns and behavior.

The use of construction equipment and machinery presents additional environmental risks, particularly through the accidental release of fuels, lubricants, hydraulic fluids, or other hazardous substances. Improper storage or handling of these materials could result in localised soil and water contamination, with potential impacts on terrestrial and aquatic ecosystems. Similarly, the generation of construction waste, including packaging materials, excavated spoil, and general refuse, could contribute to environmental degradation if not properly managed and disposed of at approved facilities.

The proposed Installation is expected to generate a range of social impacts during both the construction and operational phases of the Project. Construction-phase impacts are expected to be temporary and largely associated with pipeline installation activities within existing road corridors,

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while operational-phase impacts are expected to be predominantly beneficial and associated with improvements in water supply reliability, service delivery and system resilience.

The assessment identified several construction-phase impacts requiring management. Positive impacts include temporary employment and economic opportunities associated with project implementation. Potential adverse impacts include traffic disruption and road safety risks, road deterioration and reinstatement issues, temporary restrictions on access and connectivity, utility service interruptions, property damage, construction nuisance, community health and safety risks, worker-community interactions, worker-worker interactions, community dissatisfaction and occupational health and safety risks.

The assessment also identified the potential for women to experience reduced access to some employment and training opportunities associated with project implementation. While women are represented within the construction industry, their participation is typically concentrated in professional, technical, administrative and environmental, health and safety roles. Women remain underrepresented in many skilled, semi-skilled and unskilled construction occupations and may therefore experience reduced access to certain project-related employment opportunities unless deliberate measures are implemented to promote gender inclusion and equitable access to project benefits.

The Tables below present the social impact-mitigation matrices for the construction and operational phases of the Project, including the proposed mitigation measures, management plans and responsible parties.

Table 5-4: Impacts, Proposed Mitigation Measures, Management Plans and Responsible Party for the Construction Phase of the project

RISKS	PROBABILITY OF IMPACT	POTENTIAL IMPACTS	DIRECTION OF IMPACT	MAGNITUDE OF IMPACT	IMPACT DURATION	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	RESPONSIBLE PARTY
PHYSICAL								
Sedimentation due to site clearing and earthworks	Likely	Soil disturbance, erosion, and sedimentation	Negative	Moderate to High (localised but significant near water courses).	Short-term	- Limit clearing to the designated footprint. - Install silt fences, sediment basins, and check dams. - Schedule works for the dry season as best as possible.	Soil Erosion and Drainage Management Plan	WASA, Contractor
Increased runoff from excavation and grading on slopes	Likely	Slope instability and increased runoff leading to sediment discharge downstream of nearby water sources.	Negative	Moderate	Short-term	- Conduct a geotechnical assessment prior to works. - Stabilize exposed slopes with vegetation or bioengineering. - Install temporary drainage diversion.	Soil Erosion and Drainage Management Plan	WASA, Contractor
Sedimentation from Pipeline installation (trenching)	Likely	Localised erosion, sedimentation, and disruption of roadside drainage.	Negative	Moderate	Short-term	- Use trench boxes or shoring. - Avoid trenching during heavy rain. - Backfill and compact promptly. - Reinstate disturbed areas.	Soil Erosion and Drainage Management Plan	WASA, Contractor
Dust nuisance and contamination from stockpiling and material storage	Definite	Dust generation, sediment runoff, and contamination from fuel or chemical spills.	Negative	Moderate	Short-term	- Cover fine materials. - Store fuel/chemicals in bunded, impervious areas. - Implement spill response protocols.	Soil Erosion and Drainage Management Plan	WASA, Contractor
Dust and noise nuisance from operation of	Definite	Dust, exhaust emissions, and noise affecting nearby	Negative	Low to Moderate	Short-term	- Maintain equipment regularly. - Wet exposed road surfaces.	Soil Erosion and Drainage Management Plan	WASA, Contractor

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RISKS	PROBABILITY OF IMPACT	POTENTIAL IMPACTS	DIRECTION OF IMPACT	MAGNITUDE OF IMPACT	IMPACT DURATION	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	RESPONSIBLE PARTY
construction vehicles and machinery		residents and workers.				- Use mufflers and limit night work. - Enforce speed limits with signs.		
Pollution from Solid waste generation (construction debris, packaging)	Unlikely	Unsightly accumulation, pest attraction, and pollution can occur if improperly disposed.	Negative	Moderate	Short-term	- Segregate, reuse, or recycle where feasible. - Transport to EMA-approved disposal sites. - Maintain waste logs.	Waste Management Plan	WASA, Contractor
Pollution from Hazardous waste and chemical use (fuels, lubricants, chlorine, caustic soda)	Unlikely	Soil and water contamination, worker exposure risk, fire hazard.	Negative	Moderate to High	Medium-to long-term if spills occur.	- Bund and label chemical storage. - Maintain MSDS on-site. - Train staff in spill response and HAZMAT handling. - Use secondary containment.	Waste Management Plan Hazardous materials handling management plan	WASA, Contractor
Noise and vibration from machinery	Likely (localized)	Nuisance to residents and wildlife; stress to fauna.	Negative	Low to Moderate (treeline buffer may reduce extent of impact)	Short-term	- Restrict noisy activities to daylight hours. - Maintain equipment. - Notify nearby communities before noisy works.	Noise and Vibration Management Plan	WASA, Contractor
Increased surface runoff and drainage alteration	Likely	Potential flooding, erosion, and alteration of local hydrology.	Negative	Moderate	Medium-term	- Maintain pre-development drainage patterns. - Construct site drains and retention basins. - Ensure outlets are energy dissipated.	Soil Erosion and Drainage Management Plan	WASA, Contractor
Dust, noise and traffic nuisance from transportation of materials	Likely	Dust, noise, traffic congestion, road wear, accident risk.	Negative	Low to Moderate	Short-term	- Use approved haul routes. - Cover loads. - Schedule deliveries off-peak. - Install traffic signage.	Air Quality and Dust Control Plan Noise and Vibration Management Plan	WASA, Contractor

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RISKS	PROBABILITY OF IMPACT	POTENTIAL IMPACTS	DIRECTION OF IMPACT	MAGNITUDE OF IMPACT	IMPACT DURATION	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	RESPONSIBLE PARTY
and equipment							Traffic and Road Safety Management Plan	
ECOLOGICAL								
Vegetation clearing within roadside corridors	Likely	Removal of roadside vegetation, secondary growth, and ground cover resulting in localised habitat loss and reduction in ecological connectivity	Negative	Low (St. Margaret's)	Short-to Medium-term	- Restrict clearing to the minimum area required; clearly demarcate work areas; - retain mature trees where feasible; - undertake progressive site restoration	Biodiversity Management Plan (BMP)	Contractor; WASA
Habitat fragmentation	Likely (on alternate route)	Temporary disruption of wildlife movement corridors through vegetation clearance and construction activities	Negative	Low	Temporary	- Utilize existing transportation corridors; - minimize clearing widths; - restore disturbed habitats immediately after construction	Biodiversity Management Plan	Contractor
Disturbance to terrestrial wildlife	Unlikely	Noise, vibration, lighting, and human activity may displace birds, reptiles, amphibians, and small mammals from adjacent habitats	Negative	Low to Moderate	Temporary	- Limit vegetation clearing; - prohibit hunting and wildlife collection; - conduct worker awareness training; - schedule works during daylight hours where possible	Biodiversity Management Plan	Contractor
Injury or mortality of fauna during vegetation clearing	Unlikely (localised if alternate is selected)	Direct injury or mortality of less mobile species, nests, burrows, reptiles, amphibians, or invertebrates	Negative	Low	Immediate	- Pre-construction inspections; - ecological supervision where required; - relocate fauna when safe and practical; - avoid nesting seasons where feasible	Biodiversity Management Plan	Contractor; Environmental Officer

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Introduction or spread of invasive species	Unlikely	Movement of construction equipment and materials may facilitate the spread of invasive plant species into disturbed habitats	Negative	Low	Medium-term	- Clean equipment before entering site; - restore disturbed areas using native species; - monitor revegetated areas	Biodiversity Management Plan	Contractor
Soil erosion from excavation and trenching	Unlikely	Exposure of soils on steep slopes and disturbed surfaces resulting in erosion and sediment transport	Negative	Moderate	Temporary	- Install erosion controls; - phase excavation works; - stabilize exposed surfaces; - promptly reinstate disturbed areas	Erosion and Sediment Control Plan	Contractor
Sedimentation of freshwater drainage channels	Likely	Increased suspended sediments entering drainage systems may reduce water quality and affect aquatic habitats	Negative	Moderate	Temporary	- Install silt fencing, sediment traps, and drainage controls; - avoid excavation during heavy rainfall periods	Erosion and Sediment Control Plan; Water Quality Monitoring Plan	Contractor
Pollution from fuel, oil, and chemical spills	Unlikely	Accidental releases may contaminate terrestrial habitats, drainage systems, and coastal ecosystems	Negative	Moderate	Short-term	- Proper storage of fuels and chemicals; - secondary containment; - spill response procedures and training	Spill Prevention and Response Plan	Contractor
Waste accumulation in natural habitats	Unlikely	Improper disposal of construction waste may degrade habitat quality and attract pests	Negative	Low	Temporary	- Implement waste segregation and disposal procedures; regular site inspections and housekeeping	Waste Management Plan	Contractor
Loss of ecosystem services	Unlikely	Temporary reduction in vegetation cover may reduce erosion	Negative	Low	Temporary	- Restore disturbed areas; implement revegetation	Biodiversity Management Plan	Contractor

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RISKS	PROBABILITY OF IMPACT	POTENTIAL IMPACTS	DIRECTION OF IMPACT	MAGNITUDE OF IMPACT	IMPACT DURATION	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	RESPONSIBLE PARTY
		control, habitat provision, and other local ecosystem functions				measures following construction		
Habitat restoration and revegetation opportunities	N/A	Rehabilitation of disturbed areas can improve roadside habitat condition and stabilise soils following construction	Positive	Low to Moderate	Long-term	- Implement native species revegetation; - monitor restoration success	Biodiversity Management Plan	Contractor; WASA
SOCIAL/ECONOMIC								
Employment and Economic Opportunities	Definite	Temporary employment, local procurement, transportation, equipment rental and other economic opportunities associated with project implementation.	Positive	Low-Moderate	Short Term	- Maximise local employment opportunities where feasible. - Advertise employment opportunities locally. - Encourage procurement of local goods and services where practicable. - Implement transparent recruitment procedures.	- CESMP - Local Employment, Gender Inclusion and Workforce Conduct Plan (LEGIWCP) - WHSLMP	Contractor WASA
Limited Employment Opportunities for Women	Definite	Women may experience reduced access to employment, training and economic opportunities associated with project implementation due to the male-dominated nature of the construction	Negative	Low-Moderate	Short Term	- Implement equitable recruitment and selection procedures. - Encourage employment of qualified women in technical, administrative, environmental, health and safety, community liaison and other suitable positions. - Monitor workforce participation by gender.	- LEGIWCP	Contractor WASA

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RISKS	PROBABILITY OF IMPACT	POTENTIAL IMPACTS	DIRECTION OF IMPACT	MAGNITUDE OF IMPACT	IMPACT DURATION	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	RESPONSIBLE PARTY
		industry, occupational segregation and other barriers to participation.				- Provide equal remuneration for work of equal value. - Promote a respectful and inclusive work environment.		
Road Deterioration and Damage to Road Infrastructure	Likely	Deterioration of road surfaces, pavement, shoulders, drainage infrastructure, road markings and roadside infrastructure due to excavation activities, trenching and heavy construction traffic.	Negative	Moderate-High	Medium Term	- Restrict construction traffic to approved routes and working areas. - Conduct pre- and post-construction road condition surveys. - Monitor road conditions throughout construction. - Repair damage attributable to project activities.	- CESMP - Traffic, Transportation and Road Safety Management Plan (TTRSMP)	Contractor WASA
Delayed Road Reinstatement and Resurfacing	Likely	Prolonged disruption to mobility, road safety and community access resulting from delayed or inadequate reinstatement of affected road sections.	Negative	Moderate-High	Medium Term	- Include reinstatement standards and timelines within construction contracts. - Undertake progressive reinstatement as works advance. - Coordinate reinstatement activities with relevant road authorities. - Communicate reinstatement schedules to affected stakeholders. - Verify quality of reinstatement works before project close-out.	- CESMP - TTRSMP - Stakeholder Engagement and Grievance Management Plan (SEGMP)	Contractor WASA MOWT
Traffic, Transportation and Road Safety	Definite	Traffic delays, congestion, reduced road capacity and elevated road safety risks associated with	Negative	Moderate-High	Short-Medium Term	- Prepare and implement a Traffic Management Plan. - Schedule works to minimise peak-hour disruption where feasible.	- CESMP - TTRSMP - SEGMP	Contractor WASA MOWT TTPS

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		lane restrictions, excavation activities, construction vehicles, equipment movement and active work areas along a heavily trafficked transportation corridor.				- Install appropriate traffic control devices, signage and barriers. - Deploy trained traffic control personnel where required. - Maintain emergency vehicle access. - Provide advance notice of traffic disruptions and road restrictions.	- Community Health and Safety Management Plan (CHSMP)	
Access Restrictions and Connectivity	Likely	Temporary restrictions on access to residences, businesses, institutions and community facilities resulting from trenching, excavation and construction activities along the pipeline corridor.	Negative	Moderate	Short Term	- Maintain temporary access arrangements to residences, businesses and community facilities. - Coordinate access requirements with affected property owners and occupiers. - Phase trenching activities to minimise the duration of disruptions. - Maintain pedestrian access where practicable. - Provide advance notification of access restrictions and alternative access arrangements.	- CESMP - TTRSMP - SEGMP - Utility Service Interruption and Access Management Plan (USIAMP)	Contractor WASA
Utility Service Interruptions	Likely	Temporary interruptions to water supply services during tie-ins, testing, commissioning, pipeline isolation and connection works	Negative	Moderate	Short-Term (Episodic)	- Schedule tie-ins and service interruptions during low-demand periods where feasible. - Provide advance notice of planned interruptions.	- CESMP - USIAMP - SEGMP - O&M Transition Plan	Contractor WASA

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RISKS	PROBABILITY OF IMPACT	POTENTIAL IMPACTS	DIRECTION OF IMPACT	MAGNITUDE OF IMPACT	IMPACT DURATION	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	RESPONSIBLE PARTY
		affecting households, businesses and institutions.				- Coordinate interruption schedules with WASA operations personnel. - Minimise the duration of planned outages. - Restore services as quickly as practicable following completion of works.		
Property Damage and Third-Party Assets	Possible-Likely	Damage to fences, gates, walls, driveways, culverts, landscaping, utility connections and other private or third-party assets located adjacent to the construction corridor.	Negative	Moderate	Short-Medium Term	- Conduct pre-construction condition surveys of potentially affected properties. - Clearly document existing conditions through photographs and records. - Implement measures to avoid unnecessary disturbance of adjacent properties. - Repair or compensate for project-related damage in accordance with established procedures. - Maintain a grievance mechanism to address complaints relating to property damage.	- CESMP - SEGMP	Contractor WASA
Construction Nuisance (Noise, Dust and Vibration)	Likely	Temporary reduction in quality of life and disturbance to nearby residents, businesses, institutions and sensitive receptors.	Negative	Low-Moderate	Short Term	- Implement dust suppression measures, including wetting of exposed surfaces where necessary. - Maintain construction equipment in good working condition. - Restrict particularly noisy activities to appropriate	- CESMP - CHSMP - SEGMP	Contractor

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						daytime periods where practicable. - Minimise unnecessary vehicle idling and equipment operation. - Respond promptly to nuisance-related complaints.		
Community Health and Safety Risks	Likely	Increased risk of accidents involving pedestrians, motorists, cyclists and other road users due to open trenches, excavation activities, construction vehicles, altered traffic patterns and active work areas.	Negative	Moderate	Short Term	- Secure work areas, trenches and excavation sites using barriers, fencing and warning signage. - Maintain safe pedestrian routes around active work areas. - Implement traffic control measures and public safety controls. - Conduct regular inspections of public safety measures. - Maintain emergency access at all times. - Respond promptly to identified safety concerns.	- CESMP - CHSMP - TTRSMP	Contractor WASA
Worker-Community Relations and Interactions	Possible	Interactions between project workers and community members may result in complaints, conflicts, misunderstandings, harassment, intimidation, inappropriate behaviour or other forms of misconduct.	Mixed	Low-Moderate	Short Term	- Implement and enforce a Worker Code of Conduct. - Provide training on respectful community engagement and appropriate workplace behaviour. - Prohibit harassment, discrimination, intimidation and inappropriate conduct.	- CESMP - LEGIWCP - SEGMP	Contractor WASA CLO

RISKS	PROBABILITY OF IMPACT	POTENTIAL IMPACTS	DIRECTION OF IMPACT	MAGNITUDE OF IMPACT	IMPACT DURATION	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	RESPONSIBLE PARTY
		Women, girls and other vulnerable persons may experience heightened concerns regarding personal safety, privacy or inappropriate interactions associated with the presence of workers within communities.				- Establish confidential grievance and reporting mechanisms. - Investigate and address complaints promptly. - Conduct periodic worker awareness sessions regarding community relations and stakeholder sensitivities.		
Worker-Worker Interactions	Possible	Interactions among workers from different contractors, communities, trades and work crews may contribute to workplace conflicts, discrimination, harassment, bullying, exclusion or other inappropriate conduct. Women and other underrepresented groups may be particularly vulnerable to discriminatory behaviour, harassment or unequal treatment within a	Negative	Low-Moderate	Short Term	- Implement a Worker Code of Conduct and workplace behaviour standards. - Establish anti-harassment, anti-discrimination and grievance procedures. - Provide gender-sensitivity and workplace conduct training. - Promote respectful and inclusive workplace practices. - Investigate and address workplace complaints and disciplinary issues promptly.	- CESMP - LEGIWCP - WHSLMP	Contractor

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RISKS	PROBABILITY OF IMPACT	POTENTIAL IMPACTS	DIRECTION OF IMPACT	MAGNITUDE OF IMPACT	IMPACT DURATION	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	RESPONSIBLE PARTY
		predominantly male workforce.						
Community Dissatisfaction and Grievances	Likely	Complaints, frustration and dissatisfaction arising from traffic disruptions, access restrictions, service interruptions, road conditions, construction nuisance or inadequate communication regarding project activities.	Negative	Moderate	Short-Medium Term	- Implement a Stakeholder Engagement Plan and Grievance Redress Mechanism. - Maintain regular communication with affected communities and stakeholders. - Provide advance notice of construction activities and service interruptions. - Respond promptly to complaints and concerns. - Monitor grievance trends and implement corrective actions where necessary.	- SEGMP - CESMP	Contractor WASA CLO
Occupational Health and Safety Risks	Likely	Risk of injury, illness or fatality associated with excavation and trenching activities, traffic exposure, lifting operations, heavy equipment use, work near live utilities, confined spaces and other construction-related hazards.	Negative	Moderate-High	Short Term	- Prepare and implement a Project-specific Occupational Health and Safety Plan. - Conduct task-specific risk assessments and Job Safety Analyses (JSAs). - Provide appropriate PPE and safety training. - Implement safe work procedures and permit-to-work systems where required. - Conduct regular inspections, toolbox meetings and supervision.	- CESMP - Worker Health and Safety and Labour Management Plan (WHSMP) - LEGIWCP - Emergency Response Plan	Contractor WASA

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						- Maintain emergency response procedures and first aid arrangements.		

5.1.2 The Operations Phase

The operational phase of the proposed pipeline installation is expected to be minimal for those identified as negative in relation to the physical environment and would relate to any maintenance works that would be needed.

Social impacts during operation are expected to be overwhelmingly positive. During the operational phase, the project is expected to generate several long-term benefits, including improved reliability of potable water supply, improved levels of service, enhanced system resilience and redundancy, reduced water losses, and improvements in public health, quality of life and economic activity. The Project may also contribute to reduced dependence on truck-borne water supply. Potential adverse operational impacts are expected to be limited and primarily relate to occasional service interruptions associated with maintenance activities, inadequate communication regarding service disruptions, increased customer expectations and potential implications for public confidence in water services where anticipated benefits are not realised.

Table 5-5: Impacts, Proposed Mitigation Measures, Management Plans and Responsible Party for the Operations Phase of the Project

RISKS	PROBABILITY OF IMPACT	POTENTIAL IMPACTS	DIRECTION OF IMPACT	MAGNITUDE OF IMPACT	IMPACT DURATION	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	RESPONSIBLE PARTY
PHYSICAL								
Dust and noise nuisance from any maintenance works	Moderate	particulate emissions; greenhouse gas contribution.	Negative	Moderate and localized	Temporary during maintenance works	- - Maintain equipment; limit working hours	Air quality and noise management plan	WASA
Natural hazards (flooding, landslides, earthquakes)	Low (with mitigation)	Physical damage to infrastructure, contamination from overtopping.	Negative	High (if event occurs)	Event-based (episodic)	- - Design plant above 1-in-100-year flood level.- Implement slope stabilization and seismic design criteria.- Maintain drainage regularly.	Disaster Risk Management Plan	WASA
ECOLOGICAL								
Routine maintenance activities causing localized habitat disturbance	Low	Minor disturbance to roadside vegetation, secondary habitats, and wildlife during periodic inspections, repairs, and maintenance works Periodic trimming or removal of vegetation may reduce habitat value for some terrestrial species and alter vegetation structure	Negative	Low	Short-term, Intermittent	- Restrict maintenance footprint; reinstate disturbed areas promptly; - implement environmental procedures during maintenance works	Operations Management Plan Biodiversity Management Plan	WASA
Vegetation management within pipeline corridors	Moderate		Negative	Low	Long-term, Intermittent	- Employ selective vegetation management; - avoid unnecessary clearing; promote native vegetation cover where feasible	Biodiversity Management Plan	WASA

RISKS	PROBABILITY OF IMPACT	POTENTIAL IMPACTS	DIRECTION OF IMPACT	MAGNITUDE OF IMPACT	IMPACT DURATION	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	RESPONSIBLE PARTY
Pipeline failure affecting freshwater drainage systems	Low	Release of treated water into nearby drains or watercourses may alter local hydrology or contribute to erosion in localized areas	Negative	Low	Temporary	- Implement monitoring and rapid response procedures; maintain infrastructure integrity	Emergency Response Plan	WASA
Erosion at repaired or exposed maintenance sites	Low	Localized sediment transport into nearby drainage channels or coastal waters following maintenance activities	Negative	Low	Short-term	- Stabilize exposed soils; - implement erosion control measures following maintenance works	Operations Management Plan	WASA
Disturbance to wildlife from maintenance traffic and activities	Low	Temporary displacement of birds, reptiles, and other fauna during maintenance operations	Negative	Low	Temporary	- Schedule maintenance during daylight hours where possible; - limit disturbance footprint	Biodiversity Management Plan	WASA
Introduction or spread of invasive species during maintenance activities	Low	Movement of equipment between sites may facilitate spread of invasive plants into disturbed habitats	Negative	Low	Long-term	- Clean equipment before site access; monitor restored areas; - implement invasive species controls where necessary	Biodiversity Management Plan	WASA
Accidental contamination	Low	Localized contamination of	Negative	Low to Moderate	Temporary	- Proper storage and handling of chemicals; spill prevention measures;	Spill Prevention and Response Plan	WASA

RISKS	PROBABILITY OF IMPACT	POTENTIAL IMPACTS	DIRECTION OF IMPACT	MAGNITUDE OF IMPACT	IMPACT DURATION	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	RESPONSIBLE PARTY
from fuels, lubricants, or maintenance chemicals Long-term alteration of vegetation communities along maintained corridors	Low	soils, drainage systems, or coastal waters Preference for low-growing vegetation may alter habitat composition in some sections of the corridor	Negative	Low	Long-term	- emergency response procedures - Utilize environmentally sensitive vegetation management practices and native species restoration where feasible	Biodiversity Management Plan	WASA
SOCIAL								
Improved Reliability of Potable Water Supply	Definite	More reliable and consistent water supply resulting in reduced service interruptions and improved quality of life for households, businesses and institutions served by the system. Improved water availability, pressure management and overall service levels for customers connected to the upgraded network.	Positive	High	Long Term	-	- Routine Operations Maintenance Procedures	WASA and WASA
Improved Levels of Service	Definite		Positive	High	Long Term	-	- Routine Operations Maintenance Procedures	WASA and WASA

RISKS	PROBABILITY OF IMPACT	POTENTIAL IMPACTS	DIRECTION OF IMPACT	MAGNITUDE OF IMPACT	IMPACT DURATION	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	RESPONSIBLE PARTY
Reduced Dependence on Water Trucking	Likely	Reduced reliance on truck-borne water supplies resulting from improved transmission capacity, distribution performance and system reliability. Increased operational flexibility, improved	Positive	Moderate-High	Long Term	-	- Routine Operations Maintenance Procedures	WASA and WASA
Improved System Resilience and Redundancy	Definite	redundancy and greater resilience to infrastructure failures, maintenance activities and emergency situations.	Positive	High	Long Term	-	- Routine Operations Maintenance Procedures	WASA and WASA
Reduced Non-Revenue Water (NRW) and Improved Operational Efficiency	Definite	Reduced leakage losses, improved system efficiency and more effective utilisation of treated water resources.	Positive	High	Long Term	-	- Routine Operations Maintenance Procedures	WASA and WASA
Improved Public Health, Quality of Life and Economic Activity	Likely	Improved access to reliable potable water supporting household wellbeing, public	Positive	Moderate-High	Long Term		- Routine Operations Maintenance Procedures	WASA and WASA

RISKS	PROBABILITY OF IMPACT	POTENTIAL IMPACTS	DIRECTION OF IMPACT	MAGNITUDE OF IMPACT	IMPACT DURATION	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	RESPONSIBLE PARTY
Residual Service Interruptions During Maintenance	Possible	health outcomes, business operations and economic activity. Occasional temporary service interruptions associated with planned maintenance, repairs, emergency works or isolated operational failures. Community frustration, complaints and dissatisfaction where planned or unplanned service interruptions are not communicated adequately or in a timely manner. Increased expectations regarding future service improvements that may exceed the direct benefits delivered by the	Negative	Low-Moderate	Short-Term (Episodic)		- Routine Operations and Maintenance Procedures - WASA Customer Communication Procedures (WASA Customer Service)	WASA
Inadequate Communication Regarding Service Interruptions	Possible		Negative	Low-Moderate	Short Term	-	- Routine Operations and Maintenance Procedures - WASA Customer Complaint Procedures (WASA Customer Service)	WASA
Increased Community Expectations	Likely		Mixed	Moderate	Long Term	-	- Routine Operations and Maintenance Procedures - WASA Customer Communication/Engagement	WASA

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		Project, potentially resulting in dissatisfaction where expectations are unmet.					Procedures (WASA Customer Service)	

6 Environmental and Social Management Plan (ESMP)

6.1 Introduction to the ESMP

The Environmental and Social Management Plan (ESMP) outlined in this chapter presents the key guidelines necessary to direct the environmental and social management and occupational health and safety of the Project. This chapter outlines in detail:

- the various environmental and social plans or programs that will comply with the environmental, social and health and safety requirements that are necessary to carry out the activities of the project works, complying with the policies and regulations of both the IDB and the national government,
- institutional obligations and responsibilities for the elaboration and implementation of the required measures,
- a description of the environmental and social monitoring plan in the construction and operation stages of the project, identifying the expected results, the parameters to be measured, the places of measurement, the methods and tools to be used and the periods/frequency in which the measurements will be made, along with the responsible institutions,
- an implementation schedule of each of the proposed measures and defined responsibilities.

6.2 Objectives of the ESMP

The primary objective of the Environmental and Social Management Plan (ESMP) is to provide a structured, systematic framework that ensures the rehabilitation and upgrading works are implemented in a manner that prevents, minimises, or otherwise effectively manages adverse environmental and social impacts. In alignment with the IDB Environmental and Social Performance Standards, national regulatory requirements, and international best practice, the ESMP outlines the measures necessary to safeguard environmental resources, protect community wellbeing, and ensure worker health and safety throughout both the construction and operational phases of the projects.

More specifically, the ESMP seeks to translate the findings of the Environmental and Social Assessment (ESA) into actionable management measures by clearly defining mitigation strategies, operational controls, monitoring protocols, and compliance requirements for each identified impact. It establishes roles and responsibilities for WASA, contractors, and supervising entities to ensure accountability, consistent implementation, and effective oversight. The ESMP also seeks to ensure that all contractors and subcontractors adhere to a uniform standard of environmental and social performance across all project sites.

6.3 Roles and Responsibilities

6.3.1 Construction Phase

Prior to the start of the works, WASA will conduct the due diligence with the Environmental Management Authority to obtain certificate of environmental clearance (CEC) for the works.

During the Construction Phase, the Contractor Company will be responsible for preparing and implementing the Construction Environmental and Social Management Plan (C-ESMP) of the project, as well as obtaining the environmental and occupational health and safety qualifications and insurances required according to the national and local regulatory framework.

The Contractor will also need to obtain others applicable permits, which could include tree cutting permits for protected trees according to the Protected Trees Act, easements, excavation permits, construction permits, public road occupancy permits, waste disposal permits, permits for works near or in monuments, etc.

Before the start of the works, the Contractor must submit to the EMA, for its approval, a Construction Environmental and Social Management Program (C-ESMP).

The C-ESMP of the project will contain, as a minimum, the programs described in the following Sections of this ESMP.

Once the C-ESMP is approved, the Contractor Company will be responsible for its compliance, using the necessary means to implement the Programs that are formulated within its framework. The Contractor Company must have an environmental and social representative and a person responsible for hygiene and safety, who will be responsible for conducting the implementation of the C-ESMP. Likewise, the contractor must comply with and make the operators and subcontractors comply with all the provisions contained in said Plan, national and local environmental legislation, appropriate construction codes and best practices and the IDB Environmental and Social Policy Framework, during all stages of the execution of the works.

The Contractor Company will prepare monthly reports to the EMA, detailing the actions and results of the C-ESMP implementation.

The inspection, control, and monitoring activities of the C-ESMPc will be conducted by WASA. WASA may conduct inspection visits, prepare reports for internal use for the Project, and determine and impose corrective measures based on the stipulations of the bidding documents.

The environmental authority may also conduct control audits of the work.

At the finalization of the works, the Contractor must submit a Final Environmental and Social Report, which includes the information corresponding to the implementation of C-ESMP, including records of implementation of plans and programs, and a report on compliance with all environmental and social indicators considered at various stages of the project cycle.

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6.3.2 Operation and Maintenance

During the operational stage, WASA will be responsible for the operation and maintenance of the infrastructure built under the Program, in accordance with its current environmental policies and environmental and social management systems, including the ESMP for the operational and maintenance stage of each work.

6.3.3 Role of IDB

The IDB will oversee and supervise the implementation of the environmental and social management system for all projects under the Program. This includes the review and approval of the semi-annual environmental and social compliance reports submitted by WASA, as well as conducting environmental and social supervision missions. This is expected to last throughout project implementation.

The Table below summarizes the environmental and social management responsibilities of the entities involved in the different phases of the projects.

Table 5-2: Environmental and Social Responsibilities for Project Intervention

Project Phase	Activity	Responsibility	Monitoring	Oversight
Design	Grievance Redress Mechanism (for the duration of the Program)	WASA		IDB
	Final Project Design / Engineering Design	Independent Contractors	WASA	IDB
	Environmental and Social Assessment	Independent Consultants	WASA	IDB
	Public Consultation	WASA		IDB
	Preparation of E&S Technical Specifications for Bidding Documents	WASA		IDB
	Environmental Permits (when applicable)	WASA		WASA
Construction	ESMPc: Preparation and implementation	Contractors	WASA	IDB
	Environmental and Social compliance during construction	Contractor	WASA	IDB
	Monthly E&S Progress Report	Contractor	WASA	MPU
	Semi-annual E&S Progress Reports	WASA		IDB
	Final E&S Report	Contractor	WASA	MPU
	Final E&S Report	WASA		IDB
Operation	Operation and maintenance of the new installed infrastructure	Each WASA plant	MPU	IDB (initial period of 3

				years after work completion)
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6.4 Scope of the ESMP

This section presents the structure of the ESMP, which follows on from the identification of the potential environmental and social impacts and mitigative actions for the proposed pipeline route.

Measure	Description	Estimated Cost	Schedule	Responsible
Implementation of Mitigation Measures and Programs of Construction ESMP	Preparation of the ESMP at the construction level and implementation during the construction of the project; environmental and social monitoring of the works	1.5% of the total cost of the project	From beginning of their works until their finalization	Contractor
Implementation of Mitigation Measures of Operational ESMP	Incorporation of mitigation measures for the operational stage within the project activities	Incorporated in WASA operational budget	Throughout the lifecycle of the infrastructure	WASA

The ESMP applies to all activities, facilities, and operations associated with the pipeline route.

Its scope covers the following key thematic areas:

1. Environmental Management – addressing impacts on air quality, noise, water quality, soil, biodiversity, landscape, and waste management through targeted mitigation and monitoring programs.
2. Social Management – encompassing worker hiring practices, labour management, community engagement, health and safety, worker behaviour, gender equity, and grievance handling mechanisms, ensuring that local communities benefit from the project while minimising social risks.
3. Health and Safety Management – ensuring safe working conditions for all employees and contractors, and safeguarding community health and safety throughout construction and operation.

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4. Pollution Prevention and Resource Efficiency – controlling emissions, discharges, and waste generation, and promoting efficient use of energy, water, and raw materials in line with ESPS 3.
5. Stakeholder Engagement and Grievance Management – ensuring continuous consultation and information disclosure to affected communities and other stakeholders, in accordance with ESPS 10.
6. Climate Resilience and Energy Efficiency – integrating climate adaptation measures, energy-efficient technologies, and resilient design standards to strengthen the long-term sustainability of the project.
7. Monitoring, Reporting, and Adaptive Management – establishing procedures for environmental and social performance tracking, periodic audits, and submission of monitoring reports to the EMA, IDB, and other relevant authorities.

The ESMP also defines the institutional arrangements for its implementation, including the designation of a WASA team to oversee compliance, supported by contracted environmental officers, independent monitoring consultants, and regulatory oversight by the EMA.

Furthermore, the ESMP incorporates a capacity-building component to enhance the technical competence of WASA staff and contractors in implementing the prescribed management plans, ensuring that all environmental and social obligations are effectively fulfilled.

PLANS	DESCRIPTION	RELEVANT IDB ESPS
Water Quality Management Plan	This Water Quality Management Plan will focus on the protection and maintenance of water quality within the project areas and the surrounding receiving environment. The plan will contain a series of action items to ensure that pipeline installation have minimal impacts on source water quality, treatment processes, and downstream water resources. The plan will also outline measures to prevent contamination from construction-related activities, maintain compliance with applicable water quality standards, protect public health, and ensure the continued delivery of safe and reliable potable water throughout the project lifecycle.	ESPS 3 addresses the need to prevent and minimise pollution and promote the sustainable management of resources, including the protection of water quality from contamination arising from project activities. ESPS 1 underscores the importance of identifying, assessing, and managing environmental and social risks and impacts throughout the project lifecycle, including the implementation of effective monitoring and mitigation measures for water quality. ESPS 4 recognises that project activities, equipment, and infrastructure can pose risks to community health and safety, particularly where changes in water quality may affect the safety and reliability of potable water supplies.

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Air Quality Management Plan	This Air Quality Management Plan will focus on the control and minimisation of air emissions associated with the pipeline installation. The plan will include a series of mitigation measures and action items to reduce dust generation from earthworks, prevent and control emissions from construction equipment and machinery, and manage odours and other air pollutants that may arise during construction, installation, and commissioning activities. It will also establish monitoring requirements and good housekeeping practices to ensure compliance with applicable air quality standards, protect worker and community health, and maintain acceptable ambient air conditions throughout the project lifecycle.	ESPS 3 addresses the need to prevent and minimise pollution to air from project-related activities, including dust, emissions from machinery, and other airborne pollutants. ESPS 1 underscores the importance of identifying, assessing, and managing environmental and social risks and impacts throughout the project lifecycle, including the implementation of mitigation and monitoring measures for air quality. ESPS 4 recognises that emissions such as dust, exhaust fumes, and other air pollutants from construction and operational activities can increase risks to community health and safety.
Noise and Vibration Management Plan	This Noise and Vibration Management Plan will focus on the control and minimisation of noise and vibration impacts associated with the pipeline installation. The plan will include a series of mitigation measures and action items to reduce noise generated from construction activities, heavy machinery, transport movements, and equipment installation, as well as to manage vibration impacts that may affect nearby structures and sensitive receptors. It will also establish monitoring requirements, work scheduling controls, and good practice construction methods to ensure compliance with applicable noise standards.	ESPS 3 addresses the need to prevent and minimise noise and vibration pollution arising from project activities, including construction equipment operation and associated works. ESPS 1 underscores the importance of identifying, assessing, and managing environmental and social risks and impacts throughout the project lifecycle, including the implementation of mitigation measures and monitoring programmes for noise and vibration. ESPS 4 recognises that elevated noise levels and vibration from project activities can increase risks to community health, well-being, and safety, particularly for nearby sensitive receptors.
Waste Management Plan (WMP)	This Waste Management Plan will focus on the proper management, handling, storage, transport, and disposal of solid and liquid wastes generated during pipeline installation. The plan will include a series of mitigation measures and action items to minimise waste generation at source, promote reuse and recycling where feasible, and ensure the safe disposal of construction and operational wastes, including general waste, packaging	ESPS 3 addresses the need to prevent and minimise pollution through the effective management of solid and liquid wastes, including reduction, reuse, recycling, and safe disposal practices. ESPS 1 underscores the importance of identifying, assessing, and managing environmental and social risks and impacts throughout the project lifecycle, including waste generation

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	materials, excavated spoil, and any sludge or process-related residues.	and the implementation of appropriate mitigation and monitoring measures. ESPS 4 recognises that improper waste handling and disposal can create risks to community health and safety, including exposure to contaminants, pests, and pollution of water and surrounding environments.
Disaster management Plan	This Disaster Management Plan will focus on establishing a comprehensive framework for preparedness, mitigation, response, and recovery in relation to natural and human-induced disasters that may affect the water treatment plant during its rehabilitation and operation. The plan will include a series of measures and action items to address hazards such as hurricanes, floods, earthquakes, landslides, and other extreme weather events, as well as secondary impacts including infrastructure damage, service disruption, and contamination risks. It will also define institutional roles and responsibilities, early warning systems, communication protocols, evacuation and shutdown procedures, and coordination mechanisms with national disaster management authorities to ensure effective response, minimise losses, and support the rapid restoration of critical water supply services throughout the project lifecycle.	ESPS 1 underscores the importance of identifying, assessing, and managing environmental and social risks and impacts throughout the project lifecycle, including disaster and climate-related risks, and ensuring the implementation of appropriate management and response systems. ESPS 4 recognises that project infrastructure and operations may be vulnerable to natural hazards and disaster events, which can pose significant risks to community health, safety, and continuity of essential services such as potable water supply. ESPS 3 addresses the need to prevent and manage environmental contamination and pollution that may occur as a result of disaster events, including the release of hazardous materials or deterioration of water quality following extreme weather impacts.
Social Impact Management Plan (SIMP)	Contains: Local Employment and Gender Inclusion Management Plan Worker Health and Safety Management Plan Stakeholder Engagement Plan Grievance Redress Plan Worker Behaviour and Anti-Harassment Plan Community Health and Safety Management Plan Traffic and Road Safety management Plan	Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. ESPS 2: Labor and Working Conditions ESPS 5: Land Acquisition and Involuntary Resettlement ESPS 7: Indigenous Peoples (not applicable) ESPS 9: Gender Equality

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Biodiversity Management Plan (BMP)	This Biodiversity Management Plan will focus on the protection, conservation, and restoration of biodiversity within and surrounding areas for pipeline installation during its rehabilitation and operation. The plan will include a series of mitigation measures and action items to avoid and minimise habitat disturbance, protect any remaining flora and fauna, and prevent indirect impacts such as pollution, noise, dust, and altered drainage patterns from affecting sensitive ecosystems. It will also outline requirements for vegetation protection, invasive species management, site rehabilitation, and ecological monitoring to ensure compliance with applicable environmental standards, maintain ecosystem integrity, and enhance opportunities for biodiversity recovery where feasible throughout the project lifecycle.	ESPS 6 recognises the importance of protecting and conserving biodiversity, including habitats and species potentially affected by project activities, and promoting the sustainable management and restoration of natural ecosystems. ESPS 1 underscores the importance of identifying, assessing, and managing environmental and social risks and impacts throughout the project lifecycle, including impacts on biodiversity and the implementation of appropriate mitigation and monitoring measures. ESPS 3 addresses the need to prevent and minimise pollution and environmental degradation, including impacts on air, water, and soil that may indirectly affect biodiversity and ecosystem health.
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6.5 Management Plans

6.5.1 Water Quality Management Plan

The proposed construction and operation of the water treatment plants will involve extensive construction activities. These activities have the potential to adversely affect both source water and treated water quality.

The parameters to be monitored during land preparation and operation to ensure the protection of the aquatic environment will be stipulated by EMA National standards. Full list of standards for ambient water quality of freshwater sources is attached in (Appendix 4). Table 6-1 below is the parameters deemed to have the highest potential to contaminate water sources and deteriorate the quality of treated water.

Table 6-1 Trinidad and Tobago National Ambient Water Quality Standards – Freshwater (EMA)

Parameters (units)	Standard Range
Total Dissolved Solids (mg/L)	≤ 600
pH (pH units)	6.5-8.5
Total Alkalinity	≤ 20
Conductivity (μS)	≤2500
Chloride (mg /L)	≤ 250
Magnesium (mg Mg/L)	3.6 - 27.0
Nitrate (mg NO ₃ ⁻ /L)	≤ 10
Sodium (mg /L)	≤ 200
Sulphate (mg SO ₄ ²⁻ /L)	3.0 – 10.0
Hardness (mg CaCO ₃ /L)	As Ca: 100-300; As CaCO ₃ : 200-300
Silica (mg SiO ₂ /L)	≤ 80
Turbidity (NTU)	≤ 5
Metals:	
1. Iron (μg/L)	1. ≤300

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2. Manganese (mg/L)	2. ≤0.5
3. Lead (µg/L)	3. ≤10
4. Copper (µg/L)	4. ≤1000
5. Zinc (µg/L)	5. ≤5000
6. Cadmium (µg/L)	6. ≤2
7. Arsenic (µg/L)	7. ≤10
8. Mercury (µg/L)	8. ≤1

6.5.1.1 Monitoring Equipment, Stations, and Frequency

Monitoring should be carried out by an entity approved for regulatory sampling and testing. The recommended guidelines are as follows:

- One random monthly sampling is done each month for the first year of the project.
- After the first 2-3 months of sampling, general trends can be deduced and mitigative measures implemented for outlying parameters.
- Following the 12 months of sampling, trends will be deduced and dictate measures to be taken.
- If parameters are in line with the range of standards, testing can be reduced to being done at quarterly intervals to ensure that parameters stay in check,
- For constantly outlying parameters, testing must be continued monthly along with the mitigative measures.
- Intermediary physical tests should also be done to fully grasp the state of the water quality in the project area.
- Once parameters are determined to be non-compliant with the regulatory stipulations or process requirements, corrective actions should be taken to bring the parameters back into compliance. Investigations into the cause(s) of the non-compliance should be done as soon as possible once results are obtained to ensure swift and adequate corrective measures are implemented.

6.5.1.2 Management Measures

Water Pollution Prevention

- Include environmental clauses in all contractor agreements to hold them accountable for spills and contamination.
- Store fuel, lubricants, and chemicals in bunded containment areas at least 50 m from watercourses.
- Prohibit direct discharge of wastewater or stormwater into rivers.
- Provide spill kits and train personnel in spill response procedures.
- Maintain stormwater drains and sediment control devices throughout construction.
- Conduct regular inspections during rainfall events to ensure effectiveness of erosion control measures.

6.5.1.3 Monitoring and Compliance

Water quality monitoring will comply with the Environmental Management (Water Pollution) Rules, 2019, and IDB Environmental and Social Performance Standard 3 (Resource Efficiency and Pollution Prevention).

As the project extracts and moves water, special emphasis will be placed on maintaining water quality during construction (to prevent sedimentation and contamination) and operation (to ensure sustainable intake quality).

Monitoring Frequency

Monitoring will be conducted by the Contractor, supported by a qualified environmental specialist and supervised by WASA.

- Pre-construction: Establish baseline parameters for turbidity, total suspended solids (TSS), pH, conductivity, and dissolved oxygen (DO).
- Construction: Weekly monitoring at river intakes and downstream points (or in accordance with frequency stipulated by the EMA).
- Operation Phase: Quarterly sampling for raw and treated water to verify ongoing water quality (or in accordance with frequency stipulated by the EMA).

6.5.1.4 Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the water quality management program.

Table 6-2 Key Performance Indicators (KPI) for Water Quality Management

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Key Performance Indicators	How Will It Be Monitored and Measured	Responsibility
Sediment traps installed and maintained	Site inspections and photographs	Contractor / EHS Officer
Work halted during heavy rainfall	Logbook entries and supervisor reports	Contractor
Turbidity and TSS levels within limits	Certified laboratory test results	Contractor / WASA
Spill containment maintained	Inspection records	EHS Officer

6.5.1.5 Roles and Responsibilities

It is the responsibility of the Contractor to ensure that the management and mitigation measures for water quality are clearly understood by all workers and that they are carried out and relevant monitoring reports are prepared.

WASA is responsible for monitoring the contractor to ensure that monitoring is being undertaken and mitigation measures are being enforced.

6.5.2 Air Quality and Dust Control Plan

The Air Quality and Dust Control Management Plan (AQDCMP) provide a structured framework to prevent, monitor, and mitigate adverse impacts on ambient air quality resulting from construction and operational activities associated with the St. Margarets Pipeline. The plan emphasizes proactive measures to minimize fugitive dust emissions, equipment exhaust, and particulate matter dispersion that could affect nearby communities and sensitive ecological receptors.

The plan seeks to:

1. Protect ambient air quality within project site and the surrounding areas, ensuring that emissions from construction and operation remain within acceptable limits established under the Environmental Management (Air Pollution Control) Rules, 2014 and the World Health Organization (WHO) Air Quality Guidelines (2021).
2. Prevent nuisance dust and particulate pollution from construction activities such as excavation, hauling, stockpiling, and material handling through effective site management and dust suppression techniques. These may include:
 - Routine wetting, mainly during active construction
 - Chemical Suppressants for long term or high traffic areas

- Physical barriers including dust screens, fences or vegetative buffers
- Coverage of loose materials
- 3. Control exhaust emissions from generators, vehicles, and heavy machinery through routine maintenance, use of compliant equipment, and restriction of unnecessary idling.
- 4. Safeguard worker health and community well-being by implementing appropriate personal protective equipment (PPE) requirements and maintaining safe air quality levels at work zones and receptor sites.
- 5. Establish a monitoring and reporting framework to measure particulate matter (PM₁₀, PM_{2.5}, and TSP) levels and evaluate the effectiveness of mitigation measures, allowing for adaptive management and continuous improvement in environmental performance.

6.5.2.1 *Monitoring Equipment, Stations, and Frequency*

Monitoring should be carried out by an entity approved for regulatory sampling and testing. The recommended guidelines are as follows:

1. One random monthly sampling is done each month for the first year of the project.
 - After the first 2-3 months of sampling, general trends can be deduced and mitigative measures implemented for outlying parameters.
 - Following the 12 months of sampling, trends will be deduced and dictate measures to be taken.
2. If parameters are in line with the range of standards, testing can be reduced to being done at quarterly intervals to ensure that parameters stay in check.

6.5.2.2 *Management Measures*

In addition to the monitoring procedures, the Contractor will ensure that these measures are followed:

General measures

- Effective implementation, monitoring and enforcement of any guidelines or action provided by the Environmental Management Authority (EMA)
- Record complaints and relevant responses

Fugitive dust control measures

- Cover haulage vehicles transporting aggregate, soil and cement.

- Cover and/or wet onsite stockpiles of aggregate, soil etc., especially during windy and dry conditions
- Locate sources of dust away from sensitive receptors
- Ensure proper stock piling/storage and disposal of solid waste.
- Wet cleared land areas regularly
- Wet dust suppression methods on unsealed roads must be implemented to prevent generation of nuisance dust.
- Provide workers with the necessary PPE e.g. dust masks, and ensure that they are worn correctly
- There must be strict speed limits on dust roads to prevent dust entrainment into the atmosphere.
- Restrict the dropping of material from height during loading and unloading.
- Revegetate cleared areas immediately following construction to prevent loose soil from being blown away.

Emissions control measures

- Use low-emission machinery and maintain all equipment regularly.
- Prohibit unnecessary idling of vehicles and generators.
- Ensure all generators, compressors, and construction vehicles meet manufacturer emissions standards.
- Implement strict maintenance logs for heavy equipment.

6.5.2.3 Monitoring and Compliance

Ambient air quality monitoring will be conducted in accordance with the World Health Organization (WHO) Guidelines for Air Quality (2021) and the Environmental Management (Air Pollution Control) Rules, 2014 under the Environmental Management Act of Trinidad and Tobago.

Baseline data will be obtained from the nearest EMA monitoring stations and verified by project-specific baseline sampling prior to construction. Parameters will include PM₁₀, PM_{2.5}, and Total Suspended Particulates (TSP), which are of particular concern during site preparation, earthworks, and construction.

Table 6-3 WHO and EMA Ambient Air Quality Guidelines for PM2.5 and PM10

Parameter	Averaging Time	WHO 2021 (µg/m ³)	EMA Standards (µg/m ³)
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PM_{2.5}	24-hour mean	15	65
PM_{2.5}	Annual mean	5	15
PM₁₀	24-hour mean	45	75
PM₁₀	Annual mean	15	50

6.5.2.4 Indicators

A The following KPIs have been selected to evaluate the effectiveness of the air quality monitoring system.

Table 6-4 Key Performance Indicators (KPI) for Air Quality and Dust Management

Key Performance Indicators	How Will It Be Monitored and Measured	Responsibility
Equipment maintenance logs updated	Review of maintenance documentation	Contractor / EHS Officer
Stakeholder notifications and complaints addressed	Review of stakeholder communications	Contractor / WASA
Air quality parameters within WHO/EMAR limits	Review of lab certificates	Contractor
Frequency of dust suppression (wetting)	Site logs	Contractor
Worker PPE usage compliance	Site inspection reports	EHS Officer

6.5.2.5 Roles and Responsibilities

It is the responsibility of the Contractor to ensure that all mitigation measures are carried out and that monitoring reports are prepared. The Contractor should ensure that an Environmental Health and Safety (EHS) Manager is employed to oversee the specific requirements of this plan.

WASA is responsible for monitoring the contractor to ensure that monitoring is being undertaken and mitigation measures are being enforced.

6.5.3 Noise and Vibration Management Plan

The Noise and Vibration Management Plan (NVMP) establish a systematic approach to identify, monitor, and mitigate noise and vibration impacts associated with the construction and

operational phases of the St. Margaret's Pipeline. The plan aims to ensure that project activities are conducted in a manner that protects community health, worker safety, and the integrity of nearby structures and ecosystems.

The plan seeks to:

1. Ensure compliance with the Environmental Management (Noise Pollution Control) Rules, 2001 and relevant World Health Organization (WHO) Environmental Noise Guidelines, maintaining noise and vibration levels within acceptable limits for residential and environmentally sensitive areas.
2. Minimize noise and vibration emissions from construction equipment, vehicle movement, and material handling using low-noise machinery, proper equipment maintenance, and scheduling of high-noise activities during daytime hours.
3. Prevent nuisance and health effects on nearby communities, workers, and wildlife in the regions along the pipeline's path by maintaining effective buffer zones and implementing temporary barriers or enclosures where appropriate.
4. Monitor and evaluate noise and vibration levels at key receptor sites to ensure adherence to regulatory thresholds and facilitate adaptive management when exceedances are detected.
5. Promote awareness and accountability among construction personnel and contractors through training on noise mitigation procedures and community engagement to address complaints promptly and effectively.

6.5.3.1 Management Measures

In addition to the monitoring procedures, the Contractor will ensure the following noise reduction options are implemented where necessary:

- Provide workers with the necessary PPE (e.g., noise-cancelling headphones) and ensure that they are worn. Specialised hearing protection tailored to filter high-frequency sounds typical of electrical systems is also recommended.
- Consult with and sensitise residents in the area to the types of activities that will take place ahead of the works and assign a liaison person (recommend that a Community Liaison Officer be hired) with whom the residents can relate.
- Maintain all equipment in proper working order to avoid excessive noise generation and the simultaneous use of multiple noisy machines in proximity to each other.
- If noise complaints are received from residents, consider installing partial screening around the noisiest activities and/or mufflers on noisy equipment. In case of complaints, they should be recorded, and appropriate action should be taken via the Grievance Redress Mechanism.

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- Limit the implementation of noisy work simultaneously. As well, limit noisy activities to daytime hours, adhering to local noise ordinances.
- Implement a rotating roster of personnel who are employed for noisy work – rotate workers involved in noisy activities to minimise fatigue-related errors and prolonged exposure.
- Work around key events, peak usage times, or high-traffic periods (e.g., avoid work during school hours in educational buildings or peak visiting hours in public offices and health centres). Prioritise performing the noisiest tasks during times when targeted public buildings are unoccupied, such as evenings, weekends, or holidays.
- Train workers on the importance of minimising noise during construction. This includes proper equipment use, the scheduling of noisy activities, and following best practices for equipment maintenance.

6.5.3.2 *Monitoring and Compliance*

The ambient noise standards in Trinidad and Tobago are regulated by the Noise Pollution Control Rules, 2001 (as amended) and enforced by the Environmental Management Authority (EMA). The standards vary zonally and are displayed in the table below:

Table 6-5 Noise Standards as outlined by the Noise Pollution Control Rules, 2001 (As amended)

Zone Category	Time Period	Equivalent Continuous Sound Pressure Level (dBA)	Instantaneous Unweighted Peak Sound Pressure Level (dB peak)
Industrial Zone (Zone I)	Any time	75 dBA	130 dB
Environmentally Sensitive Areas (Zone II)	Daytime	Max 60 dBA, or 3 dBA above background level	120 dB
Environmentally Sensitive Areas (Zone II)	Nighttime	Max 60 dBA, or 3 dBA above background level	115 dB
General Area (Zone III)	Daytime (8AM-8PM)	Max 80 dBA, or 5 dBA above background level	120 dB
General Area (Zone III)	Nighttime (8PM-8AM)	Max 65 dBA, or 3 dBA above background level	115 dB

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6.5.3.3 Indicators

The following KPIs have been selected to evaluate the effectiveness of the noise monitoring system.

Table 6-6 Key Performance Indicators for Noise Management

KEY INDICATORS	PERFORMANCE HOW MONITORED MEASURED	WILL IT BE FREQUENCY AND RESPONSIBILITY
Notice given to stakeholders in advance of scheduled works	Review and inspection of documentation	Twice per month or as stipulated by the Contractor; EMA
Noise parameters within EMA standards	Results provided by EMA and the staff member responsible for EHS	Results to be presented by the EHS Officer to the WASA Technical Leads for the Project and the EMA
Log of complaints	Review and inspection of documentation	
Use of personal protective equipment gear (specialised hearing protection included)	Review and inspection of documentation	

6.5.3.4 Roles and Responsibilities

It is the responsibility of WASA and all contractors and subcontractors to ensure that all mitigation measures are carried out and that monitoring reports are prepared. The Contractor should ensure that an Environmental Health and Safety (EHS) Officer is employed to oversee the specific requirements of this plan.

WASA is responsible for ensuring the contractor understands the importance of monitoring and will support them in undertaking this task as often as is required and for implementing the mitigation measures necessary. The site and the surrounding environment will be monitored, and negative impacts caused by the construction works will be recorded. This should be included in the contract arrangements.

The sampled noise data will be compared to the standards outlined in (Table 6-4) as well as the baseline data, and the analysis will be included in the environmental monitoring report prepared and submitted to the EMA. If there are any exceedances, this will be reported immediately to the EHS

Officer to allow for the implementation of corrective measures or adjustments in management strategies based on the results and, where practicable, to the operations.

6.5.4 Soil Erosion and Drainage Management Plan

The Stormwater and Drainage Management Plan (SDMP) provide a structured framework for managing surface runoff, minimizing flood risk, and preventing erosion or sedimentation impacts throughout all phases of the St. Margaret's Pipeline Project. The plan outlines strategies to maintain natural drainage patterns, reduce stormwater contamination, and enhance the site's climate resilience in accordance with national standards and IDB environmental safeguard requirements.

The plan seeks to:

1. Prevent flooding and uncontrolled runoff within and downstream of the water catchments by implementing engineered drainage systems, retention basins, and permeable surfaces that support effective water management during high-intensity rainfall events.
2. Protect water quality and sensitive ecosystems by preventing sediment, debris, and contaminants from entering water sources which serve as critical water supply sources and support ecologically sensitive habitats.
3. Ensure compliance with the Environmental Management (Water Pollution) Rules, 2019, the Drainage Policy for Trinidad and Tobago, and best practices for stormwater design and flood mitigation recommended by the Ministry of Works and Transport, Drainage Division.
4. Incorporate climate-resilient design features that account for projected increases in rainfall intensity and sea level rise, ensuring the long-term performance of drainage infrastructure under changing climatic conditions.
5. Establish a monitoring and maintenance regime for stormwater control structures, including culverts, drains, and sediment traps, to ensure continued functionality and to allow for timely corrective action during the project's operational phase.

6.5.4.1 Management Measures

The Contractor will ensure that these measures are followed:

- Minimise the Project activities' disturbance area. Demarcate the boundaries within which Project activities will occur. All activities will strictly occur within the designated work zone, ensuring that the work scope is confined to this specific area.
- Restrict vehicular movements to designated roads and trails to reduce the possibility of off-road incidents with residents, golf carts or bicycles.

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- Constant monitoring and inspection of sites is necessary to assess the effectiveness of sediment control mechanisms implemented.
- Minimise vegetation removal to reduce disturbance to the soil (and sensitive wetland/mangrove environment) and maintain natural water infiltration rates. Maintain buffer strips of native vegetation along drainage channels to filter runoff and stabilise soil.
- Keep construction activities and equipment away from water channels and flow paths. If impossible, create temporary channels to redirect water around the zone of works while maintaining the natural flow direction.
- Limit the area of exposed soil by working on small sections at a time, allowing for immediate stabilisation post-completion.
- Avoid the excessive compaction of soil, which can reduce permeability and alter runoff patterns. Soil compaction is contributed to by construction activities that include:
 - The repeated trips of construction equipment over the soil
 - Soil excavation
 - Soil mixing
 - The use of heavy machinery on wet soil

6.5.4.2 Monitoring and Compliance

Daily inspections of the work site will be conducted by WASA and contractors. Sediment controls will be assessed during site inspections and following significant rainfall events (defined as more than 10mm of rainfall within 24 hours, leading to site runoff), or as stipulated by the EMA. The assessment will also encompass the removal of any accumulated sediments as needed. This is especially important, given the nature of the limestone substrate within the project area and the extensive impact this can have on nearby coastal and marine environments.

6.5.4.3 Indicators

The following KPIs have been selected to evaluate the effectiveness of the erosion control management systems.

Table 6-7 Key Performance Indicators for Erosion Control Management

KEY INDICATOR	PERFORMANCE HOW MONITORED MEASURED	WILL IT BE FREQUENCY AND	RESPONSIBILITY
Absence of Substantial Sediment Deposition in	Site Inspection	Daily	WASA and/or Contractor;

waterways and marine environment	Results to be presented to the EMA
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6.5.4.4 Roles and Responsibilities

It is the responsibility of the Contractor to ensure that all mitigation measures are carried out and that monitoring reports are prepared. The Contractor should ensure that an Environmental Health and Safety (EHS) Officer is employed to oversee the specific requirements of this plan.

WASA is responsible for assigning the contractor as the responsible party for undertaking the monitoring required and for implementing the mitigation measures necessary. The site and surrounding environment will be monitored by the contractor for negative impacts caused by the construction Works.

6.5.5 Waste Management Plan (incl. Hazardous Materials)

The Waste Management Plan (WMP) provides a systematic framework for the proper handling, segregation, storage, transportation, treatment, and disposal of all waste streams generated during the construction and operation phases of the project.

The main purpose of the plan is to prevent environmental contamination and safeguard human health by ensuring that all waste is managed responsibly, in full compliance with EMA regulations and IDB environmental safeguards.

Objectives

1. Identify and categorize all waste streams likely to be generated during construction and operation (solid, liquid, hazardous, and non-hazardous).
2. Prevent and minimize waste generation through design optimization, reuse, and recycling where feasible.
3. Ensure safe handling and storage of all waste materials, preventing leaching, spills, or unauthorized dumping.
4. Establish waste segregation protocols for recyclable, reusable, and disposable materials.
5. Ensure compliance with the EMA Waste Management Rules and all applicable CEC conditions.
6. Promote resource efficiency and environmental awareness among workers and contractors.
7. Provide monitoring and reporting mechanisms to track waste generation, movement, and disposal.

Waste streams expected during project implementation include:

- Non-hazardous solid waste: Construction debris (concrete, wood, packaging, scrap metal), domestic waste, paper, plastics.
- Hazardous waste: Used oil, lubricants, fuel-contaminated materials, paint cans, chemical containers, oily rags, and spent filters.
- Liquid waste: Concrete wash water, wastewater from site sanitation facilities, process backwash water (during operation).
- Biological waste: Organic matter from cleared vegetation.

Waste Hierarchy Approach

The project shall apply the internationally accepted waste management hierarchy in order of priority:

1. Avoid / Minimize: Reduce waste generation at the source through efficient material use.
2. Reuse: Recover and reuse materials such as timber or metal parts.
3. Recycle: Segregate recyclable materials (metal, paper, plastic) for collection by approved recycling entities.
4. Recover: Utilize organic waste for composting where feasible.
5. Dispose: Safely dispose of non-recyclable, non-recoverable waste at EMA-approved facilities.

6.5.5.1 Management Measures

Segregation and Storage

- Provide clearly labelled bins for each waste category.
- Locate waste collection areas away from drains, watercourses, and sensitive habitats.
- Store hazardous waste in impermeable, bunded, and ventilated containment areas with spill containment.
- Maintain an up-to-date Waste Register detailing quantities, categories, and disposal destinations.
- Inspect storage areas weekly for integrity and cleanliness.

Transportation and Disposal

- Only EMA-licensed waste haulers shall be used for transporting waste offsite.

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- All hazardous waste must be accompanied by a Waste Tracking Manifest, signed at each transfer stage.
- Non-hazardous solid waste shall be sent to the Forres Park Landfill or other EMA-approved disposal facility.
- Hazardous waste (e.g., used oil, chemicals) shall be disposed of through certified waste treatment or recovery companies (e.g., SWMCOL or other licensed operators).
- Maintain receipts and manifests for verification during audits.

6.5.5.2 Indicators

The following KPIs have been selected to evaluate the effectiveness of the waste management measures.

Table 6-8: Key Performance Indicators for Waste Management

Indicator	Target Performance Standard	/Frequency	Means Verification	of Responsible Party
No construction waste deposited in the Environment	0	Daily	Site Inspection	Contractor / WASA
Volume of hazardous waste disposed via licensed hauler	100% compliance	Per event	EMA permits and disposal receipts	WASA Environmental Unit
Number of waste-related incidents (spills, illegal dumping, leaks)	0	Ongoing	Incident logs	Contractor / WASA

6.5.5.3 Roles and Responsibilities

It is the responsibility of the WASA and all contractors to ensure that all mitigation measures are carried out and that monitoring reports are prepared. The Contractor should ensure that an

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Environmental Health and Safety (EHS) Officer is employed to oversee the specific requirements of this plan.

WASA is responsible for assigning contractors as the responsible parties for undertaking the monitoring required and for implementing the mitigation measures necessary. The Site and surrounding environment will be monitored by WASA and contractors for negative impacts caused by the construction works.

Table 6-9: Roles and Responsibilities for Waste Management

ENTITY / ROLE	KEY RESPONSIBILITIES
WASA Environmental Unit	Oversee implementation of the WMP; ensure compliance with EMA and IDB requirements; review monthly waste reports; liaise with EMA.
Contractor / HSE Officer	Implement waste management measures onsite; maintain segregation and storage; prepare monthly waste tracking reports; ensure worker training.
WASA On-Site Operators (Operational Phase)	Manage sludge, residuals, and backwash waste during WTP operation; maintain effluent and sludge disposal records.
EMA (Regulatory Authority)	Review waste management documentation; issue permits and conduct site inspections; enforce compliance under Waste Management Rules.
Waste Hauling Contractors (Licensed)	Transport waste safely to approved facilities; maintain manifest records; ensure vehicles are labelled and spill-proof.
Workers and Subcontractors	Comply with waste segregation, labelling, and disposal procedures; immediately report any spills or improper disposal.

6.5.6 Hazardous Materials Handling Management Plan

The WASA personnel responsible for the water treatment plant is primarily responsible for the handling, storage and disposal of hazardous materials.

The IDB Guidelines for Community Health, Safety and Security (ESPS 4) outlines that hazardous materials and substances may include: explosives; compressed gases, including toxic or flammable

gases; flammable liquids; flammable solids; oxidizing substances; toxic materials; radioactive material; corrosive substances; chemical fertilizers; soil amendments; chemicals, oils, and other hydrocarbons; paints; pesticides; herbicides; fungicides; asbestos; hospital and pharmaceutical waste; used batteries; radioactive medical waste; some types of fluorescent light bulbs and ballasts; and polychlorinated biphenyls (PCBs) in electrical equipment, among others. These all present a risk to human health, community, and the environment due to their physical, chemical, or biological characteristics. The best way to mitigate against the effects of hazardous waste is to refrain from the use of hazardous materials.

6.5.6.1 Monitoring Frequency

In the anticipation that the monitoring of hazardous materials handling, storage and disposal should be done weekly to ensure that all measures are being implemented and followed.

6.5.6.2 Management and Mitigation Measures

The Contractor will ensure that every effort is made to abide by the following mitigation measures during construction or operations in order to lessen the potential negative effects of inappropriate handling of hazardous materials:

Spill Prevention and Hazardous Waste Management

- Environmental conditions must be included in any construction contracts, thereby making contractors accountable for preventing accidental spillages
- Effective implementation, monitoring and enforcement of National Environmental Policy, and the National Pollution Rules and action by the Environmental Authority
- Conduct preventive maintenance for vehicles and machinery to ensure integrity and reliability and reduce/avoid leaks
- Conduct any on site repairs on impervious surfaces.
- Ensure proper handling, use and storage of all chemical and hazardous waste according to best practices:
 - Safety Data Sheets) ought to be kept on site. In case of an accident on site, there should be first aid supplies on hand and clear signage with the emergency numbers of nearby medical centres
 - Provide spill containment and cleanup equipment on site
 - Personnel handling chemicals and hazardous substances must be trained in the use of spill prevention measures

- Personnel handling chemicals and hazardous substance including chlorine and heavy fuel oils must be trained in the correct use of the appropriate Personal Protective Equipment (PPE)
- Utilise the proper dispensing equipment
- Storage areas must be well marked with appropriate signage.
- All hazardous substances must be stored on an impervious surface in a designated bunded area, able to contain 110 % of the total volume of materials stored at any given time.
- Fuel and lubrication of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spill and evaporation. There shall be no storage fuel on the project site. Fuel must be brought to the project site each day that Work is performed.
- Clean up any spills (including existing spills) immediately, through containment and removal of product and appropriate rehabilitation or disposal of contaminated soils
- All hazardous waste must be disposed of at a registered hazardous waste disposal facility, which is under the Trinidad and Tobago Solid Waste Management Company (SWMCOL) or stored in designated, lined and bunded areas as approved by the Environmental Management Authority
- Handling and disposal of hazardous waste is only conducted by trained personnel wearing the correct PPE
- Any spilling incidents must be reported as soon as possible
- Chlorine is a corrosive that is irritating to the eyes and to the respiratory system. Storage of chlorine away from heat and in a well ventilated area. Personnel handling chlorine should wear the appropriate PPE including hazardous resistant gloves, sleeved clothing to protect from skin irritation. Respirators would be needed if handling for long periods and in an area that is not well ventilated.
- Ensure proper handling and disposal of asbestos material:
 - Asbestos material, such as can be found in old pipelines, is a deadly carcinogen that should only be handled by licensed asbestos abatement professionals.
 - When handling asbestos trained personnel must seal off the work area with plastic sheeting to prevent contamination outside. Surfaces that do not need abating must be covered in plastic sheeting.
 - Warning signs must be posted to alert others that an asbestos project is underway.

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- Wear Personal Protective Equipment such as an N-100 or P-100 respirator and protective clothing to prevent asbestos exposure.
- Asbestos-containing materials should be wetted prior to any removal efforts. Once removed it should be double bagged in 6-millimeter plastic bags and enclosed in a plastic, leak-tight container with a lid and proper labelling. It can only be disposed of in an appropriate way at the designated landfill as advised by the Sanitation Service Authority.
- Decontamination enclosure areas must be provided to allow workers to remove contaminated clothing, shoes and tools.

6.5.6.3 Key Performance Indicators

The following Key Performance Indicators (KPIs) have been selected in order to evaluate the effectiveness of the hazardous materials handling.

Table 6-10: Key Performance Indicators for Hazardous Materials Handling

KEY PERFORMANCE INDICATOR	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
No leakages or spills	Monitor possible spills Inspection of site by Contractor	Contractor; Results to be presented to the Implementing Agency	Twice per month
Incident Logs	Reporting of all incidents associated with hazardous materials	WASA personnel	

6.5.6.4 Roles and Responsibilities

It is the responsibility of the Contractor to ensure that all mitigation measures are carried out and that monitoring reports are prepared. The Contractor should ensure that an Environmental Health and Safety (EHS) Manager is employed to oversee the specific requirements of this plan.

The Implementing Agency is responsible for assigning the ENGINEER as the responsible parties for undertaking the monitoring required and for implementing the mitigation measures necessary.

6.5.6.5 Data Analysis and Reporting

If there are any exceedances, this will be reported immediately to the EHS Manager to allow for management strategies to be changed according to the results.

6.5.7 Biodiversity Management Plan

The Biodiversity Management Plan provides the framework for conserving and managing the ecological integrity of the project area and surrounding environs during the design, construction, and operation of the project.

The primary objectives of the plan are to:

1. Protect terrestrial, coastal, and marine habitats within and adjacent to each project site.
2. Prevent or minimise direct and indirect biodiversity impacts arising from vegetation clearance, noise, lighting, sedimentation, and chemical contamination.
3. Maintain ecological connectivity by ensuring riparian buffers and wildlife corridors remain intact (where feasible) and functional.
4. Enhance environmental awareness among project staff and local communities to promote stewardship and sustainable coexistence.
5. Comply with national environmental laws and international biodiversity conservation principles, including EMA CEC conditions, the Convention on Biological Diversity (CBD), and IDB ESPS 6.

6.5.7.1 Management Measures

- Conduct a pre-construction coastal and marine ecological survey, including coral reef mapping and seagrass bed delineation, along the full coastal margin of the project alignment, seaward of all proposed works.
- Review the results of pre-construction ecological surveys along proposed pipeline routes, particularly the location of sensitive habitats, fauna nesting sites, and a list of rare species within the footprint.
- Restrict the construction corridor to the minimum necessary width within the road reserve; no encroachment beyond the defined working corridor.

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- All sensitive coastal species (e.g., mangroves), whether mapped pre-construction or identified during works, shall be protected by physical exclusion barriers; no clearance of these species is permitted under any circumstances.
- Vegetation cleared from the road reserve shall be disposed of at approved locations; no dumping of vegetative material in watercourses or coastal areas.
- Invasive plant species encountered shall be removed and disposed of appropriately; no translocation of invasive material.
- All disturbed surfaces to be reinstated with native groundcover, shrubs, and trees within 30 days of completion of works in each section.
- Noise-generating machinery (excavators, compactors, generators) shall not operate within 100 m of the forest edge during the avifauna breeding season (March–June).
- All fauna encountered during construction (turtles, reptiles, birds) are to be unharmed; no fauna to be handled except by trained personnel; injured animals to be reported.
- No hunting, trapping, collecting, or interfering with wildlife by construction personnel; disciplinary procedures to be defined in the contractor's site rules.
- Cover all open trenches at the end of each workday and install escape ramps for small animals.
- Ensure waste is securely stored to prevent attraction of wildlife.
- Inspect all fill and topsoil sources for invasive species.
- Clean all construction equipment and vehicles before entering the site.
- Conduct quarterly monitoring for invasive species colonisation and implement manual or mechanical removal if detected

6.5.7.2 Monitoring and Compliance

Biodiversity and habitat monitoring is designed to ensure that the mitigation and management measures outlined in the BHMP are effectively implemented and that they achieve their intended objectives. Monitoring provides the evidence base for adaptive management, allowing for corrective action if unforeseen impacts occur, and demonstrating regulatory compliance with the EMA's Certificate of Environmental Clearance (CEC) conditions and IDB safeguard requirements.

Monitoring is an ongoing process that evaluates:

1. The effectiveness of biodiversity conservation and habitat protection measures;
2. The recovery and stability of rehabilitated habitats;

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3. The status and health of key flora and fauna populations; and
4. Compliance with national environmental regulations and international biodiversity protection obligations.

6.5.7.3 Indicators

The following KPIs have been selected to evaluate the effectiveness of the noise monitoring system.

Table 6-1: Key Performance Indicators for Biodiversity and Habitat Management

INDICATOR	TARGET / PERFORMANCE STANDARD	FREQUENCY	MEANS OF VERIFICATION	RESPONSIBLE PARTY
TURBIDITY AND TSS	≤10% above baseline	Weekly (construction)	Water Quality Report	WASA Env. Officer (via Independent Lab)
PRESENCE OF PROTECTED SPECIES	No disturbance incidents	Biannual	Biodiversity Monitoring Report	WASA Env. Officer (via Independent Ecologist)
FAUNA SIGHTINGS OR MORTALITY	0 mortality due to works	Weekly (construction)	Biodiversity Monitoring Report	Contractor / WASA
REPLANTED VEGETATION SURVIVAL (%)	≥80% survival rate	3, 6, and 12 months post-planting	Biodiversity Monitoring Report	Forestry Division/WASA
INVASIVE SPECIES PRESENCE	0 new invasive species established	Quarterly	Biodiversity Monitoring Report	WASA Env. Officer (via Independent Ecologist)
DOWNSTREAM SEDIMENTATION	No significant increase in fine sediment	Weekly	Water Quality Report	WASA Env. Officer (via Independent Lab)

6.5.7.4 Roles and Responsibilities

It is the responsibility of WASA and all contractors to ensure that all mitigation measures are carried out and that monitoring reports are prepared. The Contractor hired should be supported by the WASA Environmental Officer to oversee the specific requirements of this plan.

Any contractor assigned by the WASA assumes joint responsibility of undertaking the monitoring required and implementing the mitigation measures necessary. The site and surrounding environment will be monitored by the contractor, independent ecologists, and the WASA Environmental Officer for negative impacts caused by the works.

If there are any violations, this will be reported immediately to WASA's Environmental Officer to allow for management strategies to be changed according to the results.

Table 6-2: Roles and Responsibilities for Ecosystem/Biodiversity Management

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ENTITY / ROLE	KEY RESPONSIBILITIES
WASA ENVIRONMENTAL OFFICER	Oversee implementation of biodiversity measures, ensure contractor compliance, and prepare quarterly monitoring reports.
CONTRACTOR / HSE OFFICER	Implement all mitigation and monitoring measures; employ an Environmental Officer to manage site biodiversity controls.
FORESTRY DIVISION (MINISTRY OF AGRICULTURE, LAND AND FISHERIES)	Provide technical guidance for flora/fauna management and approve relocation and replanting programmes.
EMA	Regulatory oversight; review compliance reports and conduct periodic inspections.
IDB	Review environmental performance as part of project supervision and safeguard compliance verification.

6.5.8 Disaster Risk Management Plan

The Disaster Risk Management (DRM) Plan provides a comprehensive framework for identifying, assessing, and mitigating natural and human-induced hazards that may affect the St. Margaret's Pipeline Project during construction and operation. The plan ensures that the facility, its personnel, and surrounding communities are adequately prepared to respond to and recover from extreme events, thereby supporting climate resilience, public safety, and service continuity.

The plan seeks to:

1. Safeguard critical water infrastructure by integrating disaster-resilient design features that reduce vulnerability to natural hazards such as flooding, landslides, earthquakes, and tropical storms common to the region.
2. Enhance preparedness and response capacity of WASA personnel, contractors, and local stakeholders through clear emergency protocols, communication channels, and coordination with national disaster agencies, including the Office of Disaster Preparedness and Management (ODPM).
3. Ensure compliance with the Inter-American Development Bank (IDB) Environmental and Social Performance Standard 4 (Community Health, Safety, and Security), as well as the National Disaster Risk Management Policy of Trinidad and Tobago.
4. Reduce downtime and service disruption by establishing proactive risk reduction, rapid response, and recovery mechanisms to maintain the continuous delivery of potable water during and after disaster events.
5. Promote adaptive and climate-resilient operations by incorporating lessons learned from monitoring, simulations, and periodic reviews into the ongoing management of the pipeline infrastructure.

6.5.8.1 Management Measures

The Contractor and WASA will jointly ensure that the following measures are implemented for effective emergency response and disaster risk reduction, with clearly identified first responders and visible emergency contact information on-site:

- Elevate key plant structures above the 1-in-100-year flood level plus additional freeboard for projected sea-level rise.
- In the absence of a unified National Building Code for Construction, design structures to withstand Category 4 hurricane wind loads, consistent with the Caribbean Uniform Building Code (CUBiC).

- Flood-proof critical infrastructure through elevated electrical panels, sealed clearwells, watertight doors, and reinforced retaining walls.
- Employ corrosion-resistant materials due to the proximity to the fluvial environment.
- Incorporate engineered foundations and controlled compaction to reduce risks of soil settlement or liquefaction during seismic activity.
- Implement graded site drainage channels, retention basins, and vegetated swales to divert and control stormwater runoff.
- Pre-wire for future renewable energy integration (e.g., solar backup for telemetry and SCADA systems).
- Maintain active liaison with regional emergency services (Fire Service, ODPM, and TTPS) to coordinate emergency response and establish a clear chain of command and communication protocols.
- Conduct regular training programs on disaster preparedness, including:
 - Basic first aid and emergency communications;
 - Fire prevention and response;
 - Evacuation and shelter procedures;
 - Handling of hazardous materials (chlorine, coagulants, etc.); and
 - Flood, earthquake, and marine environment risks.
- Maintain Standard Operating Procedures (SOPs) for:
 - Pre-storm shutdown and protective measures;
 - Backup generator operation and fuel management;
 - Post-event inspection, cleanup, and reactivation procedures.
- Implement quarterly emergency simulation exercises with WASA personnel, local communities, and regional authorities to test and improve the DRM Plan.
- Adhere to hazard-specific plans, the management measures of which are outlined below:

Hurricanes and Tropical Storms

- Design plant infrastructure to withstand high winds, storm surges, and heavy rainfall. This may include using friction pylons and deep foundations that can withstand hurricane winds.

- Stay informed about hurricane forecasts and warnings.
- Store loose materials, equipment, and debris in a secure location or tie them down.
- Develop and communicate a hurricane/Tropical Storm Emergency plan for all workers.
- Ensure there are first aid supplies, communication equipment, and emergency power sources available on-site.
- Have a clear plan for the cessation of Project activities in advance of a hurricane's arrival; ensure workers are informed of the plan and evacuation routes.
- Have a plan for interim treatment and/or removal should operations be impacted for more than 24 hours.
- Develop a protocol for rapid damage assessment after a hurricane to evaluate the impact on all associated critical infrastructure related to the system.
- Establish a priority restoration plan to quickly restore plant operations and services to users.

Fires

- There should be strict procedures for monitoring fire risks, maintaining and servicing equipment, and the handling, storage and removal of flammable materials from work sites.
- Maintain regular inspections and servicing of electrical equipment to detect early signs of overheating, leakage, or malfunction.
- In the event of a fire, there should be sufficient, available and well-maintained firefighting equipment (e.g., fire extinguishers). All workers should be trained in the use of firefighting equipment and evacuation procedures.
- If the fire escalates, the local fire brigade/service shall be called to extinguish it. The contact information for the fire department on the island should be displayed in a location where it is visible to all workers.

Heavy Rainfall and Flood Prevention

- Suspend construction or outdoor maintenance during severe rainfall alerts.
- Secure all chemicals, equipment, and materials away from drains and water sources.
- Use bioengineering techniques (e.g., vetiver grass and native vegetation) to stabilize disturbed slopes.
- Install silt fences, sediment basins, and check dams during construction to reduce sediment runoff.

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- Conduct drainage performance reviews annually or after each major storm.

Earthquakes

- Apply seismic-resistant design in line with CUBiC Building Code for moderate seismic zones.
- Use deep pile foundations and anchored tanks to minimize risk of differential settlement or movement.
- Conduct structural integrity assessments following any felt seismic event.
- Provide earthquake awareness sessions for staff and communities, including safe evacuation and assembly areas.

6.5.8.2 Monitoring and Compliance

Monitoring of the St. Margaret's Pipeline will be conducted daily by the Water and Sewerage Authority (WASA) to ensure full compliance with the national building codes, environmental and disaster preparedness regulations of Trinidad and Tobago, and IDB Environmental and Social Performance Standard (ESPS) 4 – Community Health, Safety, and Security. The St. Margaret's Pipeline has been designed to be climate-resilient, integrating structural and operational safeguards against tropical storms, drought, flooding, and earthquakes. Given its critical role in supplying potable water to over 160,000 customers, the risk level is classified as high.

6.5.8.3 Indicators

The following KPIs have been selected to evaluate the effectiveness of the emergency response measures.

Key Indicators (KPIs)	Performance Measurement	Monitoring and Frequency	Responsibility
Log of Safety and Emergency Equipment (served)	Review and inspection of maintenance records	Monthly	WASA and/or Contractor;
Hazard-Specific Plans (Hurricanes, Floods, Fire, and Earthquake)	Documentation review and updates	Annual	
Worker Training on Emergency and Hazard Plans	Verification of training logs	Semi-Annual	

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Emergency Conducted	Drills	Participation record and performance evaluation	Quarterly	Results to be presented by the EHS Officer to the WASA
Post-Event Assessments Completed	Damage	Review of inspection reports	After each major event	Technical Leads for the Project

6.5.8.4 Roles and Responsibilities

It is the responsibility of the WASA and contractors to ensure that the emergency response measures are clearly understood by all workers and that all management and mitigation measures are carried out and that monitoring reports are prepared.

6.5.9 Stakeholder Engagement and Grievance Management Plan (SEGMP)

6.5.9.1 Introduction and Objectives

The Installation of the St. Margaret's Junction to Pointe-à-Pierre Transmission and Distribution Pipelines Project will require ongoing engagement with affected stakeholders throughout the construction phase to ensure that project information is communicated effectively, stakeholder concerns are identified and addressed in a timely manner, and potential disruptions are appropriately managed.

Construction activities have the potential to affect residents, businesses, road users, public transportation operators, institutions, utility providers and other stakeholders through traffic disruptions, temporary access restrictions, utility service interruptions, construction nuisance, road reinstatement activities and other construction-related impacts. Effective stakeholder engagement will therefore be critical to maintaining positive stakeholder relations and minimising community dissatisfaction throughout project implementation.

The objectives of this Plan are to:

- Ensure timely and accurate dissemination of project information.
- Promote meaningful engagement with affected stakeholders.
- Provide opportunities for stakeholders to raise concerns, ask questions and provide feedback.
- Establish transparent procedures for receiving, recording, investigating and resolving grievances.
- Promote stakeholder awareness of construction schedules, traffic management measures, utility interruptions and access arrangements.

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- Ensure that the needs of vulnerable groups are appropriately considered throughout project implementation.
- Support implementation of the Project's social management measures and stakeholder commitments.

This Plan shall be implemented in conjunction with the Traffic, Transportation and Road Safety Management Plan (TTRSMP), Community Health and Safety Management Plan (CHSMP), Local Employment, Gender Inclusion and Workforce Conduct Plan (LEGIWCP), Worker Health, Safety and Labour Management Plan (WHSMP) and Utility Service Interruption and Access Management Plan (USAMP).

6.5.9.2 Key Stakeholders

Key stakeholders associated with the Project include:

Stakeholder Category	Stakeholders
Project Proponent	WASA
Government Agencies	Ministry of Works and Transport (MOWT), Couva/Tabaquite/Talparo Regional Corporation and other relevant agencies
Emergency Services	Trinidad and Tobago Police Service (TTPS), Trinidad and Tobago Fire Service (TTFS), and Ambulance Services,
Utility Providers	WASA, T&TEC, telecommunications providers, and other utility operators
Project Communities	Pointe-a-Pierre, Plaisance Park, St. Margaret
- Residents	Residents located along and adjacent to the pipeline corridor
- Community institutions & organisations	Schools, health centre, churches, and local groups representing the interest of residents
- Businesses	Commercial establishments, hotel, restaurants, roadside businesses, vendors and service providers along the relevant sections of the SMR
Transportation Stakeholders	Public transport operators, commuters, motorists and road users
Community Facilities	Schools, health facilities, religious institutions and community centres
Vulnerable Groups	Older persons, persons with disabilities, pregnant women, persons who are acutely ill or homebound and other vulnerable groups
Project Workforce	Employees, contractors and subcontractors

6.5.9.3 *Management Measures*

A. Stakeholder Identification and Analysis

- Maintain a stakeholder register identifying affected stakeholders and stakeholder groups.
- Periodically review and update stakeholder information throughout project implementation.
- Identify stakeholders likely to be disproportionately affected by construction activities.
- Identify vulnerable stakeholders requiring special consideration during project implementation.

B. Information Disclosure and Communication

- Provide stakeholders with timely and accurate information regarding project activities.
- Communicate information regarding construction schedules, traffic management arrangements, utility interruptions, access restrictions and reinstatement activities.
- Use appropriate communication channels to reach affected stakeholders.
- Ensure information is communicated in a manner that is clear, accessible and easily understood.

C. Stakeholder Consultation and Engagement

- Engage affected stakeholders throughout project implementation.
- Conduct consultations with affected residents, businesses, institutions and other stakeholders where activities are likely to result in significant disruption.
- Maintain open communication channels for stakeholder feedback.
- Document stakeholder concerns and responses provided.

D. Community Notifications

- Provide advance notice of lane restrictions, traffic management measures, utility interruptions, access restrictions, reinstatement activities and other construction activities likely to affect stakeholders.
- Notify affected residents, businesses, institutions and road users of anticipated construction schedules and disruptions.
- Provide updates where construction schedules change or where disruptions extend beyond originally communicated timeframes.

- Coordinate communications with WASA, relevant authorities and emergency service providers where activities may affect traffic flow or access.

E. Grievance Management

- Establish and maintain a Project Grievance Mechanism (GM).
- Provide stakeholders with multiple channels for submitting grievances, complaints, concerns and enquiries.
- Record all grievances within a Grievance Register.
- Investigate grievances promptly and implement corrective actions where required.
- Communicate grievance outcomes to complainants.
- Monitor grievance trends and recurring issues to identify opportunities for improvement.
- Complaints involving harassment, discrimination, gender-based violence and harassment (GBVH), sexual exploitation and abuse (SEA), sexual harassment (SH) or other forms of serious misconduct shall be managed in accordance with the procedures outlined in the Local Employment, Gender Inclusion and Workforce Conduct Plan.

F. Vulnerable Groups

- Consider the needs of vulnerable groups when planning and implementing project activities.
- Provide reasonable accommodation measures where feasible to minimise impacts on vulnerable stakeholders.
- Give particular consideration to access requirements, mobility constraints and service interruption impacts affecting vulnerable groups.
- Ensure vulnerable stakeholders have access to grievance and feedback mechanisms.

G. Monitoring and Reporting

- Maintain records of stakeholder engagement activities undertaken.
- Maintain records of stakeholder concerns, grievances and corrective actions.
- Monitor stakeholder feedback and emerging issues throughout project implementation.
- Report stakeholder engagement activities and grievance management performance through project reporting systems.

6.5.9.4 *Grievance Management Procedure*

Grievances may be submitted verbally, in writing, by telephone, email, through the CLO or anonymously. The grievance management process shall comprise the following steps:

Step 1: Receipt and Registration

- Receive the grievance through the approved grievance channels.
- Record the grievance within the Grievance Register.
- Assign a grievance reference number.
- Capture relevant information, including the nature of the grievance, complainant details (where provided), date received and preferred method of communication.
- Acknowledge receipt of the grievance within 2 working days and communicate the grievance management process and anticipated resolution timeframe to the complainant.

Step 2: Screening and Classification

- Review the grievance and determine whether it is related to project activities.
- Assess the nature, severity and potential consequences of the grievance.
- Classify the grievance according to the established grievance levels.
- Determine whether the grievance requires special handling procedures, e.g. in the case of serious misconduct.
- Assign responsibility for investigation and resolution to the appropriate personnel.

Step 3: Investigation

- Investigate the grievance and gather relevant information.
- Conduct site visits, interviews or consultations as necessary.
- Consult relevant project personnel, contractors or stakeholders where required.
- Review available records, documentation and supporting evidence.
- Determine the underlying causes of the grievance and identify appropriate corrective actions.

Step 4: Resolution

- Develop and implement appropriate corrective actions.
- Communicate the proposed resolution and implementation timeframe to the complainant.

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- Coordinate corrective actions with relevant project personnel and stakeholders.
- Escalate unresolved grievances where necessary in accordance with the grievance procedure.

Step 5: Close-Out

- Verify implementation of corrective actions.
- Confirm whether the grievance has been resolved.
- Obtain confirmation of complainant satisfaction where applicable.
- Record the outcome and close the grievance within the Grievance Register.
- Identify any lessons learned or follow-up actions required to prevent recurrence.

Grievance Levels

Level	Description	Target Resolution Time
Level 1	Routine complaints (dust, noise, information requests, minor traffic concerns)	Within 5 working days
Level 2	Moderate grievances (access restrictions, reinstatement concerns, service interruptions)	Within 10 working days
Level 3	Significant grievances (property damage, significant livelihood impacts, repeated disruptions)	Within 20 working days
Level 4	Serious grievances (personal injury, major property damage, serious misconduct allegations, legal matters)	Immediate investigation; case-specific resolution

6.5.9.5 Monitoring and Compliance

The Contractor shall monitor implementation of stakeholder engagement and grievance management activities throughout project implementation.

Monitoring shall include review of stakeholder engagement activities, stakeholder feedback, grievances received, response times, corrective actions and stakeholder satisfaction.

Any deficiencies identified shall be addressed promptly and documented through the Project corrective action process.

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6.5.9.6 Indicators (KPIs)

The following KPIs shall be used to monitor implementation of this Plan.

KPI	Monitoring Method	Frequency	Responsibility
Number of stakeholder engagement activities conducted	Engagement records	Monthly	Contractor CLO
Number of stakeholders engaged	Engagement records	Monthly	Contractor CLO
Number of grievances received by level	Grievance Register	Monthly	Contractor CLO
Percentage of grievances acknowledged within two working days	Grievance Register	Monthly	Contractor CLO
Percentage of grievances resolved within the specified timeframe	Grievance Register	Monthly	Contractor CLO
Number of recurring grievances requiring corrective action	Grievance Register	Monthly	Contractor
Number of stakeholder notifications issued	Notification records	Monthly	Contractor CLO

6.5.9.7 Roles and Responsibilities

The roles and responsibilities for implementation of this Plan are outlined below.

Entity/Role	Key Responsibilities
WASA	Provide oversight of stakeholder engagement and grievance management activities; review significant grievances and stakeholder concerns.
Contractor	Implement stakeholder engagement activities; maintain grievance records; investigate grievances; implement corrective actions and provide reporting.
Contractor CLO	Lead implementation of stakeholder engagement activities; coordinate stakeholder communications; manage grievance receipt and tracking; support grievance resolution and stakeholder notifications.
Supervising Engineer	Monitor implementation of the Plan; review stakeholder engagement performance and corrective actions.
Project Workers	Comply with stakeholder engagement requirements, Worker Code of Conduct and grievance management procedures.

6.5.10 Local Employment, Gender Inclusion and Workforce Conduct Plan (LEGIWCP)

6.5.10.1 Introduction and Objectives

The Installation of the St. Margaret's Junction to Pointe-à-Pierre Transmission and Distribution Pipelines Project is expected to generate temporary employment and economic opportunities during the construction phase. The Project will also result in increased interaction among workers, contractors, subcontractors, residents, businesses and other stakeholders located along the project corridor.

This Plan establishes measures to maximise local employment opportunities, promote gender inclusion, support respectful workplace behaviour, manage worker-community interactions and prevent inappropriate conduct, harassment and discrimination throughout project implementation.

The objectives of this Plan are to:

- Promote local employment and economic opportunities associated with project implementation.
- Encourage equitable access to employment and training opportunities.
- Promote gender inclusion within the project workforce.
- Establish standards of conduct and behaviour for project workers.
- Promote positive worker-community and worker-worker interactions.
- Prevent discrimination, harassment, bullying, intimidation and other forms of inappropriate conduct.
- Establish procedures for reporting and addressing workplace misconduct and community concerns.
- Support implementation of the Project's stakeholder engagement, labour management and community health and safety commitments.

This Plan should be implemented in conjunction with the Stakeholder Engagement and Grievance Management Plan (SEGMP), Community Health and Safety Management Plan (CHSMP), Worker Health, Safety and Labour Management Plan (WHSMP) and other relevant project management plans.

6.5.10.2 Management Measures

A. Local Employment and Economic Opportunities

- Maximise local employment opportunities where feasible and consistent with workforce requirements.

- Advertise employment opportunities locally using appropriate communication channels.
- Encourage recruitment of qualified persons from communities located within or adjacent to the project area.
- Promote local procurement of goods and services, where appropriate and consistent with project requirements, quality standards and procurement procedures.
- Implement transparent recruitment and selection procedures.
- Communicate employment opportunities, qualification requirements and application procedures clearly and consistently.

B. Gender Inclusion

- Promote equitable access to employment and training opportunities for women and men.
- Encourage employment of qualified women in professional, technical, administrative, environmental, health and safety, community liaison and other suitable positions.
- Recognise that women remain underrepresented in many skilled, semi-skilled and unskilled construction occupations and seek to reduce barriers to participation where feasible.
- Monitor workforce participation by gender.
- Provide equal remuneration for work of equal value.
- Provide and maintain a safe, respectful and inclusive workplace free from discrimination, harassment, bullying, intimidation and other inappropriate conduct.
- Ensure workers have equitable access to employment opportunities, training, supervision, welfare facilities, grievance mechanisms and career development opportunities.

C. Worker Conduct and Community Relations

- Prepare and implement a Project-level Worker Code of Conduct.
- Require all workers, including subcontractors, to sign and comply with the Worker Code of Conduct prior to commencing work.
- Ensure workers treat fellow workers, community members and stakeholders with dignity and respect.
- Prohibit discrimination, harassment, intimidation, bullying, abusive behaviour and other forms of inappropriate conduct.
- Require workers to interact professionally when working in or near communities, homes, businesses, schools, health facilities and other sensitive receptors.

- Require workers to respect local customs, cultural norms and community expectations.
- Require workers to wear appropriate identification while undertaking project activities.
- Prohibit unauthorised entry onto private property.
- Investigate and address worker conduct complaints promptly.

D. Worker-Worker Relations

- Promote respectful workplace behaviour and professional conduct among all workers.
- Prohibit workplace discrimination, harassment, bullying, intimidation and exclusion.
- Provide workers with access to grievance and reporting mechanisms.
- Investigate workplace complaints promptly and fairly.
- Promote awareness of workplace rights, responsibilities and expected standards of behaviour.
- Implement corrective and disciplinary measures where violations occur.

E. Worker Behaviour, Anti-Harassment and GBVH Measures

E.1 Code of Conduct Requirements

All workers, including subcontractors, shall:

- Sign the Worker Code of Conduct prior to commencing work.
- Receive orientation regarding expected standards of behaviour and conduct.
- Comply with all provisions of the Worker Code of Conduct.
- Conduct themselves in a professional and respectful manner when interacting with workers, community members and stakeholders.

The Worker CoC shall prohibit:

- Sexual harassment, exploitation or abuse.
- Discrimination, bullying, intimidation or threatening behaviour.
- Unwanted sexual comments, gestures or advances.
- Relationships with persons under 18 years of age.
- Retaliation against complainants or witnesses.

- Any conduct that may place community members or workers at risk.

E.2 Worker Training and Behavioural Oversight

- Provide induction training on worker conduct, respectful workplace behaviour, gender inclusion and community relations.
- Conduct periodic refresher training and toolbox talks.
- Provide awareness training on gender-based violence and harassment (GBVH), Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH).
- Ensure supervisors understand their responsibilities regarding worker conduct and behavioural management.
- Monitor worker behaviour throughout project implementation.

E.3 Reporting and Survivor-Centred Response

Complaints involving allegations of GBVH, SEA, SH, discrimination, intimidation or other forms of serious misconduct shall be managed through the Project Grievance Redress Mechanism using enhanced confidentiality and survivor-centred procedures.

The following measures shall apply:

- Complaints may be submitted anonymously and confidentially.
- Complainants may choose to report concerns through the Community Liaison Officer (CLO), WASA representative or other designated personnel.
- Sensitive complaints shall be managed using restricted reporting and information-sharing procedures.
- Information relating to complaints shall only be accessible to authorised personnel.
- Appropriate referrals to medical, psychosocial, counselling, legal or other support services shall be facilitated where required and where such services are available.
- Complainants shall not be required to participate in investigations beyond the level with which they are comfortable.
- Retaliation against complainants, witnesses or persons reporting concerns shall not be tolerated.
- All complaints shall be managed in a manner that prioritises safety, confidentiality, dignity and respect.

E.4 Worker-Community Interaction Measures

- Promote respectful interactions between workers and community members.
- Limit worker access to schools, community centres and other sensitive locations unless authorised.
- Monitor worker-community interactions and respond promptly to concerns.
- Communicate the Project's zero-tolerance approach to harassment, discrimination and inappropriate conduct.
- Support awareness of grievance reporting mechanisms among affected communities.

F. Monitoring and Reporting

- Maintain records of employment and recruitment activities.
- Maintain records of workforce composition by gender.
- Maintain records of Code of Conduct training and worker inductions.
- Record worker conduct complaints, grievances and corrective actions.
- Monitor implementation of worker conduct and gender inclusion measures.
- Report performance through the Project monitoring and reporting system.

6.5.10.3 Monitoring and Compliance

The Contractor shall monitor implementation of this Plan throughout project implementation. Monitoring shall include review of employment practices, workforce composition, worker conduct, worker-community interactions, training activities, complaints and grievances.

Any deficiencies identified shall be addressed promptly through corrective actions and documented through project reporting procedures.

6.5.10.4 Indicators (KPIs)

The following KPIs shall be used to monitor implementation of this Plan.

KPI	Monitoring Method	Frequency	Responsibility
Number of local workers employed	Employment records	Monthly	Contractor
Percentage of workforce recruited locally	Employment records	Monthly	Contractor
Percentage of workforce that is female	Employment records	Monthly	Contractor

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Percentage of workers signing the Worker Code of Conduct	Signed records	Monthly	Contractor
Number of worker conduct, CoC, harassment or discrimination complaints received	Complaint and grievance records	Monthly	Contractor CLO

6.5.10.5 Roles and Responsibilities

The following outlines the roles and responsibilities for implementation of this Plan.

Entity/Role	Key Responsibilities
WASA	Provide oversight of implementation of the Plan; review significant workforce-related issues; support resolution of sensitive complaints where required.
Contractor	Implement employment, gender inclusion and workforce conduct measures; maintain workforce records; provide training; enforce the Worker Code of Conduct; investigate complaints and implement corrective actions.
Contractor CLO	Support communication of employment opportunities; receive and track worker conduct complaints; support grievance management and community awareness activities.
Supervising Engineer	Monitor implementation of workforce management measures; review compliance and corrective actions; verify performance reporting.
Contractor HSE Personnel	Monitor worker behaviour and compliance with workforce conduct requirements; support investigations and corrective actions; assist with training and awareness activities.
Project Workers	Comply with the Worker Code of Conduct, workforce conduct requirements and grievance procedures; participate in required training and awareness activities.

6.5.11 Traffic, Transportation and Road Safety Management Plan (TTRSMP)

6.5.11.1 Introduction and Objectives

Construction of the proposed St. Margaret's Junction to Pointe-à-Pierre Transmission and Distribution Pipelines will require the transportation of workers, construction materials, equipment, pipes, aggregates, fuel and other supplies throughout the construction period. Construction activities will also involve excavation, trenching, pipe installation, tie-ins, testing, commissioning and road reinstatement activities along existing north-south road corridors.

Construction traffic has the potential to affect residents, businesses, road users, pedestrians, public transportation operators, and other stakeholders through increased traffic volumes, temporary lane

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restrictions, reduced roadway capacity, road safety risks, access disruptions, road deterioration and construction-related nuisance. Potential impacts are expected to be most pronounced along the Southern Main Road corridor and other roads utilised to access work areas and transport personnel, equipment and materials.

Traffic, transportation and road safety impacts associated with the Project are expected to occur primarily during the construction phase. Accordingly, the Contractor shall prepare and implement a Traffic Management Plan (TMP) before commencement of works. The TMP shall be developed in consultation with relevant authorities and stakeholders, as appropriate, and submitted to WASA and the Supervising Engineer for review and approval prior to the start of construction activities.

The TMP shall establish the measures required to manage construction-related traffic, transportation and road safety risks, and minimise disruption to residents, businesses, road users, and other stakeholders. The Plan shall also seek to maintain safe and efficient movement of vehicles and pedestrians while reducing the potential for traffic congestion, access restrictions and traffic-related incidents associated with project activities.

The objectives of this Plan are to:

- Promote safe movement of workers, residents, road users and construction vehicles.
- Minimise traffic disruptions and transportation-related impacts.
- Maintain safe and reasonable access to residences, businesses, institutions and community facilities.
- Reduce risks associated with the movement of construction vehicles, equipment and materials.
- Protect pedestrians and other vulnerable road users.
- Provide timely communication regarding traffic restrictions, access disruptions and construction activities.
- Minimise deterioration of roads affected by project-related activities.
- Ensure timely repairs and reinstatement of affected road infrastructure.
- Ensure compliance with applicable traffic management and road safety requirements.

This Plan should be implemented in conjunction with the SEGMP, Community Health and Safety Management Plan (CHSMP) and Utility Service Interruption and Access Management Plan (USIAMP).

6.5.11.2 Management Measures

A. Traffic Management Planning

- Prepare and implement a Project-specific Traffic Management Plan prior to commencement of construction activities.
- Coordinate traffic management arrangements with WASA, the Ministry of Works and Transport, Trinidad and Tobago Police Service and other relevant authorities, as required.
- Identify approved access routes, haul routes and construction vehicle routes.
- Identify locations requiring temporary traffic control measures.
- Review and update traffic management arrangements throughout project implementation.
- Schedule construction activities to minimise disruption where feasible.

B. Construction Traffic Management

- Restrict project vehicles to approved routes wherever practicable.
- Minimise unnecessary vehicle movements.
- Ensure construction vehicles are operated by appropriately licensed and competent personnel.
- Enforce appropriate speed limits for project vehicles.
- Maintain all project vehicles in safe operating condition.
- Ensure loads are secured and transported safely.
- Avoid unnecessary obstruction of public roads.
- Coordinate deliveries of large equipment, pipes and materials to minimise traffic disruption where feasible.

C. Traffic Control and Road Safety Measures

- Install and maintain appropriate traffic control devices, warning signs, barriers and safety measures around work areas.
- Deploy trained Traffic Control Personnel where required.
- Implement temporary lane management measures where necessary.
- Maintain safe pedestrian routes around active work areas.
- Provide adequate visibility around construction sites and traffic control points.

- Maintain emergency vehicle access at all times.
- Provide adequate lighting, warning devices and reflective materials where work occurs during low-light conditions.
- Inspect traffic control measures regularly and correct deficiencies promptly.

D. Access Management

- Maintain access to residences, businesses, institutions, utilities and community facilities wherever practicable.
- Coordinate access requirements with affected property owners and occupiers.
- Provide temporary access arrangements where normal access is disrupted.
- Minimise the duration of access restrictions.
- Restore access promptly following completion of works.
- Provide advance notice of planned access restrictions and alternative access arrangements.

E. Transportation of Materials, Equipment and Waste

- Establish designated routes for transportation of materials, equipment and waste.
- Transport excavated material, construction debris and waste in accordance with approved procedures.
- Prevent spillage of materials onto public roads.
- Clean affected roads where construction activities result in mud, debris or material deposition.
- Monitor transportation activities to minimise impacts on road users and surrounding communities.

F. Community Notifications and Information Disclosure

- Provide advance notice of lane restrictions, traffic management measures, access disruptions and other activities likely to affect road users and adjacent stakeholders.
- Notify affected residents, businesses and institutions of anticipated construction schedules and disruptions.
- Communicate changes to construction schedules in a timely manner.
- Coordinate notifications through the Community Liaison Officer (CLO).

- Respond promptly to traffic-related complaints and concerns.

G. Road Condition Monitoring and Reinstatement

- Conduct pre-construction road condition assessments where appropriate.
- Monitor roads used by project traffic for signs of deterioration attributable to project activities.
- Maintain records of road condition inspections.
- Repair damage resulting from project-related activities where required.
- Implement road reinstatement measures in accordance with applicable standards and project requirements.
- Undertake progressive reinstatement of affected road sections where feasible.
- Restore affected road surfaces, shoulders, drainage structures, road markings and other affected infrastructure following completion of works.

6.5.11.3 Monitoring and Compliance

The Contractor shall monitor implementation of traffic management measures throughout project implementation. Monitoring shall include inspections of traffic control measures, vehicle operations, road safety performance, access management measures, stakeholder complaints and road conditions.

Any deficiencies identified shall be corrected promptly and documented through the Project corrective action process.

Traffic-related incidents, complaints and non-compliance issues shall be recorded, investigated and reported in accordance with project requirements.

6.5.11.4 Indicators (KPIs)

The following KPIs shall be used to monitor implementation of this Plan.

KPI	Monitoring Method	Frequency	Responsibility
Number of traffic-related complaints received	Complaint records	Monthly	Contractor CLO
Number of road safety incidents involving project vehicles	Incident records	Monthly	Contractor

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Number of traffic management inspections completed	Inspection records	Monthly	Contractor
Number of access-related complaints received	Complaint records	Monthly	Contractor CLO
Number of road condition inspections completed	Inspection records	Monthly	Contractor
Percentage of planned stakeholder notifications issued	Notification records	Monthly	Contractor CLO

6.5.11.5 Roles and Responsibilities

The following outlines the roles and responsibilities for implementation of this Plan.

Entity/Role	Key Responsibilities
WASA	Provide oversight of implementation of the TTRSMP; review significant traffic-related issues; coordinate with relevant authorities where required.
Contractor	Prepare and implement the Traffic Management Plan; implement traffic control measures; maintain safe transportation practices; monitor compliance; investigate incidents; undertake road reinstatement and corrective actions.
Contractor CLO	Coordinate stakeholder notifications; communicate traffic restrictions, access disruptions and construction schedules; receive and track traffic-related complaints and concerns.
Supervising Engineer	Monitor implementation of traffic management measures; verify compliance; review road reinstatement activities; track corrective actions.
Traffic Control Personnel	Implement temporary traffic control measures; direct vehicular and pedestrian traffic; maintain traffic control devices; support safe movement around work areas.
Project Workers and Drivers	Comply with traffic management procedures, speed restrictions, road safety requirements and instructions provided by Traffic Control Personnel.

6.5.12 Community Health and Safety Management Plan (CHSMP)

6.5.12.1 Introduction and Objectives

Construction of the proposed St. Margaret's Junction to Pointe-à-Pierre Transmission and Distribution Pipelines will involve excavation, trenching, pipe installation, tie-ins, testing, commissioning and road reinstatement activities within existing road corridors and developed areas.

These activities have the potential to affect the health, safety and wellbeing of residents, businesses, road users, pedestrians and other members of the public.

Potential community health and safety risks include exposure to active work areas, open trenches, construction equipment, traffic hazards, construction nuisance, temporary access restrictions and worker-community interactions. Particular consideration should be given to vulnerable groups that may experience greater exposure or sensitivity to project-related impacts, including older persons, persons with disabilities, pregnant women, children, persons who are acutely ill or homebound and persons with respiratory illnesses.

The objectives of this Plan are to:

- Protect the health, safety and wellbeing of residents, businesses, road users and other stakeholders.
- Prevent or minimise community exposure to construction-related hazards.
- Maintain safe access around work areas.
- Protect vulnerable groups from disproportionate impacts.
- Manage construction nuisance that may affect nearby communities.
- Promote positive worker-community interactions.
- Establish procedures for responding to community health and safety incidents and emergencies.
- Ensure compliance with applicable health and safety requirements.

This Plan should be implemented in conjunction with the SEGMP, LEGIWCP, TTRSMP, and Utility Service Interruption and Access Management Plan USIAMP.

6.5.12.2 Management Measures

A. Community Health and Safety Planning

- Identify community health and safety risks before commencement of construction activities.
- Integrate community health and safety requirements into construction planning and work procedures.
- Consider community safety requirements when scheduling and implementing project activities.
- Coordinate with WASA, local authorities and emergency services where required.
- Review community health and safety risks periodically throughout project implementation.

B. Public Safety Around Work Areas

- Secure active work areas, trenches, excavations and construction sites using barriers, fencing, warning tape, signage and other appropriate measures.
- Prevent unauthorised access to active work areas.
- Clearly identify hazards associated with construction activities.
- Maintain safe separation between construction activities and members of the public.
- Ensure work areas remain orderly and free of unnecessary hazards.

- Provide adequate lighting and warning devices where work occurs during low-light conditions.
- Inspect work areas regularly and correct identified hazards promptly.

C. Pedestrian and Vulnerable Road User Safety

- Maintain safe pedestrian access around active work areas wherever practicable.
- Provide temporary pedestrian crossings or alternative routes where necessary.
- Clearly mark pedestrian routes and crossing points.
- Deploy Traffic Control Personnel where required to assist safe movement around work areas.
- Maintain safe access for older persons, persons with disabilities, pregnant women and other vulnerable groups.
- Consider the needs of vulnerable road users when planning construction activities and access arrangements.

D. Management of Construction Nuisance

- Implement dust suppression measures where necessary.
- Minimise dust generation during excavation, trenching, transportation and reinstatement activities.
- Maintain equipment in good operating condition to minimise excessive emissions and noise.
- Restrict particularly disruptive activities to appropriate working hours where feasible.
- Minimise unnecessary vehicle idling and equipment operation.
- Respond promptly to nuisance-related complaints and concerns.

E. Protection of Vulnerable Groups

- Identify vulnerable stakeholders who may be disproportionately affected by project activities.
- Consider the needs of vulnerable groups when planning access arrangements, traffic management measures and utility interruptions.
- Provide advance notification of activities likely to affect vulnerable persons.
- Coordinate reasonable accommodation measures where necessary and feasible.
- Ensure vulnerable stakeholders have access to grievance and reporting mechanisms.
- Consider the needs of vulnerable groups during emergency response activities.

F. Worker-Community Interactions

- Promote respectful and professional interactions between workers and community members.
- Implement and enforce the Worker CoC.
- Prohibit harassment, discrimination, intimidation and other inappropriate behaviour.
- Investigate complaints relating to worker behaviour promptly.
- Maintain accessible grievance reporting mechanisms for community members.
- Promote awareness of grievance reporting procedures among affected stakeholders.

G. Emergency Preparedness and Incident Response

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- Develop and implement emergency response procedures relevant to community health and safety risks.
- Maintain emergency contact information at work sites.
- Report community health and safety incidents promptly.
- Investigate incidents and implement corrective actions where required.
- Coordinate with emergency services where necessary.
- Maintain appropriate first aid and emergency response resources at work sites.

6.5.12.3 Monitoring and Compliance

The Contractor shall monitor implementation of community health and safety measures throughout project implementation. Monitoring shall include inspections of work areas, public safety measures, pedestrian access arrangements, community complaints, nuisance-related issues and incident records.

Any deficiencies identified shall be corrected promptly and documented through the Project corrective action process.

Community health and safety incidents, complaints and non-compliance issues shall be recorded, investigated and reported in accordance with project requirements.

6.5.12.4 Indicators (KPIs)

The following KPIs shall be used to monitor implementation of this Plan.

KPI	Monitoring Method	Frequency	Responsibility
Number of community health and safety complaints received	Complaint records	Monthly	Contractor CLO
Number of community-related incidents associated with project activities	Incident records	Monthly	Contractor
Number of inspections of public safety measures completed	Inspection records	Monthly	Contractor
Number of nuisance-related complaints received	Complaint records	Monthly	Contractor CLO
Number of corrective actions implemented for community safety issues	Corrective action records	Monthly	Contractor
Percentage of planned community notifications issued	Notification records	Monthly	Contractor CLO

6.5.12.5 Roles and Responsibilities

The following outlines the roles and responsibilities for implementation of this Plan.

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Entity/Role	Key Responsibilities
WASA	Provide oversight of implementation of the CHSMP; review significant community health and safety issues; support coordination with relevant authorities where required.
Contractor	Implement community health and safety measures; maintain safe work areas; investigate incidents; implement corrective actions; maintain monitoring records and reporting.
Contractor CLO	Coordinate community notifications; communicate health and safety information to stakeholders; receive and track community complaints and concerns; support grievance management activities.
Supervising Engineer	Monitor implementation of community health and safety measures; verify compliance; review incident investigations and corrective actions.
Contractor HSE Personnel	Monitor community health and safety performance; conduct inspections; identify hazards; support incident investigations; maintain monitoring records.
Project Workers	Comply with community health and safety requirements, Worker Code of Conduct and instructions provided by supervisors and Health, Safety and Environmental Personnel.

6.5.13 Worker Health, Safety and Labour Management Plan (WHSLMP)

6.5.13.1 Introduction and Objectives

Construction of the proposed St. Margaret's Junction to Pointe-à-Pierre Transmission and Distribution Pipelines will require workers to undertake excavation, trenching, pipe installation, lifting operations, equipment operation, road reinstatement and other construction-related activities. These activities may expose workers to a range of occupational health and safety risks, including vehicle-related hazards, moving equipment, excavation hazards, manual handling risks, heat stress, noise, dust and other workplace hazards.

This Plan establishes the measures required to protect the health, safety and welfare of workers, ensure compliance with applicable labour requirements and promote safe working practices throughout project implementation.

The objectives of this Plan are to:

- Protect workers from occupational health and safety hazards.
- Prevent workplace incidents, injuries and illnesses.
- Promote safe systems of work and hazard awareness.
- Ensure compliance with applicable labour and occupational health and safety requirements.
- Promote fair and respectful treatment of workers.
- Provide workers with access to grievance and reporting mechanisms.
- Establish procedures for incident reporting, investigation and corrective action.

This Plan should be implemented in conjunction with the LEGIWCP, CHSMP, TTRSMMP and other relevant project management plans.

6.5.13.2 Management Measures

A. Occupational Health and Safety Planning

- Develop and implement site-specific occupational health and safety procedures.
- Conduct job hazard analyses and risk assessments prior to commencing high-risk activities.
- Integrate health and safety requirements into work planning and construction procedures.
- Review health and safety risks periodically throughout project implementation.
- Ensure adequate supervision of construction activities.

B. Hazard Identification and Risk Management

- Identify workplace hazards associated with excavation, trenching, lifting operations, equipment operation, road reinstatement and related activities.
- Implement appropriate control measures to eliminate or minimise identified hazards.
- Conduct routine workplace inspections.
- Correct unsafe conditions promptly.
- Review hazards following incidents, near misses or significant changes in work activities.

C. Personal Protective Equipment (PPE)

- Provide workers with appropriate PPE based on assigned tasks and identified risks.
- Ensure PPE is maintained in good condition and replaced when necessary.
- Train workers in the proper use, care and limitations of PPE.
- Monitor compliance with PPE requirements.

D. Excavation, Trenching and Construction Safety

- Implement controls for excavation and trenching activities.
- Inspect excavations and trenches regularly.
- Provide safe means of access and egress where required.
- Ensure excavation areas are appropriately protected and marked.
- Implement controls for work at heights where applicable.
- Ensure lifting operations are undertaken by competent personnel using appropriate equipment and procedures.

E. Worker Health and Welfare

- Provide access to potable drinking water and appropriate welfare facilities.
- Encourage adequate hydration and heat stress prevention measures.
- Maintain suitable sanitary facilities.
- Provide access to first aid resources and trained personnel.
- Encourage prompt reporting of illnesses, injuries and health concerns.

F. Training and Competency

- Provide health and safety induction training for all workers.
- Conduct task-specific training where required.

- Conduct toolbox talks and safety briefings regularly.
- Ensure operators of vehicles, equipment and machinery are appropriately licensed, trained and competent.
- Maintain training records.

G. Labour Management and Worker Grievances

- Communicate worker rights, responsibilities and workplace expectations.
- Maintain a worker grievance mechanism.
- Provide workers with access to confidential reporting channels.
- Investigate worker complaints promptly and fairly.
- Prohibit retaliation against workers who raise concerns or report incidents.
- Promote fair and respectful treatment of workers.

H. Incident Reporting and Emergency Response

- Establish procedures for reporting occupational health and safety incidents.
- Record and investigate incidents, injuries and near misses.
- Implement corrective actions to prevent recurrence.
- Maintain emergency response procedures.
- Ensure emergency contact information is readily available.
- Coordinate emergency response activities where required.

6.5.13.3 Monitoring and Compliance

The Contractor shall monitor implementation of occupational health, safety and labour management measures throughout project implementation. Monitoring shall include workplace inspections, training records, incident reports, worker grievances, corrective actions and compliance with health and safety requirements.

Any deficiencies identified shall be corrected promptly and documented through the Project corrective action process.

Occupational health and safety incidents, worker complaints and non-compliance issues shall be recorded, investigated and reported in accordance with project requirements.

6.5.13.4 Indicators (KPIs)

The following KPIs shall be used to monitor implementation of this Plan.

KPI	Monitoring Method	Frequency	Responsibility
Number of occupational health and safety incidents recorded	Incident records	Monthly	Contractor

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Number of workplace inspections completed	Inspection records	Monthly	Contractor
Number of toolbox talks and safety briefings conducted	Training records	Monthly	Contractor
Percentage of workers receiving health and safety induction training	Training records	Monthly	Contractor
Number of worker grievances received	Grievance records	Monthly	Contractor
Number of corrective actions implemented for health and safety issues	Corrective action records	Monthly	Contractor

6.5.13.5 Roles and Responsibilities

The following outlines the roles and responsibilities for implementation of this Plan.

Entity/Role	Key Responsibilities
WASA	Provide oversight of implementation of the WHSLMP; review significant occupational health and safety issues; monitor overall labour management performance.
Contractor	Implement occupational health, safety and labour management measures; provide training; conduct inspections; investigate incidents; implement corrective actions; maintain records and reporting.
Supervising Engineer	Monitor implementation of health and safety measures; verify compliance; review incident investigations and corrective actions.
Contractor HSE Personnel	Conduct inspections; identify workplace hazards; monitor compliance; support training; investigate incidents; maintain health and safety records.
Contractor CLO	Support communication regarding workforce-related concerns that interface with community issues and grievance mechanisms.
Project Workers	Comply with occupational health and safety requirements; use required PPE; participate in training; report hazards, incidents and unsafe conditions.

6.5.14 Utility Service Interruption and Access Management Plan (USIAMP)

6.5.14.1 Introduction and Objectives

Construction of the proposed St. Margaret's Junction to Pointe-à-Pierre Transmission and Distribution Pipelines will involve excavation, trenching, pipe installation, tie-ins, testing, commissioning and road reinstatement activities within existing road corridors. These activities may

result in temporary disruptions to utility services, restrictions on access to properties and temporary inconvenience to residents, businesses, institutions and other stakeholders.

Particular attention shall be given to maintaining access to residences, businesses, schools, health facilities, places of worship, public facilities and other sensitive receptors, while minimising the duration and extent of utility service interruptions associated with construction activities.

The objectives of this Plan are to:

- Minimise the frequency and duration of utility service interruptions associated with project activities.
- Maintain safe and reasonable access to residences, businesses, institutions and community facilities.
- Ensure timely communication regarding planned utility interruptions and access restrictions.
- Reduce inconvenience to affected stakeholders.
- Protect vulnerable persons who may be disproportionately affected by utility interruptions or access restrictions.
- Ensure timely restoration of services and access following completion of works.
- Establish procedures for responding to utility-related complaints and concerns.

This Plan should be implemented in conjunction with the SEGMP, TTRSMP and CHSMP.

6.5.14.2 Management Measures

A. Utility Service Interruption Planning

- Identify locations where project activities may affect existing utility infrastructure or service delivery.
- Plan tie-ins, testing and commissioning activities to minimise service interruptions where feasible.
- Coordinate planned interruptions with WASA operational personnel and other relevant utility providers as required.
- Schedule planned interruptions to minimise impacts on residents, businesses and institutions where feasible.
- Maintain records of planned and unplanned utility interruptions.

B. Utility Service Interruption Management

- Minimise the duration of planned utility interruptions.
- Implement appropriate procedures for isolating, repairing and restoring affected services.
- Respond promptly to unplanned utility disruptions resulting from project activities.
- Maintain communication with affected stakeholders throughout interruption events.
- Restore services as quickly as practicable following completion of works.

C. Access Management

- Maintain safe and reasonable access to residences, businesses, institutions and community facilities wherever practicable.

- Coordinate access arrangements with affected property owners and occupiers.
- Provide temporary access arrangements where normal access is disrupted.
- Minimise the duration of access restrictions.
- Maintain access for emergency vehicles and emergency services at all times.
- Restore normal access promptly following completion of works.

D. Protection of Vulnerable Stakeholders

- Identify vulnerable persons who may be disproportionately affected by utility interruptions or access restrictions.
- Consider the needs of older persons, persons with disabilities, pregnant women, persons who are acutely ill or homebound and other vulnerable groups when planning interruptions and access arrangements.
- Provide advance notification of planned interruptions or restrictions that may affect vulnerable stakeholders.
- Coordinate reasonable assistance measures where necessary and feasible.

E. Notifications and Stakeholder Communication

- Provide advance notice of planned utility interruptions, tie-ins, testing activities and access restrictions.
- Notify affected residents, businesses, institutions and community facilities of anticipated schedules and durations.
- Communicate changes to planned interruption schedules promptly.
- Coordinate notifications through the Community Liaison Officer (CLO).
- Maintain accessible channels for stakeholder enquiries and complaints.

F. Service Restoration and Reinstatement

- Verify restoration of services following completion of interruption activities.
- Monitor restoration activities to ensure service continuity is achieved.
- Reinstate driveways, entrances, walkways and other affected access infrastructure following completion of works.
- Restore affected areas to conditions consistent with project requirements and applicable standards.
- Address stakeholder concerns relating to reinstatement promptly.

G. Complaints and Corrective Actions

- Record utility and access-related complaints within the Project Grievance Register.
- Investigate complaints promptly.
- Implement corrective actions where required.
- Communicate outcomes to affected stakeholders.
- Monitor recurring complaints to identify opportunities for improvement.

6.5.14.3 Monitoring and Compliance

The Contractor shall monitor implementation of utility service interruption and access management measures throughout project implementation. Monitoring shall include planned and unplanned utility interruptions, stakeholder notifications, access arrangements, complaints, service restoration activities and reinstatement works.

Any deficiencies identified shall be corrected promptly and documented through the Project corrective action process.

Utility-related incidents, complaints and non-compliance issues shall be recorded, investigated and reported in accordance with project requirements.

6.5.14.4 Indicators (KPIs)

The following KPIs shall be used to monitor implementation of this Plan.

KPI	Monitoring Method	Frequency	Responsibility
Number of planned utility interruptions communicated in advance	Notification records	Monthly	Contractor CLO
Number of unplanned utility interruptions attributable to project activities	Incident records	Monthly	Contractor
Number of access-related complaints received	Complaint records	Monthly	Contractor CLO
Number of utility-related complaints received	Complaint records	Monthly	Contractor CLO
Number of reinstatement-related complaints received	Complaint records	Monthly	Contractor
Percentage of affected stakeholders notified prior to planned interruptions	Notification records	Monthly	Contractor CLO

6.5.14.5 Roles and Responsibilities

The following outlines the roles and responsibilities for implementation of this Plan.

Entity/Role	Key Responsibilities
WASA	Provide oversight of implementation of the USIAMP; coordinate planned service interruptions; support communication with affected stakeholders where required.
Contractor	Plan and implement utility interruption and access management measures; maintain access arrangements; undertake service restoration and reinstatement activities; investigate complaints and implement corrective actions.
Contractor CLO	Coordinate stakeholder notifications; communicate planned interruptions and access restrictions; receive and track complaints and concerns; support grievance management activities.
Supervising Engineer	Monitor implementation of utility interruption and access management measures; verify compliance; review reinstatement activities and corrective actions.

Contractor HSE Personnel	Monitor implementation of access and safety measures associated with utility interruption activities; support inspections and reporting.
Project Workers	Comply with utility interruption, access management and reinstatement procedures; report issues and support timely restoration activities.

6.6 Grievance Redress Mechanism

6.6.1 Introduction and Objectives

The following GRM provides a structured, transparent, and accessible process for the affected communities and other stakeholders to raise concerns, lodge complaints, receive redress and feedback related to the project intervention.

The objectives of the GRM are to:

- Ensure that all grievances, particularly those related to road access, construction safety, road reinstatement, environmental nuisance, and service interruptions, are systematically recorded, assessed, and resolved in a timely and fair manner.
- Strengthen trust, transparency, and accountability between WASA, the Contractor, government agencies, and affected communities.
- Provide special support to vulnerable groups (older adults, persons with disabilities, women-headed households, low-literacy groups) to ensure equitable access to the mechanism.
- Reduce the risk of conflicts by addressing issues promptly before they escalate.
- Support continuous improvement of project performance by capturing trends and lessons learned.

The GRM aligns with the Stakeholder Engagement Plan (SEP), Community Health and Safety Management Plan (CHSMP), Traffic Management and Road Safety Plan, and relevant CESMP components. A Worker GRM will be implemented but this mechanism, though relatable, is separate and apart from this project SEP.

The following steps will be taken as part of the GRM:

6.6.2 Grievance Uptake and Submission

To ensure that persons with disabilities and other vulnerable groups effectively access a Grievance Redress Mechanism (GRM), the concept of universal design is applied, meaning that systems are designed from the outset to be usable by as many people as possible without requiring special adaptation. The mechanism outlined below therefore uses multiple channels for submitting complaints as listed above using different means, including both verbal/voice-based systems and written means as well as in-person and remote means.

Grievances may be submitted through multiple channels to maximise accessibility:

- CLO – in person, by phone, WhatsApp, SMS;
- Verbal via the Contractor site office with clear signage and wayfinding systems;
- WASA project representatives;
- Public meetings or consultations (including wheelchair-accessible offices and meeting rooms and consultation venues);
- Written letters or complaint forms;
- GRM boxes at community facilities;
- Project email; and
- Anonymous submissions.

Physical barriers can prevent persons with mobility impairments from accessing grievance services as well as intellectual barriers and as such, the system allows for representation as follows:

- Permission for family members, caregivers, advocates, or disability organizations to assist complainants.
- Provision for support persons during interviews and hearings.
- Allowance of complaints to be submitted through authorized representatives.
- Partner with Disabled Persons' Organizations (DPOs).
- Disseminate information through disability networks.
- Use community meetings, radio, social media, and accessible materials using simple language and avoiding all jargons.
- Train community workers to assist persons with disabilities in filing complaints.

All grievances are treated confidentially, especially those involving safety, worker behaviour, or sensitive issues including GBVH complaints. The Grievance submission form in Appendix 3 aids this process.

6.6.3 Registration and Acknowledgement

- Every grievance receives a unique GRM Case ID.
- The CLO enters the grievance into the GRM Log within 24 hours.
- Acknowledgement is issued to the complainant within 24 hours, or immediately for safety-related cases.
- Anonymous cases will also be registered and investigated.

6.6.4 Screening and Classification

Grievances are screened and categorised according to type within 48 hours of receiving the complaint:

- Access restrictions/road disruptions;
- Noise, dust, vibration;
- Safety risks (open trenches, traffic hazards);
- Service interruptions (water supply, other project related utility disruptions – electricity, TSTT);
- Environmental issues – air quality, water quality, biodiversity, etc.;

- Worker behaviour;
- Land, property, drainage, reinstatement issues (road and access);
- Gender-based or vulnerable group-related concerns; and
- Requests for information.

Screening determines:

1. Urgency;
2. required investigation; and
3. responsible entity.

6.6.5 Investigation and Resolution

- HSQ team, CLO, and relevant technical staff will conduct site investigations.
- Root cause analysis is carried out for each complaint.
- Contractor/WASA implement corrective action measures, which may include:
 - reinstatement of access;
 - repairing damages;
 - reinforcing safety measures;
 - additional communication;
 - traffic adjustments; and
 - water supply alternatives.

6.6.6 IDB's Grievance Redress Mechanism - Independent Consultation and Investigation Mechanism (MICI)

Outside of the investigation and resolutions outlined above, should there remain outstanding issues for redress, project-affected people and communities can access the IDB's grievance mechanism, The Independent Consultation and Investigation Mechanism (MICI). MICI has been set up independently of IDB operations and management and which reports directly to the IDB's Executive Board, to consider grievances from individuals and communities affected by projects financed by the IDB Group.

MICI manages two mechanisms through which it assesses claims made by claimants:

- (i) The Consultation Phase, which is a voluntary and flexible space for dispute resolution, under the impartial mediation of the MICI. Through this mechanism, the claimant(s), the Borrower and/ or the executing agency and the IDB have an opportunity to resolve their differences and reach an agreement that resolves the complaint;
- (ii) The Compliance Verification Phase, which consists of an investigation of facts by MICI to determine whether the IDB met its obligations with regards to the requirements of its ESPF.

6.6.7 Resolution timeframe

Resolution timelines will be applied based on the complexity of each grievance, as outlined below:

- Minor issues: within 7 days
- Moderate issues: within 14 days

- Complex issues requiring agency coordination: within 30 days

Complainants are informed of proposed and completed actions. Feedback on the completed actions will be sought from complainants.

6.6.8 Close-Out and Documentation

A grievance is closed only when:

1. Corrective action is completed;
2. The complainant confirms satisfaction, where applicable; and
3. The CLO records the closure in the GRM Log.

Cases may be closed without agreement only after escalation and final decision by WASA.

6.6.9 Escalation Procedure

If the complainant is dissatisfied:

Level 1: Contractor

Level 2: WASA Project Management Staff

Level 3: WASA Senior Management or an appointed Independent Reviewer

Level 4: National regulatory authorities (e.g., Regulated Industries Commission)

Escalation timelines are communicated clearly to complainants.

6.6.10 Disclosure and Awareness

- GRM Summary Posters displayed in communities.
- GRM process explained at all community meetings.
- CLO conducts local outreach, especially with vulnerable households.
- Hotline/WhatsApp numbers publicly posted.

Confidentiality, Data Protection and Non-Retaliation

- Complainants are protected from retaliation.
- Sensitive cases (e.g., violence, gender issues) handled discreetly.
- Records kept securely by WASA.

Monitoring and Compliance

Monitoring ensures that all grievances are managed efficiently and transparently.

6.6.11 Monitoring Activities

These activities include the following:

- Daily updates from the CLO on new grievances.
- Weekly review of the GRM Log by the Contractor HSQ Manager/Officer.
- Monthly verification by WASA and the Supervisory Consultant.
- Quarterly review of trends, systemic issues, and response time performance.
- Cross-checking actions implemented on the ground.
- Reporting on open, in-progress, and closed cases.

6.6.12 Compliance Measures

- Non-compliance triggers Corrective Action Plans issued by WASA or Supervisory Consultant.
- Repeated failure to respond effectively to grievances may lead to contractual penalties, especially Level 3 and Level 4 grievances or those that have progressively escalated over time without satisfactory conclusion.
- Performance included in monthly ESMP compliance reports.

6.6.13 Indicators

The performance of the GRM will be tracked through the following indicators.

KPI	Monitoring and Measurement Method	Frequency	Responsibility
Number of grievances received	GRM Log	Weekly	Contractor; CLO
Percentage acknowledged within 24 hours	Log audit	Weekly	Contractor
Percentage resolved within defined timelines	Log review; follow-up checks	Monthly	WASA; Contractor
Number of grievances escalated	Log analysis	Monthly	WASA
Grievance themes and trends	GRM report	Monthly	WASA
Satisfaction rate of resolved cases	Follow-up calls	Monthly	CLO
Participation of vulnerable groups	GRM disaggregation tracking	Monthly	CLO; WASA
Corrective actions implemented on time	Verification inspections	Weekly	Contractor; Supervisory Consultant/WASA

6.6.14 Roles and Responsibilities

Effective grievance resolution requires strong coordination between the Contractor, WASA, supervisory personnel, and community representatives. Roles must be clearly defined to ensure timely response and transparent accountability.

ENTITY / ROLE	KEY RESPONSIBILITIES
WASA	Oversight of GRM; approval of escalation decisions; quarterly analysis; coordination with government agencies; ensuring corrective actions are implemented; public disclosure of GRM summary.
CONTRACTOR	Primary recipient of grievances; implement corrective actions; maintain daily GRM Log; coordinate with CLO; ensure safety and reinstatement issues are addressed promptly.

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COMMUNITY OFFICER	LIAISON	First point of contact; receive and register grievances; acknowledge complaints; maintain communication with complainants; support vulnerable households; assist with investigations; keep records updated. Work with community leaders/focal points to inform residents, local businesses, guesthouses and organisations about the GRM; to support their communication about the project; and to report concerns early. Coordinate with community leaders, including the SGRC Councillor to inform residents about the GRM; to facilitate communication with residents about the project, local businesses, organisations, and guest houses; and to support their reporting concerns early. Work with partner agencies like MOWT, SGRC and utilities to address grievances relating to road reinstatement, traffic management and access disruptions; utility damage; and participate in joint inspections.
HSQ (CONTRACTOR)	TEAM	Conduct site investigations; verify hazards; inspect access, signage, barriers; support resolution of safety and environmental grievances.
SUPERVISORY CONSULTANT		Independent oversight; verification of grievance handling quality; ensure compliance with ESMP; escalate serious unresolved issues to WASA.

6.7 Project Components with Potential Land Acquisition and Livelihood Implications

The St. Margaret–Pointe-à-Pierre Transmission and Distribution Network Upgrades Project, Project comprise transmission and distribution network improvements that have the potential to generate temporary land access requirements, temporary occupation of land, access restrictions and livelihood-related impacts. These components are summarised in Table 5.

Table 5: Project Components with Potential Land Acquisition and Livelihood Implications

Project Component	Description	Potential Land Acquisition and Livelihood Considerations
Transmission and Distribution Network Infrastructure	Installation and upgrading of transmission and distribution pipelines, valves, chambers, fittings, service connections and associated appurtenances required to improve water supply reliability, operational efficiency and network performance.	Based on information currently available, works are expected to occur primarily within existing road reserves, rights-of-way, utility corridors and other publicly accessible infrastructure corridors. Significant permanent land acquisition is not currently anticipated. Temporary occupation of land, temporary access restrictions and temporary livelihood disruptions may occur during construction.
Temporary Construction Areas	Temporary work areas required for pipeline installation, equipment staging, construction activities and associated works.	Temporary occupation of land may be required during construction. The location and extent of such areas will be confirmed during detailed design and construction planning.
Laydown Areas and Material Storage Areas	Temporary areas used for storage of pipes, construction	Temporary land access arrangements may be required depending on final construction requirements and site availability.

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	materials, equipment and other project-related resources.	
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6.7.1 Transmission and Distribution Network Infrastructure

The projects comprise the installation and upgrading of transmission and distribution infrastructure intended to improve potable water service delivery, increase network reliability and strengthen the operational performance of water supply systems serving the St. Margaret–Pointe-à-Pierre service areas.

Based on information currently available, pipeline installation activities are expected to be undertaken primarily within existing road reserves, rights-of-way, utility corridors and other publicly accessible infrastructure corridors. Consequently, significant permanent land acquisition is not currently anticipated. However, temporary occupation of land, temporary access restrictions, traffic management requirements and temporary disruptions to adjacent livelihood activities may occur during project implementation.

6.7.2 Temporary Construction Areas, Laydown Areas and Material Storage Areas

The projects may require temporary construction work areas, laydown areas, equipment staging areas and material storage areas to support construction activities. At the time of preparation of this Plan, the locations and extent of these areas have not yet been confirmed.

Depending on final construction planning requirements, temporary occupation of land and temporary access arrangements may be required. The need for such arrangements will be confirmed during detailed design and construction planning activities and managed in accordance with the provisions of this Plan.

6.8 Potential Land Acquisition, Displacement and Livelihood Risks

6.8.1 Current Status of Design Development

At the time of preparation of this Plan, detailed engineering design activities remain ongoing and final construction requirements have not yet been confirmed for all project components. Based on information currently available, the proposed transmission and distribution network upgrades are expected to be undertaken primarily within existing road reserves, public rights-of-way, utility corridors and other publicly accessible infrastructure corridors.

Consequently, significant permanent land acquisition and physical displacement are not currently anticipated. However, temporary occupation of land, temporary access restrictions, traffic management requirements and temporary disruptions to livelihood activities may occur during project implementation.

The nature and extent of potential land acquisition, access restrictions, displacement and livelihood impacts cannot yet be fully quantified. This section therefore identifies the potential risks and

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considerations that may require further assessment during detailed design and project implementation.

6.8.2 Preliminary Land Requirements

Based on information currently available, the preliminary land requirements associated with the projects are summarised in Table 6. These requirements remain subject to refinement as detailed design, construction planning, stakeholder engagement and site investigations progress.

Table 6: Preliminary Land Requirements

Project Component	Preliminary Land Requirement	Current Status
Transmission and Distribution Network Infrastructure	Existing road reserves, public rights-of-way, utility corridors and other publicly accessible infrastructure corridors	No permanent land acquisition currently anticipated
Temporary Construction Areas	To be determined	To be confirmed during detailed design and construction planning
Laydown Areas and Material Storage Areas	To be determined	To be confirmed during detailed design and construction planning
Equipment Staging Areas	To be determined	To be confirmed during detailed design and construction planning
Temporary Access Arrangements	To be determined	To be confirmed during detailed design and construction planning

Based on the information currently available, the projects are expected to be implemented primarily within existing transportation and utility corridors. Consequently, significant land acquisition is not currently anticipated. However, temporary occupation of land and temporary access arrangements may be required to facilitate construction activities.

6.8.3 Potential Types of Land Acquisition and Land Access Requirements

Depending on the final design, construction methods and implementation arrangements, the projects may involve different forms of land access, land use or temporary occupation. At the time of preparation of this Plan, the extent of any land acquisition or land access requirements has not yet been confirmed.

6.8.4 Permanent Land Acquisition

Based on information currently available, significant permanent land acquisition is not currently anticipated. The proposed works are expected to be undertaken primarily within existing road reserves, public rights-of-way and utility corridors.

The need for any permanent land acquisition associated with project implementation will be confirmed following completion of detailed design activities, route verification and construction planning.

6.8.5 Temporary Occupation of Land

Temporary occupation of land may be required during construction for work areas, equipment staging, material storage, contractor facilities, traffic management arrangements and temporary access requirements.

The location, duration and extent of any temporary occupation will be determined during detailed design and construction planning and managed in accordance with the provisions of this Plan.

6.8.6 Rights-of-Way and Access Arrangements

The projects are expected to utilise existing public rights-of-way and utility corridors wherever feasible. However, temporary access arrangements may be required to facilitate construction activities, movement of equipment, storage of materials and implementation of traffic management measures.

Where additional access arrangements are required, they should be identified, assessed and managed in accordance with the procedures established in this Plan.

Table 7: Potential Land Access Requirements

Type of Requirement	Potential Application
Temporary Occupation of Land	Construction work areas, laydown areas, equipment staging and contractor facilities
Temporary Access Arrangements	Construction access, movement of equipment and delivery of materials
Temporary Traffic Management Areas	Lane closures, traffic diversions and temporary road occupation
Rights-of-Way and Road Reserves	Installation of transmission and distribution infrastructure

6.8.7 Potentially Affected Land Users and Livelihood Activities

The projects have the potential to affect a range of land users, businesses and livelihood activities located adjacent to construction areas. At the current stage of project development, the extent of any affected persons or livelihood activities has not yet been determined. Potentially affected land users and livelihood activities are summarised in Table 8.

Table 8: Potentially Affected Land Users and Livelihood Activities

Category	Potential Relevance to the Project
Adjacent Property Owners	Potential temporary access restrictions, construction disturbance and temporary occupation of land where required
Residential Occupants	Potential temporary disruption associated with construction activities, traffic management measures and restricted access
Commercial Enterprises	Potential impacts arising from temporary construction activities, reduced visibility, parking restrictions and temporary access limitations
Roadside Vendors and Informal Traders	Potential impacts where vending activities occur adjacent to pipeline works, road reserves or construction areas
Road Users and Transport Operators	Potential impacts associated with lane closures, traffic diversions and temporary changes in traffic circulation patterns
Community Facilities and Service Providers	Potential temporary access restrictions affecting users of public facilities and services
Vulnerable Persons and Households	Potential disproportionate impacts associated with temporary access restrictions, mobility limitations or livelihood disruptions

Based on information currently available, residential displacement is not anticipated. However, this will be confirmed following finalisation of detailed design and construction planning activities.

6.8.8 Vulnerable Persons and Households

Certain individuals and households may be more vulnerable to project-related impacts due to economic, social, physical or other circumstances that may reduce their ability to respond to or recover from temporary disruptions associated with project activities.

These may include:

- Elderly persons;
- Persons with disabilities;

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- Female-headed households;
- Low-income households;
- Informal workers and vendors;
- Social assistance recipients;
- Persons with limited mobility; and
- Persons with limited livelihood alternatives.

The identification of vulnerable persons and households will be undertaken during stakeholder engagement activities and any subsequent surveys or assessments undertaken by the Project.

6.8.9 Potential Impacts

At the current stage of project development, the nature and extent of impacts cannot yet be fully quantified. However, based on available information and the requirements of ESPS 5, the projects have the potential to generate the impacts summarised in Table 9.

Table 9: Preliminary Assessment of Potential Land Acquisition, Displacement and Livelihood Risks

Impact Type	Classification	Potential Relevance
Physical Displacement	Loss of housing, land, structures or access to property requiring relocation	Not currently anticipated based on available project information
Economic Displacement	Loss of income, livelihoods, productive resources or livelihood opportunities resulting from project activities	Potentially relevant
Temporary Business Disruption	Temporary restrictions on customer access, reduced visibility, parking restrictions or interruptions to business operations	Potentially relevant
Temporary Livelihood Disruption	Temporary impacts on roadside vending, informal trading or other income-generating activities	Potentially relevant
Temporary Occupation of Land	Temporary use of land for construction activities, material storage or equipment staging	Potentially relevant

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Temporary Access Restrictions	Temporary restrictions affecting access to properties, businesses, public facilities or livelihood activities	Potentially relevant
Traffic and Mobility Impacts	Temporary lane closures, traffic diversions and changes to traffic circulation patterns	Potentially relevant
Construction-Related Disturbance	Temporary impacts associated with noise, dust, vibration and construction traffic	Potentially relevant

Based on information currently available, the principal risks currently identified relate to temporary occupation of land, temporary access restrictions, temporary business disruption, temporary livelihood impacts and construction-related disturbances associated with pipeline installation activities.

The significance of these impacts will depend on the final design, construction methods, work locations, duration of activities and effectiveness of mitigation measures implemented during project construction. These risks will be further assessed and refined during detailed design and project implementation.

6.9 Land Acquisition and Resettlement Framework

6.9.1 Avoidance and Minimisation Principles

Consistent with the requirements of ESPS 5, the Project should seek to avoid or minimise land acquisition, displacement and livelihood impacts through careful site selection, design optimisation and construction planning.

Where impacts cannot be avoided, measures should be implemented to minimise impacts and ensure that affected persons are treated fairly and equitably. Compensation, assistance and livelihood restoration measures should be implemented where required in accordance with this Plan.

The Project should apply the following hierarchy:

1. Avoid impacts where feasible.
2. Minimise unavoidable impacts.
3. Mitigate residual impacts.
4. Compensate affected persons where applicable.
5. Restore affected livelihoods where impacts occur.

6.9.2 Screening and Impact Identification

As detailed design progresses, all Project components should be screened to determine whether land acquisition, temporary land occupation, access restrictions or livelihood impacts may occur.

The screening process should include:

- Confirmation of final land requirements;
- Verification of land ownership and tenure arrangements;
- Identification of affected assets and land uses;
- Identification of affected land users and livelihood activities;
- Identification of vulnerable persons and households; and
- Determination of the nature and significance of potential impacts.

Table 10: Land Acquisition and Livelihood Screening Process

Step	Activity
1	Confirm final design and land requirements
2	Verify land ownership and tenure arrangements
3	Identify affected assets and land uses
4	Identify affected land users and livelihood activities
5	Identify vulnerable persons and households
6	Determine required mitigation, compensation and restoration measures

6.9.3 Land Acquisition Process

Where land acquisition or land access arrangements are required, the process should include verification of ownership and land use arrangements, stakeholder engagement, valuation, compensation and implementation of agreed measures prior to commencement of the relevant Project activities.

Table 11: Land Acquisition Process

Step	Description
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Land requirement confirmation	Confirm land requirements based on final design
Ownership verification	Confirm ownership, occupancy and land use arrangements
Stakeholder engagement	Consult with affected persons and stakeholders
Valuation	Undertake valuation of affected assets where required
Compensation and assistance	Determine and implement applicable measures
Land access	Secure lawful access to affected lands
Monitoring	Monitor implementation and outcomes

Based on information currently available, significant permanent land acquisition is not currently anticipated for the projects covered by this Plan, as the proposed works are expected to be undertaken primarily within existing road reserves, rights-of-way, utility corridors and other publicly accessible infrastructure corridors. However, the need for any land acquisition, easements, rights-of-way or other land access arrangements will be confirmed following completion of detailed design and construction planning activities.

6.9.4 Census and Asset Inventory

Where impacts are identified, a census and asset inventory should be undertaken to identify affected persons, affected assets and affected livelihood activities.

The inventory may include:

- Land parcels;
- Structures and improvements;
- Crops and trees;
- Businesses and commercial activities;
- Informal livelihood activities; and
- Other affected assets or resources.

6.9.5 Socio-Economic Surveys

Where land acquisition, economic displacement or livelihood impacts are identified, socio-economic surveys may be undertaken to establish baseline conditions and inform compensation, assistance and livelihood restoration measures.

The surveys may include:

- Household characteristics;
- Sources of income and livelihoods;
- Land use and resource use patterns;
- Business activities;
- Vulnerability considerations; and
- Livelihood restoration needs.

6.9.6 Valuation Methodology

Valuation of affected assets should be undertaken using recognised valuation methods and, where required, qualified valuation professionals.

Valuation may include:

- Land;
- Structures and improvements;
- Crops and trees;
- Business assets; and
- Other affected resources.

Compensation should be determined in accordance with applicable national legal requirements and relevant IDB requirements.

6.9.7 Eligibility Criteria

Eligibility for compensation, assistance or livelihood restoration measures should be determined based on the nature of the impact and the status of the affected person, land user or livelihood activity.

Table 12: Preliminary Eligibility Categories

Category	Potential Eligibility
Legal landowners	Compensation and assistance where applicable
Leaseholders and tenants	Assistance and compensation where applicable

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Residential Occupants	Assistance where occupancy or access is affected
Agricultural users	Compensation and assistance where applicable
Commercial enterprises	Assistance where business activities are affected
Informal land users	Assistance where livelihood activities are affected
Roadside vendors	Assistance where livelihood activities are affected

6.9.8 Entitlement Framework

The entitlement framework establishes the types of assistance that may be provided depending on the nature of the impact.

Table 13: Preliminary Entitlement Framework

Impact Type	Potential Entitlement
Permanent loss of land	Compensation in accordance with applicable requirements
Temporary occupation of land	Restoration of land and compensation where applicable
Loss of crops or trees	Compensation where applicable
Temporary business disruption	Appropriate assistance measures where applicable
Loss of livelihood opportunities	Livelihood restoration measures where applicable
Temporary loss of access	Appropriate mitigation and assistance measures
Temporary disruption to residential access	Appropriate mitigation and access management measures

The final entitlement framework should be refined following completion of detailed design and impact identification activities.

6.9.9 Compensation Procedures

Where compensation is required, the following principles should apply:

- Compensation should be determined using appropriate valuation methods.
- Affected persons should be informed of applicable compensation arrangements.
- Compensation agreements should be documented.

- Compensation should be provided prior to commencement of activities resulting in the loss of assets, access or livelihood opportunities, unless otherwise agreed.
- Appropriate records should be maintained.

6.9.10 Special Assistance for Vulnerable Persons

Where vulnerable persons or households are identified, additional assistance measures may be provided to facilitate meaningful participation and reduce the risk of disproportionate impacts.

Such measures may include:

- Additional consultation and engagement;
- Assistance with accessing compensation processes;
- Additional livelihood support measures where appropriate; and
- Referrals to relevant social support services where appropriate.

6.9.11 Documentation and Recordkeeping

WASA should maintain appropriate records relating to:

- Land requirements;
- Asset inventories;
- Socio-economic surveys;
- Consultation activities;
- Compensation agreements;
- Grievances and resolutions;
- Livelihood restoration measures; and
- Monitoring and reporting activities.

Records should be maintained in accordance with applicable Project procedures and data management requirements.

6.9.12 Monitoring and Compliance

Implementation of the measures described regarding Land Acquisition and Resettlement be monitored throughout Project implementation to ensure compliance with this Plan, applicable national legislation and relevant IDB requirements.

Monitoring activities may include review of land acquisition records, asset inventories, compensation documentation, stakeholder engagement records, grievance records and

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implementation reports. Where monitoring identifies deficiencies or non-compliance, corrective actions should be implemented in a timely manner.

6.9.13 Indicators (KPIs)

Table 14 presents the key performance indicators that will be used to monitor implementation and effectiveness of the land acquisition and resettlement framework.

Table 14: Land Acquisition and Resettlement KPIs

Key Performance Indicator	How Will It Be Monitored and Measured	Responsibility
Land requirements verified prior to acquisition or access	Review of land acquisition and design records	WASA
Affected persons and assets identified and documented	Census and asset inventory records	WASA / Supervising Consultant
Compensation agreements completed prior to land access	Review of compensation records	WASA
Land acquisition and compensation grievances resolved within established timeframes	Review of grievance records	WASA
Required mitigation, compensation and restoration measures implemented	Monitoring reports and site verification	WASA / Supervising Consultant

6.9.14 Roles and Responsibilities

Table 15 outlines the roles and responsibilities of the parties responsible for implementing, monitoring and reporting on the measures described in this section.

Table 15: Roles and Responsibilities for Land Acquisition and Resettlement

Party	Responsibility
WASA	Overall implementation of the Land Acquisition and Resettlement Framework and compliance with applicable requirements
Supervising Consultant	Monitoring, verification and reporting on implementation of framework measures

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Construction Contractor	Compliance with approved land access arrangements and implementation of applicable mitigation measures
Commissioner of State Lands	Administration of State land matters where applicable
Qualified Valuation Professional	Valuation of affected assets where required
Contractor CLO	Stakeholder engagement, issue resolution and support to implementation activities

6.10 Cultural Heritage Management Plan

6.10.1 Chance Find Program/ Watching Brief

During construction activities, cultural heritage assemblages may be discovered or identified. The Chance Find Program is intended to manage impacts to known, probable and unknown cultural sites. Consultations and communication with the legal and regulatory institutions, such as the National Trust of Trinidad and Tobago should be held and procedures and protocols for assessing any unanticipated cultural heritage sites or materials encountered during the project construction phase should be developed and implemented as outlined below.

6.10.1.1 Chance/Find Protocols & Procedures

Essentially there are several main protocols involved in the implementation of a Chance Find Procedure. These include:

- The Chance Find Program includes the following procedures:
 - a. A local specialist or archaeologist should remain on call and shall provide oversight of the entire Chance Find Program.
 - b. The on-call specialist should be used on an as-needed-basis and will monitor the Chance Find Program.
 - c. The on-call specialists are only required to conduct field monitoring in the case of unusual or highly sensitive and important chance finds.
- A stop work authority/procedure should be affected in the immediate area for the protection of cultural heritage materials encountered during construction activities.
- Document and assess Chance Finds to determine if additional investigations are required.
- Adhere to any established protocols established in consultation with project management of Implementing Agency, Contractors, cultural heritage specialists, local regulatory bodies (for the design and implementation of additional investigations, if needed).
- Identify the roles and responsibilities of the various stakeholders involved.

- The archaeologist must be present during all ground disturbing works conducted within culturally sensitive areas.
- Ground works in other areas should be monitored by at least one member of the project staff who has previously received cultural heritage training.
- Considering that a chance find can be reported by any member of the project staff, it is important that cultural training be provided to all project staff and subcontractors.
- If a Chance Find is encountered, the following steps should be undertaken:
 1. Issue a stop work order in the vicinity of the find.
 2. Inform the site supervisor or project manager.
 3. Install temporary site protection measures such as warning tape or avoidance signs.
 4. Inform all personnel of the Chance Find if access to any part of the work area is restricted.
 5. Establish a localized no-go area needed to protect the Chance Find.
 6. Arrange for the specialists to perform a preliminary evaluation to determine whether the Chance Find is cultural heritage and if so, whether it is an isolate or part of a larger site or feature.
 7. Leave artefacts in place if possible; if materials are collected, they will be placed in bags and labelled by an archaeologist and transported to the relevant agency. Artefacts should not be allowed to be taken by any project personnel as personal possessions.
 8. Document the finding via the use of photography, notes, GPS coordinates and maps as appropriate.
 9. If the Chance Find proves to be an isolated find or not of cultural heritage, the specialist will authorize the removal of the site protection measures and activity in the area.

If, however, the specialist confirms the Chance Find as a cultural heritage of artefact or site of significance, inform the National Trust of Trinidad and Tobago, and initiate discussions about treatment as follows:

1. Prepare and retain archaeological monitoring records including initial reports whether they are later confirmed or not. The record shall include coordinates of all observations to be retained;
2. Develop and implement treatment plans for confirmed finds using the services of qualified cultural heritage experts;
3. If a Chance Find is a verified cultural heritage site, prepare a final Chance Find report once treatment has been completed;
4. While investigation is ongoing, co-ordination with onsite personnel is needed so as to keep them informed of the status and schedule of the investigations and inform them of when construction will resume.

In the event that mitigation is required, then expedient rescue excavations should be undertaken by the relevant archaeological specialists unless the chance find is of international importance. If this is the case, then special care should be taken and archaeologists with the appropriate expertise in addressing the find should be appointed.

6.11 Consultation Event outline

In accordance with ESPS 10 meaningful consultations are a requirement throughout the project period for all project interventions. As such a public consultation event is essential for the proposed project to facilitate the disclosure of project information to allow stakeholders to understand the project's risks, impacts, and potential opportunities and development benefits from the project.

Following the publishing of the ESA and ESMP for the project intervention for public viewing, a public consultation event will be held with no less than 1 week's notice prior to the execution of a public consultation. At least 1 week prior to an event, public advertisement inviting the community should be communicated using multiple modes of communication. The following are some options for advertising that can be utilised for this project:

- Online websites
- Radio or television announcements
- Community Flyers – hard copy in mailboxes and posted community centres
- Community Flyers circulated in the what's App groups of community groups and other community based organisation
- Invitation Letters to government agencies, nongovernmental organisation, private sector and other local entities

To ensure that the consultation meets the requirements of ESPS 10, all communication will be published and presented in the English language, accessible and culturally appropriate, taking into account the needs of groups that may be differentially or disproportionately affected by the project or groups with specific information needs (e.g. disability, literacy, gender, mobility, or accessibility).

In order to make the public consultation accessible for the TT-L1071 program, multiple public consultation events are being recommended based on the groupings outlines below:

1. Project Locations North Central: Acono,
2. Project Locations North East: Matura, Salybia
3. Project Locations South West: Siparia, St. Margaret's, Petrotrin
4. Project Locations South East: Mayaro, Naparimo
5. Project Locations Tobago: Hillsborough

The consultations will take place within a 1 to 2 week period in the evenings beginning at 5:30pm to facilitate the attendance of the working population.

The public consultations will be conducted with a independent chair person and will be conducted in a manner that provides opportunities to project-affected people and other relevant stakeholders, without fear of reprisal, to express their views on project risks, impacts, and mitigation measures, and on access to potential opportunities and development benefits, and allows the Borrower to consider and respond to any concerns or questions they have regarding the project interventions.

To facilitate accessibility a Hybrid approach is recommended at all the event to facilitate persons participating remotely in these consultations.

Additionally, each consultation will have a target number of attendees from stakeholders and groups that may be affected by the project activities. The Consultant will also strive to ensure an adequate gender ratio among the participants. A 50/50 balance of males to females is the recommended target.

WASA will serve as the host for the public consultations and will fund and make the logistical planning, venue and refreshments. The project consultants will support this process by assisting with the development of the agenda for the event and will facilitate at all events.

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8 Appendices

Appendix 1: National Air Quality Standards (Max. Permissible Levels for Ambient Air Quality)

No.	Substance	Short-Term Maximum Permissible Levels		Long-Term Maximum Permissible Levels	
		Maximum Permissible Levels	Averaging Time	Maximum Permissible Levels	Averaging Time
Particulates					
1	Total Suspended Particulate (TSP)	150 µg/m ³	24 hours		
2	PM ₁₀	75 µg/m ³	24 hours	50 µg/m ³	1 year
3	PM _{2.5}	65 µg/m ³	24 hours	15 µg/m ³	1 year
Non-Metallic Inorganic Substances					
4	Carbon monoxide (CO)	100 000 µg/m ³	15 minutes		
		60 000 µg/m ³	30 minutes		
		30 000 µg/m ³	1 hour		
		10 000 µg/m ³	8 hours		
5	Nitrogen dioxide (NO ₂)	200 µg/m ³	1 hour	40 µg/m ³	1 year
6	Sulfur dioxide (SO ₂)	500 µg/m ³	10 minutes	50 µg/m ³	1 year
		125 µg/m ³	24 hours		
7	Ozone (O ₃)	120 µg/m ³	8 hours		
8	Sulfuric acid (H ₂ SO ₄)	100 µg/m ³	30 minutes		
9	Hydrogen sulphide (H ₂ S)	30 µg/m ³	30 minutes		
10	Ammonia (NH ₃)	3600 µg/m ³	30 minutes		
11	Total fluoride	1.0 µg/m ³	24 hours	0.4 µg/m ³	90 days
12	Hydrogen chloride (HCl)	100 µg/m ³	30 minutes		
13	Chlorine (Cl) and its compounds	300 µg/m ³	30 minutes		
14	Asbestos (fibres > 5 µm in length)	0.04 fibres/cm ³	24 hours		
15	Asbestos (total)	5 µg/m ³	30 minutes		
Metallic Substances					
16	Cadmium (Cd) and its compounds	5.0 µg/m ³ of total Cd in free and combined form	30 minutes		
17	Mercury (Hg) and its compounds	1.5 µg/m ³ of total alkyl Hg compounds	30 minutes		
		5.0 µg/m ³ of total Hg in free and combined form	30 minutes		

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No.	Substance	Short-Term Maximum Permissible Levels		Long-Term Maximum Permissible Levels	
		Maximum Permissible Levels	Averaging Time	Maximum Permissible Levels	Averaging Time
18	Antimony (Sb) and its compounds	75 µg/m ³ of total Sb in free and combined form	30 minutes	Sb and its compounds	75 µg/m ³ of total Sb in free and combined form
19	Beryllium (Be) Compounds	0.01 µg/m ³	24 hours		
20	Lead (Pb)	10 µg/m ³ of total Pb in free and combined form	30 minutes	1.5 µg/m ³ 0.5 µg/m ³	3 months 1 year
Organic Substances					
21	Biphenyl (C ₆ H ₅) ₂)	60 µg/m ³	1 hour		
22	Carbon disulfide (CS ₂)	330 µg/m ³	24 hours		
23	Ethylbenzene (C ₆ H ₅ C ₂ H ₅)	1000 µg/m ³	24 hours		
24	Formaldehyde (CH ₂ O)	65 µg/m ³	24 hours		
25	Mercaptan (as Methyl Mercaptan- CH ₃ SH)	20 µg/m ³	1 hour		
26	Polychlorinated Biphenyls (PCBs)	0.15 µg/m ³	24 hours	0.035 µg/m ³	1 yr
27	Xylenes (C ₆ H ₄ (CH ₃) ₂) (isomers and mixture)	2300 µg/m ³	24 hours		
28	Total Dioxin and Furans	0.5 pg TEQ/m ³	24 hours		

PM₁₀ means Particulate Matter with an aerodynamic diameter of less than 10 µm;

PM_{2.5} means Particulate Matter with an aerodynamic diameter of less than 2.5 µm;

ng means nanogram or one-billionth of a gram which is expressed as 1 x 10⁻⁹ grams in scientific notation; and

pg means picogram or one-trillionth of a gram which is expressed as 1 x 10⁻¹² in scientific notation.

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Appendix 2: National Air Quality Standards (Stack Release Limits)

NO.	SUBSTANCE/PARAMETER	MAXIMUM PERMISSIBLE LIMITS mg/Nm ³
Particulate Substance		
1	Particulate matter	100 mg of particulate matter in each normal cubic metre of residual gases, (adjusted to a basis of 12 % CO ₂ for air emissions from fuel-burning equipment, if required by the specified test method)
Physical Parameter		
2	Opacity	20 % ¹
Non-Metallic Inorganic Substances		
3	Sulfur dioxide (SO ₂)	1000
4	Oxides of nitrogen (NO _x)	500 as NO ₂
5	Carbon monoxide (CO)	1000
6	Sulfuric acid (H ₂ SO ₄) mist or sulfur trioxide (SO ₃)	100 as SO ₃
7	Hydrogen sulfide (H ₂ SO ₄)	15
8	Ammonia (NH ₃)	50
9	Fluorine (F) and its compounds	5 as hydrogen fluoride (HF); or 5 as total fluoride
10	Acids and acid gases, as hydrogen chloride (HCl)	10 as HCl
11	Chlorine (Cl) and its compounds	5 as Cl
Metallic Inorganic Substances		
12	Lead (Pb) and its compounds	0.5 as Pb
13	Antimony (Sb) and its compounds	5 as Sb
14	Arsenic (As) and its compounds	0.8 as As
15	Cadmium (Cd) and its compounds	0.05 as Cd
16	Mercury (Hg) and its compounds	0.05 as Hg
17	Heavy metals (other)	5 as heavy metals (other)
Organic Substances		
18	Volatile Organic Compounds (VOCs)	20 as VOCs
19	Dioxins	0.2 ng TEQ/Nm ³ ²
20	Furans	0.2 ng TEQ/Nm ³

In order to calculate a TEQ, a toxic equivalent factor (TEF) is assigned to each member of the dioxin and dioxin-like compounds category. The TEF is the ratio of the toxicity of one of the

For the purposes of Schedule 2 -

¹ Opacity is to be measured by averaging opacity over any six-minute period.

² Toxic Equivalent (TEQ) is a calculated value that allows comparisons of the toxicity of different combinations of dioxins and dioxin-like compounds. The two most toxic compounds in the dioxin and dioxin-like compounds category are the comparison points. For example, a mixture weighing 10 g with a TEQ of 5 g would be as toxic as 5 g of either of those compounds.

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Compounds in this category to the toxicity of the two most toxic compounds in the category, that is, 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin (commonly referred to as dioxin) and 1, 2, 3, 7, 8 - pentachlorodibenzo-p-dioxin, which are assigned a TEF of 1. TEFs that have been established through international agreements currently range from 1 to 0.0001.

A TEQ is calculated by multiplying the actual grams weight of each dioxin and dioxin-like compound by its corresponding TEF (e.g., 10 grams $\times$ 0.1 TEF = 1 gram TEQ) and then summing the results. The number that results from this calculation is referred to as grams TEQ.

For example, consider the following 60g mixture:

10 g of compound A, with a TEF of 1
20 g of compound B, with a TEF of 0.5
30 g of compound C, with a TEF of 0.2

The TEQ of this mixture would be –

$$(10 \text{ g} \times 1) + (20 \text{ g} \times 0.5) + (30 \text{ g} \times 0.2) = 26 \text{ g TEQ}$$

This mixture of 60 g of various compounds would be as toxic as 26 g of either of the two most toxic compounds.

Sampling and analysis to determine compliance with the standards listed in Schedules 1 and 2 shall be in accordance with such methods as are approved by Authority.

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Appendix 3: National Water Quality Standards (Water Pollutants)

No.	Parameters or Substances	Quantity, Condition or Concentration at which substance or parameter is defined as a pollutant ^a
1.	Temperature	Maximum variation of 3 ⁰ C from ambient
2.	Hydrogen ion (pH)	Less than 6 or greater than 9
3.	Dissolved Oxygen Content (DO)	<4
4.	Five day Biological Oxygen Demand (BOD ₅ at 20 ⁰ C)	>10
5.	Chemical Oxygen Demand (COD)	>60
6.	Total Suspended Solids (TSS)	>15
7.	Total Oil and Grease (TO&G) or n-Hexane Extractable Material (HEM)	>10
8.	Ammoniacal Nitrogen (as NH ₃ -N)	>0.01
9.	Total Phosphorus (as P)	>0.1
10.	Sulphide (as H ₂ S)	>0.2
11.	Chloride (as Cl ⁻)	>250
12.	Total Residual Chlorine (as Cl ₂)	0.2
13.	Dissolved Hexavalent Chromium (Cr ⁶⁺)	>0.01
14.	Total Chromium (Cr)	>0.1
15.	Dissolved Iron (Fe)	>1.0
16.	Total Petroleum Hydrocarbons (TPH)	NIAA
17.	Total Nickel (Ni)	>0.5
18.	Total Copper (Cu)	>0.01
19.	Total Zinc (Zn)	>0.1
20.	Total Arsenic (As)	>0.01
21.	Total Cadmium (Cd)	>0.01
22.	Total Mercury (Hg)	>0.005
23.	Total Lead (Pb)	>0.05
24.	Total Cyanide (as CN ⁻)	>0.01
25.	Phenolic Compounds (as phenol)	>0.1
26.	Radioactivity	NIAA
27.	Toxicity	NATE
28.	Faecal Coliforms	>100

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Appendix 4: National Water Quality Standards (Water Pollutants)

No.	Water Pollutants	Receiving Environment			
	Parameters or Substances	Inland Surface Water	Coastal Nearshore	Marine Offshore	Environmentally Sensitive Areas and/or Groundwater
Levels or Conditions					
1.	Temperature	35	40	45	NIAA
2.	Dissolved Oxygen	>4	>4	>4	>4
3.	Hydrogen ion (pH)	6-9	6-9	6-9	6-9
4.	Five day Biological Oxygen Demand (BOD ₅ at 20°C)	30	50	100	10
5.	Chemical Oxygen Demand (COD)	250	250	250	60
6.	Total Suspended Solids (TSS)	50	150	200	15
7.	Total Oil and Grease (TO&G) or n-Hexane Extractable Material (HEM)	10	15	100	No release
8.	Ammoniacal Nitrogen (as NH ₃ -N)	10	10	10	0.1
9.	Total Phosphorous (as P)	5	5	5	0.1
10.	Sulphide (as H ₂ S)	1	1	1	0.2
11.	Chloride (as Cl ⁻)	250	NIAA	NIAA	NIAA
12.	Total Residual Chloride (as Cl ₂)	1	1	2	0.2
13.	Dissolved Hexavalent Chromium (Cr ⁶⁺)	0.1	0.1	0.1	0.01
14.	Total Chromium (Cr)	0.5	0.5	0.5	0.1
15.	Dissolved Iron (Fe)	3.5	3.5	3.5	1.0
16.	Total Petroleum Hydrocarbons (TPH)	25	40	80	No release
17.	Total Nickel (Ni)	0.5	0.5	0.5	0.5
18.	Total Copper (Cu)	0.5	0.5	0.5	0.01
19.	Total Zinc (Zn)	2	2	2	0.1
20.	Total Arsenic (As)	0.1	0.1	0.1	0.01
21.	Total Cadmium (Cd)	0.1	0.1	0.1	0.01
22.	Total Mercury (Hg)	0.01	0.01	0.01	0.005
23.	Total Lead (Pb)	0.1	0.1	0.1	0.05
24.	Total Cyanide (as CN ⁻)	0.1	0.1	0.1	0.01
25.	Phenolic Compounds (as phenol)	0.5	0.5	0.5	0.1
26.	Radioactivity	NIAA	NIAA	NIAA	NIAA
Levels or Conditions					
27.	Toxicity	NATE	NATE	NATE	NATE
28.	Faecal Coliforms	400	400	400	100

* all units are in milligrams per litre (mg/L) except for temperature (°C), pH (pH units), faecal coliforms (counts per 100ml), radioactivity (Bq/L) and toxicity (toxic units)

NIAA-no increase above ambient

NATE-no acute toxic effects

NSD-No solid debris

<-less than

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Appendix 5: Ambient Water Quality Standards for Freshwater

PHYSICO-CHEMICAL PARAMETERS		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	WATER SUPPLY	RECREATIONAL USE
1	Temperature (°C)	≤ 30	≤ 30	≤ 30
2	Dissolved Oxygen (mg/L)	≥ 3.0	≥ 85% saturation	≥ 80% saturation
3	pH (pH Units)	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5
4	Total Alkalinity (mg/L)	≤ 20	≤ 20	≤ 20
5	Nitrate (mg/L)	≤ 10	≤ 10	≤ 10
6	Total Phosphate (mg/L)	≤ 0.5	≤ 0.5	≤ 0.5
7	Sulphate (mg/L)	≤ 250	≤ 400	≤ 400
8	Conductivity (µS)	Not Applicable	≤ 2,500	Not Applicable
9	Total Hardness (mg/L)	Not Applicable	As Ca: 100 to 300; As CaCO ₃ : 200 to 300	Not Applicable
10	Chlorides (mg/L)	120 to 230 (long term); 640 to 860 (short term)	≤ 250	Not Applicable
11	Colour (TCU)	Not Applicable	≤ 15	Not intense to impede visibility for swimming
12	Hydrogen sulphide (mg/L)	Not Applicable	≤ 0.05	Not detectable
13	Odour	Not Applicable	Inoffensive	Inoffensive
14	Total Suspended Solids (mg/L)	During the dry season: ≤ 25 mg/L During periods of heavy rainfall: a maximum increase of 25 mg/L above background levels, where these levels range from 25 to 250 mg/L. Where background levels are ≥ 250 mg/L, increase should not be more than 10% of background levels.	Not Applicable	During the dry season ≤ 65 mg/L. During periods of heavy rainfall, a maximum increase of 100 mg/L above background levels, where these levels range from 65-500 mg/L. Where background levels are > 500 mg/L, the increase should not be more than 10% of background levels

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PHYSICO-CHEMICAL PARAMETERS		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	WATER SUPPLY	RECREATIONAL USE
15	Total dissolved solids (mg/L)	Not Applicable	≤ 600	Not Applicable
16	Turbidity (NTU)	Not Applicable	≤ 5	≤ 50
17	Taste	Not Applicable	Inoffensive	Not Applicable
18	Total Oil and Grease (mg/L)	≤ 1	≤ 1	Not detected as a film, sheen or discolouration, or by odour on water's surface; not detected by sight or odour on shorelines, river banks and sediments
19	Silica (mg/L)	Not Applicable	≤ 80	Not Applicable
20	Sodium (mg/L)	Not Applicable	≤ 200	Not Applicable
21	Ammonia (µg/L)	≤ 320	≤ 500	Not Applicable
METALS		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	WATER SUPPLY	RECREATIONAL USE
22	Aluminium (mg/L)	Not Applicable	≤ 0.2	Not Applicable
23	Arsenic (µg/L)	≤ 5	≤ 10	Not Applicable
24	Barium (µg/L)	Not Applicable	≤ 700	Not Applicable
25	Cadmium (µg/L)	≤ 2.0 (short term); ≤ 0.25 (long term)	≤ 2	Not Applicable
26	Chromium (total) (µg/L)	Not Applicable	≤ 50	Not Applicable
27	Chromium III (µg/L)	≤ 570 (short term); ≤ 74 (long term)	Not Applicable	Not Applicable
28	Chromium VI (µg/L)	16 (short term); ≤ 0.01 (long term)	Not Applicable	Not Applicable
29	Copper (µg/L)	≤ 1	≤ 1,000	Not Applicable
30	Iron (µg/L)	≤ 300	≤ 300	Not Applicable
31	Lead (µg/L)	≤ 65 (short term); ≤ 1 (long term)	≤ 10	Not Applicable
32	Manganese (mg/L)	Not Applicable	< 0.5	Not Applicable

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METALS		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	WATER SUPPLY	RECREATIONAL USE
33	Mercury (µg/L)	≤ 1.4 (short term); ≤ 0.026 (long term)	≤ 1	Not Applicable
34	Nickel (µg/L)	≤ 470 (short term); ≤ 25 (long term)	≤ 20	Not Applicable
35	Selenium (µg/L)	≤ 1	≤ 10	Not Applicable
36	Silver (µg/L)	≤ 3.2 (short term); ≤ 0.02 (long term)	≤ 100	Not Applicable
37	Zinc (µg/L)	≤ 120 (short term); ≤ 2.4 (long term)	≤ 5,000	Not Applicable
PESTICIDES/ HERBICIDES		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	WATER SUPPLY	RECREATIONAL USE
38	Aldrin (µg/L)	Not Applicable	≤ 0.03	Not Applicable
39	Chlordane (µg/L)	≤ 2.4 (short term); ≤ 0.0043 (long term)	≤ 0.2	Not Applicable
40	Dieldrin (µg/L)	≤ 0.24 (short term); ≤ 0.056 (long term)	≤ 0.03	Not Applicable
41	DDT (µg/L)	≤ 0.006	≤ 1	Not Applicable
42	Endrin (µg/L)	≤ 0.086 (short term); ≤ 0.01 (long term)	≤ 0.2	Not Applicable
43	Endosulfan (µg/L)	≤ 0.06 (short term); ≤ 0.003 (long term)	≤ 20	Not Applicable
44	α-Endosulfan (µg/L)	≤ 0.22 (short term); ≤ 0.056 (long term)	Not Applicable	Not Applicable
45	β-Endosulfan (µg/L)	≤ 0.22 (short term); ≤ 0.056 (long term)	Not Applicable	Not Applicable
46	Heptachlor (µg/L)	≤ 0.52 (short term); ≤ 0.0038 (long term)	≤ 0.03	Not Applicable
47	Hexachlorobenzene (µg/L)	≤ 0.01 (long term)	≤ 1	Not Applicable
48	Lindane (γ-BHC) (µg/L)	≤ 0.95 (short term); ≤ 0.07 (long term)	≤ 0.2	Not Applicable
49	Mirex (µg/L)	≤ 0.001	Not Applicable	Not Applicable
50	Pentachlorobenzene (µg/L)	≤ 6	Not Applicable	Not Applicable

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PESTICIDES/ HERBICIDES		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	WATER SUPPLY	RECREATIONAL USE
51	PCBs (µg/L)	≤ 0.014	≤ 0.5	Not Applicable
52	Toxaphene (µg/L)	≤ 0.73 (short term); ≤ 0.0002 (long term)	≤ 3	Not Applicable
53	2,4- Dichlorophenoxy acetic acid/2,4-D (mg/L)	Not Applicable	≤ 0.03	Not Applicable
54	Alachlor (µg/L)	Not Applicable	≤ 2	Not Applicable
55	Atrazine (mg/L)	Not Applicable	≤ 0.003	Not Applicable
56	Bromoxynil (mg/L)	Not Applicable	≤ 0.005	Not Applicable
57	Carbaryl (µg/L)	≤ 2.1	≤ 90	Not Applicable
58	Carbofuran (mg/L)	Not Applicable	≤ 0.007	Not Applicable
59	Dalapon (mg/L)	Not Applicable	≤ 0.2	Not Applicable
60	Diazinon (µg/L)	≤ 0.17	≤ 20	Not Applicable
61	Dicamba (mg/L)	Not Applicable	≤ 0.12	Not Applicable
62	Dimethoate (mg/L)	Not Applicable	≤ 0.006	Not Applicable
63	Glyphosate (µg/L)	≤ 27 (short term); ≤ 0.8 (long term)	≤ 280	Not Applicable
64	Malathion (µg/L)	≤ 0.1	≤ 190	Not Applicable
65	Metolachlor (mg/L)	Not Applicable	≤ 0.01	Not Applicable
66	Metribuzin (mg/L)	Not Applicable	≤ 0.08	Not Applicable
67	Paraquat (mg/L)	Not Applicable	≤ 0.007 (as Paraquat ion)	Not Applicable
68	Picloram (mg/L)	Not Applicable	≤ 0.19	Not Applicable
69	Simazine (mg/L)	Not Applicable	≤ 0.002	Not Applicable
POLYCYCLIC AROMATIC HYDROCARBONS		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	WATER SUPPLY	RECREATIONAL USE
70	Acenaphthene (µg/L)	≤ 5.8	Not Applicable	Not Applicable
71	Anthracene (µg/L)	≤ 0.012	Not Applicable	Not Applicable
72	Benzo[a]anthracene (µg/L)	≤ 0.018	Not Applicable	Not Applicable
73	Benzo[a]pyrene (µg/L)	Not Applicable	≤ 0.01	Not Applicable
74	Fluoranthene (µg/L)	≤ 0.04	Not Applicable	Not Applicable

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DISCLOSABLE ESA AND ESMP FOR THE PROPOSED INSTALLATION OF TRANSMISSION
PIPELINES FROM ST. MARGARET'S JUNCTION TO POINTE-À-PIERRE ENTRANCE

POLYCYCLIC AROMATIC HYDROCARBONS		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	WATER SUPPLY	RECREATIONAL USE
75	Fluorene (µg/L)	≤ 3	Not Applicable	Not Applicable
76	Naphthalene (µg/L)	≤ 1.1	Not Applicable	Not Applicable
77	Phenanthrene (µg/L)	≤ 0.4	Not Applicable	Not Applicable
78	Pyrene (µg/L)	≤ 0.025	Not Applicable	Not Applicable
79	Total PAHs (µg/L)	Not Applicable	≤ 0.1	Not Applicable
OTHER ORGANIC CHEMICALS				
80	Benzene (µg/L)	≤ 370	≤ 1	Not Applicable
81	Ethylbenzene (µg/L)	≤ 90	≤ 300	Not Applicable
82	Toluene (µg/L)	≤ 2	≤ 700	Not Applicable
83	Xylene (mg/L)	Not Applicable	≤ 0.5	Not Applicable
84	Cyanide (µg/L)	≤ 22 (short term); ≤ 4 (long term)	≤ 50	Not Applicable
85	Heptachlor epoxide (µg/L)	Not Applicable	≤ 0.2	Not Applicable
86	Methyl tertiary-butyl ether (MTBE) (µg/L)	≤ 10,000	Not Applicable	Not Applicable
87	Tributyltins (TBTs) (µg/L)	≤ 0.46 (short term); ≤ 0.072 (long term)		Not Applicable
88	Di (2-ethylhexyl) phthalate (DEHP) (µg/L)		≤ 6	Not Applicable
MICROBIOLOGICAL PARAMETERS		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	WATER SUPPLY	RECREATIONAL USE
89	<i>Cryptosporidium</i> (counts/100 ml)	Not Applicable	0	Not Applicable
90	<i>Escherichia coli</i> (counts/100 ml)	≤ 126	0	≤ 200 (geometric mean of at least 5 samples)
91	Faecal coliforms (counts/100 ml)	Not Applicable	0	≤ 200 (geometric mean of at least 5 samples)
92	<i>Enterococci</i> (counts/100 ml)	≤ 33	0	≤ 35 (geometric mean of at least 5 samples)
93	<i>Giardia</i> (counts/100 ml)	Not Applicable	0	Not Applicable
94	<i>Legionella</i> (counts/100 ml)	Not Applicable	0	Not Applicable

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MICROBIOLOGICAL PARAMETERS		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	WATER SUPPLY	RECREATIONAL USE
95	Heterotrophic plate count (colonies/ml)	Not Applicable	≤ 500	Not Applicable
96	Total coliforms (counts/100 ml)	Not Applicable	0	Not Applicable
97	Cyanobacteria (cells/100 ml)	Not Applicable	Not Applicable	$\leq 100,000$

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Appendix 6: Ambient Water Quality for Marine Environments

PHYSICO-CHEMICAL PARAMETERS		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	RECREATION
1	Temperature (°C)	≤ 32	≤ 32
2	Dissolved Oxygen (mg/L)	≥ 5 mg/L	> 80% saturation
3	pH (pH Units)	6.5 to 8.5	6.5 to 8.5
4	Nitrate (mg/L)	≤ 10	≤ 10
5	Total Phosphate (mg/L)	≤ 0.1	≤ 0.5
6	Total Suspended Solids (mg/L)	Dry season maximum 25 Maximum of 250 during periods of heavy rainfall	during the dry season ≤ 80 mg/L. During periods of heavy rainfall, a maximum increase of 100 mg/L above background levels, where these levels range from 80-500 mg/L. Where background levels are >500 mg/L, the increase should not be more than 10% of background levels
7	Colour (TCU)	Increased colour (in combination with turbidity) should not reduce the depth of the compensation point for photosynthetic activity by more than 10% from the seasonally established norm for aquatic life	should not be so intense or so dark as to impede users in estimating depth, seeing subsurface hazards easily and, for people concerned with their safety, in detecting users in difficulty
8	Total Oil and Grease (mg/L)	≤ 1.0	Not detected as a film, sheen or discolouration, or by odour on water's surface; not detected by sight or odour on shorelines, river banks and sediments
9	Salinity (ppt)	Human activities should not cause the salinity (expressed as parts per thousand [‰]) of marine and estuarine waters to fluctuate by more than 10% of the natural level expected at that time and depth	Not Applicable
10	Ammonia (mg/L)	≤ 0.5	≤ 0.5
11	Odour	Not Applicable	Not detectable
12	Litter	Not Applicable	≤ 3 items of litter per m ²

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METALS		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	RECREATION
13	Arsenic (mg/L)	0.036 (CCC)	Not Applicable
14	Cadmium (mg/L)	0.0079 (CCC)	Not Applicable
15	Chromium VI (mg/L)	1.1 (CMC); 0.05 (CCC)	Not Applicable
16	Copper (mg/L)	0.0048 (CMC); 0.0031 (CCC)	Not Applicable
17	Lead (mg/L)	0.21 (CMC); 0.0081 (CCC)	Not Applicable
18	Mercury (mg/L)	0.0018 (CMC); 0.00094 (CCC)	Not Applicable
19	Nickel (mg/L)	0.074 (CMC); 0.071 (CCC)	Not Applicable
20	Selenium (mg/L)	0.290 (CMC) to 0.071 (CCC)	Not Applicable
21	Silver (mg/L)	0.0019 (CMC); 0.0008 (CCC)	Not Applicable
22	Zinc (mg/L)	0.09 (CMC); 0.081 (CCC)	Not Applicable

PESTICIDES/ HERBICIDES		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	RECREATION
23	Aldrin (µg/L)	0.0013 (CMC)	Not Applicable
24	Chlordane (µg/L)	0.09 (CMC); 0.004 (CCC)	Not Applicable
25	Dieldrin (µg/L)	0.71 (CMC); 0.0019 (long term)	Not Applicable
26	Endrin (µg/L)	0.037 (CMC); 0.0023 to 0.004 (CCC)	Not Applicable
27	Endosulfan (µg/L)	0.09 (CMC); 0.002 to 0.005 (CCC)	Not Applicable
28	α-Endosulfan (µg/L)	0.034 (CMC); 0.0087 (CCC)	Not Applicable
29	β-Endosulfan (µg/L)	0.034 (CMC); 0.0087 (CCC)	Not Applicable
30	Heptachlor (µg/L)	0.053 (CMC); 0.0036 (CCC)	Not Applicable
31	Lindane (γ-BHC) (µg/L)	0.16	Not Applicable
32	Mirex (µg/L)	0.001	Not Applicable
33	PCBs (µg/L)	0.03	Not Applicable
34	Toxaphene (µg/L)	0.21 (CMC); 0.0002 (CCC)	Not Applicable
35	Carbaryl (µg/L)	1.6	Not Applicable
36	Diazinon (µg/L)	0.82	Not Applicable

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POLYCYCLIC AROMATIC HYDROCARBONS		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	RECREATION
37	Naphthalene (µg/L)	1.4 to 50	Not Applicable
OTHER ORGANIC CHEMICALS		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	RECREATION
38	Benzene (µg/L)	110 to 500	Not Applicable
39	Ethylbenzene (µg/L)	25	Not Applicable
40	Toluene (µg/L)	215	Not Applicable
41	Cyanide (µg/L)	1 to 2 (CMC); 1 (CCC)	Not Applicable
42	Methyl tertiary-butyl ether (MTBE) (µg/L)	5,000	Not Applicable
43	Tributyltins (TBTs) (µg/L)	0.42 (CMC); 0.0074 (CCC)	Not Applicable
OTHER ORGANIC CHEMICALS		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	RECREATION
44	Di (2-ethylhexyl) phthalate (DEHP) (µg/L)	16	Not Applicable
MICROBIOLOGICAL PARAMETERS		PROTECTION OF AQUATIC LIFE & AQUATIC ECOSYSTEMS	RECREATION
45	<i>Escherichia coli</i> (counts/100 ml)	Not Applicable	≤ 250 (geometric mean of at least 5 samples)
46	Faecal coliforms (counts/100 ml)	Not Applicable	100 (geometric mean of at least 5 samples)
47	<i>Enterococci</i> (counts/100 ml)	Not Applicable	The geometric mean of at least 5 samples, taken during a period not to exceed 30 days, should not exceed 35 enterococci/100 mL. Resampling should be performed when any sample exceeds 70 enterococci/100ml. However, if it can be demonstrated that <i>E. coli</i> or faecal coliforms can adequately demonstrate the presence of faecal contamination in marine waters, then the <i>E. coli</i> or faecal coliform maximum limit for fresh waters may be used. If there is any doubt, samples should be examined for both sets of indicators for extended periods to determine if a positive relationship exists.

Appendix 7: Code of Conduct

Introduction

The project is committed to ensuring a work environment which minimizes any negative impacts on the local environment, communities, and its workers. The project also strongly commits to creating and maintaining an environment in which Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH) have no place, and where they will not be tolerated by any employee, sub-contractor, supplier, associate, or any representative of the company implementing the proposed works.

The purpose of this *Code of Conduct* is to:

1. Create a common understanding of what constitutes acceptable and unacceptable forms of conduct during work and in any interactions with the community and beneficiaries. This includes matters of sexual exploitation and abuse, and sexual harassment including their forms, the reasons behind their prohibition and the sanctions to be deployed.
2. Create a shared commitment to fair, appropriate and socially responsive behaviors and guidelines for company employees as well as contractors/third-party suppliers to prevent, report, and respond to SEA and SH, and
3. Create understanding that breach of this code of conduct will result in disciplinary action.
4. Frequency and content of the training for the prevention of sexual exploitation and abuse.

Definitions

Sexual Exploitation and Abuse (SEA)¹

Is defined as any actual or attempted abuse of a position of vulnerability, differential power, or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another².

- **Sexual Abuse:** “The actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions.” **Usually between project team members and beneficiaries.**
- **Sexual Harassment:**³ Unwelcome sexual advances, request for sexual favors, and other verbal or physical conduct of sexual nature. **Usually between members of the project team, within WASA and between project team and contractors.**

¹ As defined in the UN Secretary's bulletin – Special Measures for protection from sexual exploitation and abuse October, 9, 2003 ST/SGB/2003/13

² In the context of World Bank Financed operations exploitation occurs when access to, or benefit from a World Bank Financed good or service is used to extract sexual gain.

³ Inter-Agency Standing Committee *Protection against Sexual Exploitation and Abuse (PSEA): Inter-agency cooperation in community-based complaint mechanism. Global standard Operating Procedures.* May 2016

Sexual Harassment versus SEA⁴

SEA occurs against a beneficiary or member of the community. Sexual harassment occurs between personnel/staff of an organization or company and involves any unwelcome sexual advance or unwanted verbal or physical conduct of a sexual nature. The distinction between the two is important so that agency policies and staff training can include specific instruction on the procedures to report each.

Consent is the choice behind a person's voluntary decision to do something. Consent for any sexual activity must be freely given, ok to withdraw, made with as much knowledge as possible, and specific to the situation. If agreement is obtained using threats, lies, coercion, or exploitation of power imbalance, it is not consent. **Under this Code of Conduct⁵ consent cannot be given by anyone under the age of 18, regardless of the age of majority or age of consent locally. Mistaken belief regarding the age of the child is not a defense.**

There is no consent when agreement is obtained through:

- the use of threats, force or other forms of coercion, abduction, fraud, manipulation, deception, or misrepresentation
- the use of a threat to withhold a benefit to which the person is already entitled, or
- a promise is made to the person to provide a benefit.

While all forms of violence against a community resident or a co-worker are forbidden, this code of conduct is particularly concerned with the prevention and reporting of sexual exploitation and abuse (SEA) and sexual harassment which constitute gross misconduct, is grounds for termination or other consequences related to employment and employment status:

1. Examples of sexual exploitation and abuse include, but are not limited to:

- A project worker tells women in the community that he can get them jobs related to the work site (cooking and cleaning) in exchange for sex.
- A worker that is connecting electricity input to households says that he can connect women headed households to the grid in exchange for sex.
- A project worker gets drunk after being paid and rapes a local woman.
- A project worker denies passage of a woman through the site that he is working on unless she performs a sexual favor.
- A manager tells a woman applying for a job that he will only hire her if she has sex with him.
- A worker begins a friendship with a 16-year-old girl who walks to and from school on the road where project related work is taking place. He gives her moto rides to school. He tells her that he loves her. They have sex. In this case, even though the age of

⁴ Ibid

⁵ In accordance with the United Nations Convention on the Rights of the Child.

consent for the country maybe be 16 this is still illegal for the purposes of the project as the acceptable age of consent in this case is 18 years of age.

2. Examples of sexual harassment in a work context include, but are not limited to:

- Male staff comment on female staffs' appearances (both positive and negative) and sexual desirability.
- When a female staff member complains about comments male staff are making about her appearance, they say she is "asking for it" because of how she dresses.
- A male manager touches a female staff members' buttocks when he passes her at work.
- A male staff member tells a female staff member he will get her a raise if she sends him naked photographs of herself.

Individual signed commitment (example):

I, _____, acknowledge that sexual exploitation and abuse (SEA) and sexual harassment, are prohibited. As an (*employee/contractor*) of (*contracted agency / sub-contracted agency*) in (*country*), I acknowledge that SEA and SH activities on the work site, the work site surroundings, at workers' camps, or the surrounding community constitute a violation of this *Code of Conduct*. I understand SEA and SH activities are grounds for sanctions, penalties or potential termination of employment. Prosecution of those who commit SEA and SH may be pursued if appropriate.

I agree that while working on the project I will:

- Treat all persons, including children (persons under the age of 18), with respect regardless of sex, race, color, language, religion, political or other opinion, national, ethnic or social origin, gender identity, sexual orientation, property, disability, birth or other status.
- Commit to creating an environment which prevents SEA and SH and promotes this code of conduct. In particular, I will seek to support the systems which maintain this environment.
- Comply with the laws governing the land with regards to employment and will strive to provide equal opportunities to all, ensure work environments are safe and compensate those employed under me with fair wages.
- **Not** participate in SEA and SH as defined by this *Code of Conduct* and as defined under (*country*) law (*and other local law, where applicable*).
- **Not** use language or behavior towards women, children or men that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate.
- **Not** participate in sexual contact or activity with anyone below the age of 18. Mistaken belief regarding the age of a child is not a defense. Consent from the child is also not a defense. I will not participate in actions intended to build a relationship with a minor that will lead to sexual activity.
- **Not** solicit/engage in sexual favors in exchange for anything as described above.

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- Unless there is the full consent by all parties involved, recognizing that a child is unable to give consent and a child is anyone under the age of 18, I will not have sexual interactions with members of the surrounding communities. This includes relationships involving the withholding or promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex—such sexual activity is considered “non-consensual” under this Code.

I commit to:

- Adhere to the provisions of this code of conduct both on and off the project site.
- Attend and actively partake in training courses related to preventing SEA and SH as requested by my employer.

If I am aware of or suspect SEA and SH, at the project site or surrounding community, I understand that I am encouraged to report it to the Grievance Reporting Mechanism (GRM) or to my manager. The safety, consent, and consequences for the person who has suffered the abuse will be part of my consideration when reporting. I understand that I will be expected to maintain confidentiality on any matters related to the incident to protect the privacy and security of all those involved.

Sanctions: I understand that if I breach this Individual Code of Conduct, my employer will take disciplinary action which could include:

- Informal warning or formal warning
- Additional training.
- Loss of salary.
- Suspension of employment (with or without payment of salary)
- Termination of employment.
- Report to the police or other authorities as warranted.

I understand that it is my responsibility to adhere to this code of conduct. That I will avoid actions or behaviors that could be construed as SEA and SH. Any such actions will be a breach this Individual Code of Conduct. I acknowledge that I have read the Individual Code of Conduct, do agree to comply with the standards contained in this document, and understand my roles and responsibilities to prevent and potentially report SEA and SH issues. I understand that any action inconsistent with this Individual Code of Conduct or failure to act mandated by this Individual Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Signature: _____

Printed Name: _____

Title: _____

Date: _____

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Appendix 8: Stakeholder Engagement Schedule

STAKEHOLDER GROUP	Information to Be Communicated	Communication Method	Frequency / Trigger	Responsibility
RESIDENTS ALONG PIPELINE CORRIDOR	Construction schedules, road access changes, temporary crossings, water interruptions, reinstatement updates	WhatsApp, door-to-door notices, flyers, community boards, community meetings	Two weeks advance notice with an additional notice 48 hours before disruptions	Contractor CLO; WASA
VULNERABLE GROUPS (ELDERLY, PWDs, WOMEN-HEADED HOUSEHOLDS, ETC.)	Access support, safety measures, personal assistance if needed	Direct outreach; home visits; calls (contingent on the identification of affected vulnerable households)	As required; before high-impact works	Contractor CLO
SCHOOLS AND OTHER SENSITIVE RECEPTORS	Safety briefings, noise/dust schedules	Direct outreach; letters; WhatsApp notification	Bi-weekly; before works near facility	Contractor; WASA
BUSINESS OWNERS AND VENDORS	Access management, delivery disruptions, traffic diversions	Visits; emails; WhatsApp	Weekly	Contractor; CLO
TRANSPORT OPERATORS AND ROAD USERS	Roadwork disruptions, detours, reinstatement timelines	Radio, signage, local WhatsApp groups	Weekly; day prior to changes	Contractor; MOWT; SGRC
LOCAL COMMUNITY GROUPS	Project updates; expected impacts; engagement invitations	Community meetings; WhatsApp	Monthly	WASA; CLO
SGRC	Road reinstatement progress; complaints received	Coordination meetings	Weekly	WASA; Contractor
MOWT	Trenching schedule; reinstatement; road conditions	Technical meetings	Weekly	Contractor; WASA
EMERGENCY SERVICES (POLICE, FIRE,	Access routes; emergency coordination protocol	Email; briefings	Before major works	WASA

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STAKEHOLDER GROUP	Information to Be Communicated	Communication Method	Frequency / Trigger	Responsibility
HEALTH, SGRC DISASTER UNIT)				
GENERAL PUBLIC THE MEDIA	Project updates; progress; water service changes	Local radio; posters; social media	Monthly	WASA

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Appendix 9: Grievance Submission Form

Case ID Number: _____
Applicant's Name: _____
Sex: [Male] _____
[Female] _____
[Not stated] _____
Age: _____

- ☐ I wish to submit complaint anonymously
☐ I demand that my personal details not be disclosed without my consent

Address: _____
Telephone: _____
Email: _____

Description of Complaint:

(Subject of case, when did it occur, location, who is involved, reach, and effects of situation, etc.)

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Date of Incident:

☐

One-time incident/complaint

☐

Happened more than once (indicate how many times):

☐

Ongoing (an ongoing problem)

In your view, what measures would provide solution to the problem?

Signature:

Date:

Note: Please Submit your completed form to:

The Community Liaison Officer

[Official Address]/Email/Whatsapp

Trinidad and Tobago