MACORP WHARF CONSTRUCTION

PROJECT SUMMARY

Name of the Project: MACORP Wharf Construction

Company: Machinery Real Estate & Integrated Services Inc. (MARINS)

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26 Providence East Bank Demerara Guyana

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Table of Contents

1.0. PROJECT DESCRIPTION

MACORP is always seeking to better serve our customers across Guyana. This commitment has been combined with a proactive approach to the rapid growth rate of Guyana's economy, particularly in the energy sector.

As such, a decision was made to soon embark on the construction of a *Wharf* at our Providence, East Bank Demerara (EBD) location. This project and the proposed structure are intended to be used for the loading and offloading of various heavy-duty equipment, machinery, spares and various construction materials. This will contribute to the transport network of moving such items to and from the interior and along the coast. The construction of this wharf will contribute to the expanding mining and construction sectors. The dedicated size of the wharf is estimated to be length 85.344m (280ft) and width 16.764m (55ft).

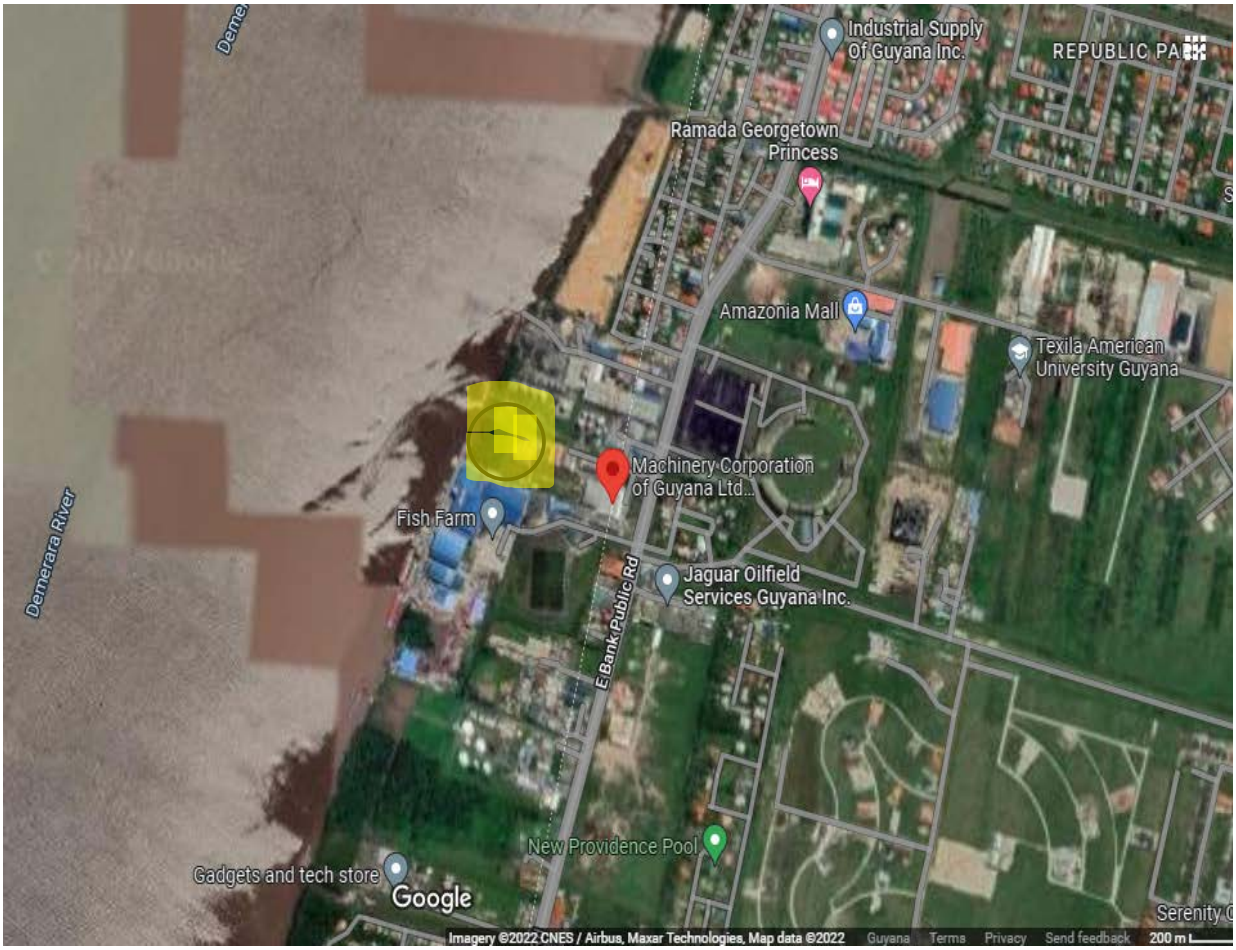
We intend to approach this project in compliance with all necessary regulations that will ensure it is done safely and with all environmental considerations.

1.1. Location

The wharf will be constructed adjacent to the MACORP Headquarters at Plantation Providence, EBD, along the right bank of the Demerara River. The site is approximately 2.4 km (1.53mil) from Agricola and 5.4 km (3.36 mil) from the centre of Georgetown. The wharf itself will be approximately 277.3m (909.8 ft) from the main MACORP building. The GPS coordinates are as follows: 6°75'81.3"N, 58°18'43.0"W.

When completed, the site will have several access points: **a)** through a proposed access road, which will run directly behind the MACORP main building, **b)** the northern side of the project, along the GuyOil Gas Station Road, which leads from the East Bank Demerara Road, and **c)** access from the Demerara River.

The land use around the project site is currently mixed. The surroundings are primarily occupied by commercial and industrial property, with all of these being some distance away from each other. Construction is yet to begin; therefore, the site remains vegetated with various land shrubs, aquatic and semi-aquatic plants.



Map 1: The proposed location of the wharf (highlighted zone)

(Source: Google Maps)

1.2. Feasible and reasonable alternatives

Our company is committed to safeguarding the environment in which we operate, along with having quality in everything that we do. As such, this project has been designed by our team with due consideration to all possible alternatives. We have concluded that the current design is the most optimal, and efficient option considering the surroundings and its environmental impact and energy usage.

1.3. Baseline Information (Physical, Ecological, and Social Environment)

1.3.1. Physical

1.3.1.1. Basic Soil Classification: the location of the wharf is along the shore banks of the Demerara River. The area can be described as having intertidal mudflats. Mudflats are formed from the accumulation of sediments supplied from nearby rivers. The mudbanks demark a slowing down of the flow of the river as it approaches the Atlantic Ocean. As such, mangroves and other salt-loving vegetation grow out of these exposed mudflats, the roots of which work to keep it together.

1.3.1.2. Soil Profile: Further inland from the mudflats, according to subsoil exploration within that area, there develops the usual Demerara clay. The sediments of which are a mixture of clay flats and tidal marshes. Silt is also part of that combination along different sections of the wider profile. The main kind of sediment within the region can be described as saline to brackish clay without or with vague mottles. Coropina clay also exists within this zone and can be described as a stiff brown silty clay.

Soil Characteristics:

- The soil at the location can be classified as very weak clay – Bs 5980
- Compressive strength ≤ 1.25 MN/m^2
- Soil Type – Clay shear strength ≤ 20 kN/m^2

1.3.1.3. Ground Water: To be determined later through scheduled geotechnical analysis via an engineering and construction team.

1.3.1.4. The Demerara River**:** this river flows over 340km north before it empties into the Atlantic Ocean. It is silty, saline, and brown in colour. The flow of this body of water channels into various creeks and tributaries along its route.

Picture #1: An aerial view of the Demerara River

(Source: Oil Now website)

1.3.2. Ecological

1.3.2.1. Flora

No work has started at the proposed site location. Therefore, the vegetation contained remains as is. The main vegetation is densely packed mangroves and other aquatic and semi-aquatic swamp shrubs. There has been minimal removal of mangroves within the area. The list below indicates the current flora thriving on the project site.

Scientific Name	Family	Common Name
Typha latifolia	Typhaceae	Cattail
Avicennia germinans	Acanthaceae	Mangrove (black)
Nuphar Lutea	Nymphaeaceae	Yellow-water Lily
Various*	Various*	Scattered Swamp shrubs

Table 1: List of observed Flora on Project Site

The identified species are commonly found scattered across shores of slightly brackish to freshwater, slow-moving bodies of water. It should be noted that several plants of the aquatic nature develop and/or bloom when water levels are low, and sediments are exposed making it a seasonal environment for them. The vegetation on the coasts of the Demerara River are very important habitats and support various fish and birds as resting places and nurseries. Apart from the joint food production of the plants, the mud also contains many organic particles that also serve as food.

Picture #2: Black Mangrove bush along the Demerara River coast

1.3.2.2. Fauna

Some fauna found within the project area are various birds, insects and fish. The list below outlines the primary animals and birds that live within this zone. All observed animals are commonly found within the tropical geographic zones. No exotic fauna was identified on the project site.

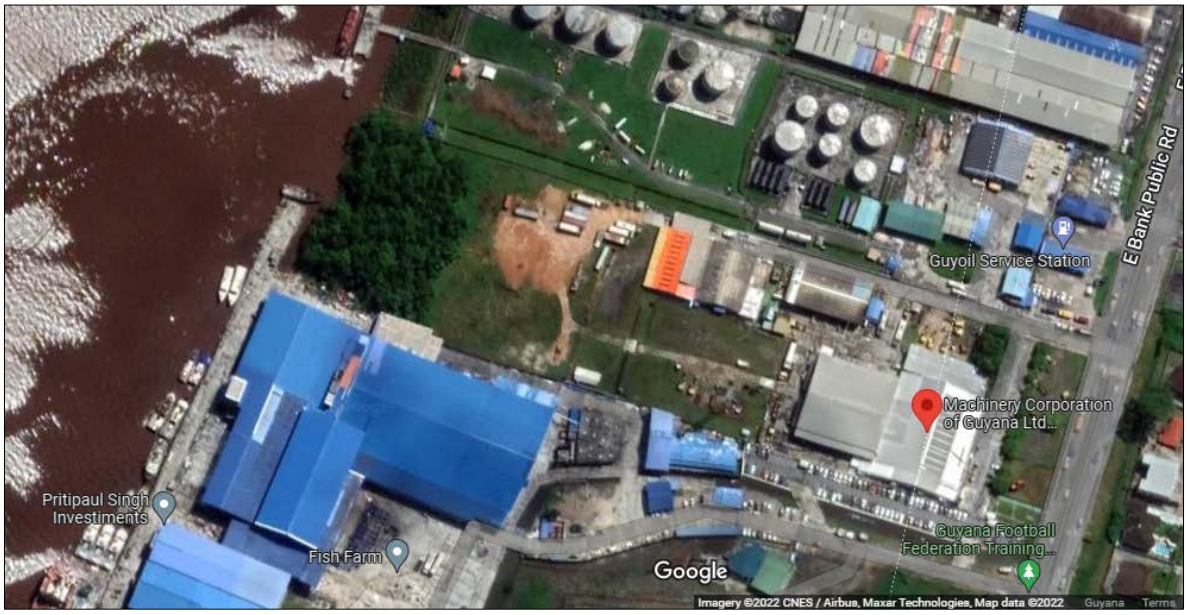
Common Name	Scientific Name	Species	Description
Great egret (common egret, great white heron)	*Ardea alba*	Herons (*Ardeidae*)	These tall birds are quite distinctive with their bright white feathers, black legs and orange beaks. They live near fresh and saltwater, nesting high in trees to protect their eggs. Their size is usually 3-3.5ft with a wingspan of 4.5-4.5ft.
Cattle Egret	*Bubulcus ibis*	Herons (*Ardeidae)*	Compared with other herons, the cattle egrets are noticeably small and compact. They have relatively short legs with a short thick neck. They stalk insects and other small animals on the ground and on cattle. They nest in dense colonies of stick nests in trees.
Mudflat Snails	*Amphibola crenata*	Amphibolidae	These are found in shorelines where there are muddy sections. These are deposit feeders, sifting through mud for organic material, such as algae and bacteria. It notably leaves a continuous faecal trail behind it. It makes a nest of mud, mucous and eggs which hatch into free-swimming larvae. They are very active at low tide.
Crabs *(and other crustaceans)*	Specific crab not clearly identified	*Anthropods*	Crustaceans are generally aquatic and differ from other arthropods in having two pairs of appendages (antennules and antennae) in front of the mouth and paired appendages near the mouth that function as jaws. Crustaceans may eat plants, animals, or the remains of living things. Some types of crustacean live off the material on the bodies of fish or other sea animals
Common Red mud worm *(and other types of worms)*	Specific worm not clearly identified	Specific worm not clearly identified	Mud worms have bristles or paddles along each of the body segments, that are used for swimming and for extra traction when crawling along the mud. Unlike wandering worms that seek out prey, such as clam worms, mud worms

			capture food as it comes to them, using their specially modified palps. In areas heavily populated with mud worms, over 50 worms can be present per square inch
Fish	Specific fish not clearly identified	Specific fish not clearly identified	Mangrove roots provide an ecologically important habitat for a wide variety of fish. The roots offer shelter from predators when used as a nursery. It also serves as a rich zone of food supplies for the general fish population

Table 2: List of Fauna at Project Site

1.3.3. Social Environment

The project is in a very culturally diverse and coastal area, where multiple commercial/industrial activities occur. Some of the immediate neighbors include the GuyOil Service Station, Pritipaul Singh Investments and Fish Farm, Toolsie Persaud Limited, a hardware store and mining supplies store. Jaguar Oilfield Services Guyana Limited is also located within the vicinity. The activities are primarily business centric. However, a section of the Providence Residential zone is located to the east of the proposed activity, across the always busy East Bank Demerara (EBD) Road. Located across the EBD road, as well, is the Providence Masjid. Therefore, there are no residential properties that exist in the immediate environs of the wharf project site. Thus, none of the activities are likely to affect that section of the population.



Map 2: A closer view of the proposed location of the wharf

Similar to our operations at Providence, we intend to be good corporate citizens by consistently engaging with the surrounding residents and the businesses who operate within the zone. As a result of the wharf construction, we will bring jobs to the community, of which we are proud. Further, we intend to build long lasting relationships with the community by being good stewards within the operating space, keeping them informed of relevant updates or issues as needed. Our operations will not become a noise nuisance or pollute the air. We intend to operate during normal work hours. As such, proactively, all stages of this project (construction, operations, decommissioning) will be considered in our Risk Assessment and Mitigation Programme to ensure that we are operating responsibly in every phase of this project.

2.0. PROJECT DESIGN

2.1. Project Design/Construction

The figure below outlines the cross section of the wharf to be developed

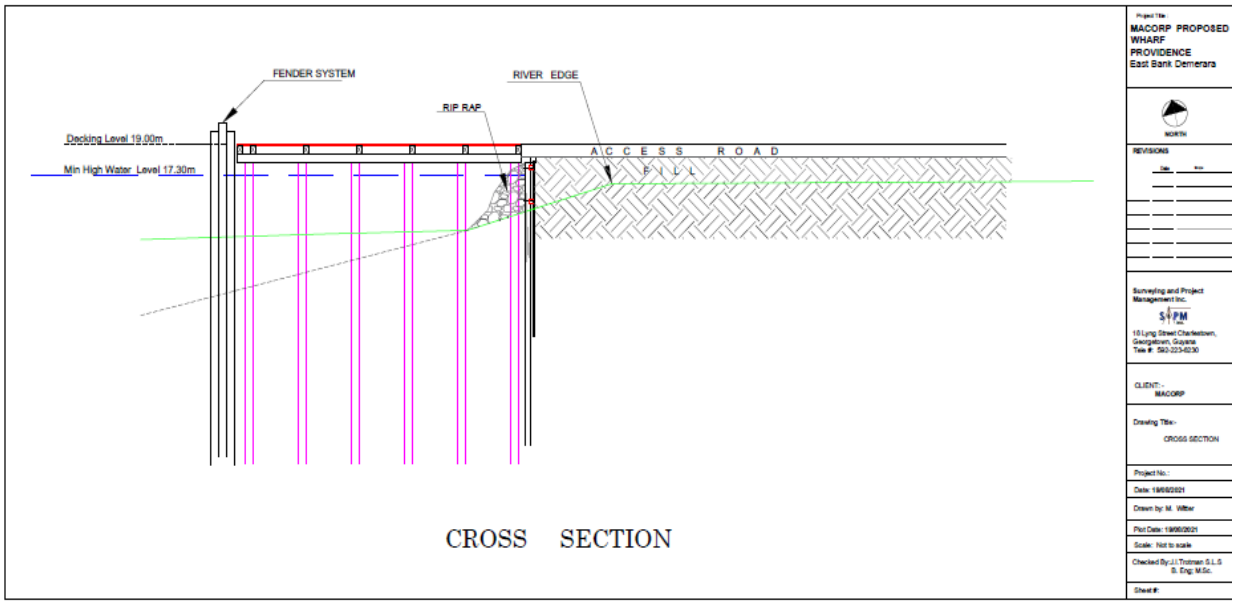


Figure 1: Cross Section of Wharf

The wharf will comprise a total estimated area of 1430.36m^2, with a length of 85.344m (280ft) and width 16.764m (55ft). The structure will be constructed with the use of greenheart timber piles using the following specifics: -

Average pile dia.	450mm
Average length	24m
No. of piles on main structure	120
No. of piles on fender	39
No. of piles in dolphin	7no x 6 = 42
Bending strength	181 N/mm^2
Modulus Elasticity	2100 N/mm^2
Compression parallel to grain	89.9 N/mm^2

Additional material to be used include concrete piles, cement, sand, steel, stone, and form boards.

2.3. DEVELOPMENT STAGES

2.3.1. Engineering and Design Phase

For the Engineering and Design Phase, a group of engineers from different disciplines will visit to ensure that the overall construction plan is an efficient and environmentally friendly design. During this phase, measurements of the land formation and the adjacent water sections will be made to ensure the capacity of, and the structure of the wharf will be adequate. Greenheart piles will be sourced from local vendors, and any other additional supplies will be supplied from the appropriate local and international vendors. This is to ensure that the design and materials would comply with the international standards and regulations for construction.

2.3.2. Construction Phase

After the design phase has been finalized, the project will commence procuring all the permits required to start the construction phase. We will reach out to the Neighborhood Democratic Council (NDC), the Environmental Protection Agency (EPA), and Central Housing and Planning Authority (CH&PA). Once the permits have been granted, it is expected that we will start mobilization on site of the different contractors and project team to start pile driving and creating the necessary foundations. The construction team is expected to comprise of 30 employees working on the project.

2.3.3. Operational Phase

After the construction phase has finished, the company will start to utilize the newly constructed wharf for the berthing of various vessels. A fulltime team of 15 employees will be at the site to facilitate the operations. Types of vessels to be docked include barges, tugs, and marine vessels.

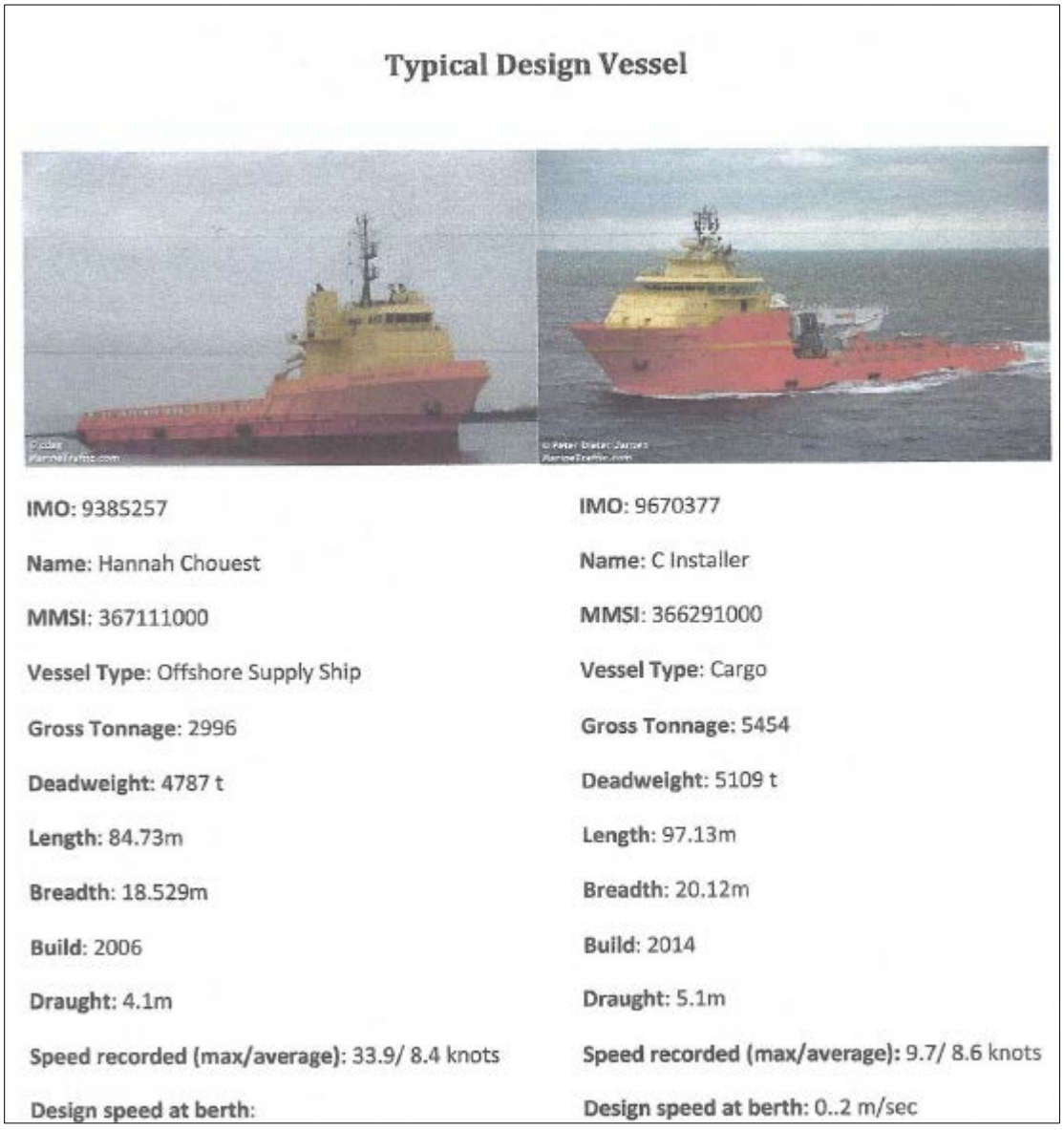


Figure 2: Example of types of vessels to utilize the wharf

2.4. UTILITY SERVICES, WATER SUPPLY AND TREATMENT SYSTEMS.

During all phases, electricity will be sourced from the Guyana Power and Light (GPL) grid, but a diesel-powered generator will also be available on stand-by. The expected average energy use will be 1100kwh per day. All other utilities will be supplied from and available at the MACORP Head office nearby. Additionally, washroom facilities, changing rooms

and the like, will be in care of the headquarters for all staff of the project to utilize. Therefore, there will be no effluent produced within the project zone.

2.5. WASTE PRODUCTION AND MANAGEMENT

2.5.1. Construction Phase

During the construction phase, a Waste Management Plan will be implemented. This will be shared with all the personnel and must be followed accordingly to their responsibilities. Additionally, during this phase, two (2) main types of waste is expected to be generated.

- Construction Waste
- Domestic/Food/ Organic Waste

In the construction phase, bins will be placed throughout the worksite and be emptied when they become filled. Bins will be appropriately labelled to guide workers when disposing waste. No hazardous waste is expected to be generated in this phase. Although waste will be generated from two waste stream, both are non-hazardous and will be disposed at the Haags Bosch Landfill Facility. Land material will be used to refill/ reinforce the sea damn where applicable. Material that can not be reused will be discarded at the Haags Bosch Landfill Facility along with the other categories of waste.

2.5.2. Operational Phase:

When the wharf becomes operational, MACORP plans to have bins strategically placed throughout the facility. These bins will either be colour coded or appropriately labeled to guide all stuff on expected waste disposal practices. The operational team will be based between the wharf and the MACORP main building where all other facilities are available for proper waste disposal.

2.6. PROJECT DURATION

This will be determined after the final review of the Lead Engineer’s estimate on design, schedules, and material availability.

2.7. POTENTIAL IMPACTS, AND ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURES

MACORP seeks to guarantee occupational health, safety, and environmental management, through the design and implementation of our HSE Management Plan, following the requirements set forth in the OHSAS 18001:2007 and ISO 14001:2015 standards (with transition to ISO 45001:2018), other legal requirements in force regarding OSH and/or the environment in Guyana, such as the Occupational Health and Safety Law (Cap. 99:06) and other applicable laws.

It should be noted that MACORP is motivated by the firm conviction that the implementation of all the elements of the HSE Management Plan will be beneficial in terms of profitability, safety, and improvement of the quality of life of the workers, the community, and other interested parties in the mid to long term, along with the integral development of the organization.

During the execution of the activities, the application of the system established in the organization will be to fulfill the requirements of the standards set out through the PDVA cycle (P (Plan), D (Do), V (Verify), and A (Act)). The below outlined the potential impacts, along with applicable mitigation measures.

Table 3: Potential Impacts and Mitigation Measures

Activity/Area	Potential Impacts/ Consequences	Extent of area affected & Environmental Aspect	Does it cross County or Country Boundaries	Magnitude & Complexity of the Impact	Probability of the Impacts	Frequency /Duration	Mitigation Measures
Removal of topsoil	Disruption of the Ecosystem/ habitat	a) Project area and immediate West of the Project Boundary (and towards the MACORP building) b) Physical & Ecological	No	These impacts will only affect the Project site.	High	Once/ Forever	Excavation will be done in stages considering that any organic material cannot be mixed with other types of material like sand or clay. The organic material shall be placed in piles with a maximum height of 4.9 ft. to avoid any fall of the material and control its handling for its final disposition
	Potential for Flooding		No		High	Once/ Until completion of Project	Excavated area will be landfilled with loam and sand to prevent any major flooding to the project site. Further land elevation will be done during construction phase. If possible, any excavated clay may be reused on the project for landfilling purposes to reinforce the sea dam
	Potential for soil erosion		No		High	Once/ Until completion of Project	The pile must be covered using Geotextile or any other material that can prevent any affectation by the air, wind, rain, sun, or other elements.

Activity/Area	Potential Impacts/ Consequences	Extent of area affected & Environmental Aspect	Does it cross County or Country Boundaries	Magnitude & Complexity of the Impact	Probability of the Impacts	Frequency /Duration	Mitigation Measures
Surface Water	Potential for construction material to enter water way	a)Nearby water body, particularly the drainage canal to the South-East and the Demerara River b) Physical	No	Will affect the drainage canal immediately South-East and the Demerara River. Once maintained and regularly de-silted there should be no issues for the Canal to collect any additional water	Medium	During Construction	Before construction begins, contractors will assess the current water ways nearby and temporary barriers or sediment control measures must be put in place to avoid their contact with the water. The Contractor will conduct weekly visible inspections of waterways to ensure no visible construction material has entered or accumulated into either water body.
Ground Water	Developer does not foresee any activities associated with the project to impact Ground water.						
Landscape Modification	Modification to Project site and potential temporary landscape modification of immediate surroundings	a) Project Site b) Immediate surroundings	No	Any modification to the landscape is expected to only occur within the boundaries of the project, there may be slight modifications to immediate surroundings of the project site but will be corrected before completion	Low	During Construction	Before the construction activities start, a photographic register of the project and surroundings must be done to ensure that there are no modifications to the surrounding landscape out of the project scope. This register will be maintained and reviewed once the construction has finished. If any alteration should occur, an immediate intervention must be done to correct the affected and minimize the impact leaving a photographic and written record of the intervention.

Activity/Area	Potential Impacts/ Consequences	Extent of area affected & Environmental Aspect	Does it cross County or Country Boundaries	Magnitude & Complexity of the Impact	Probability of the Impacts	Frequency /Duration	Mitigation Measures
				of project e.g., storage of or reuse of excavated material			Proper signage and delimitation of the work sites must be done to prevent any modifications outside the project area. During the construction phase, cleaning crews must perform cleaning rounds to the site and surroundings to prevent any debris or rubbish dragged by the wind or water to stay in the surroundings. Permission and guidance will be sought from the necessary institutional bodies to guide the construction team on the proper management of mangroves within the area. Their notes will be aptly incorporated into mitigation plans during construction and post construction phases
Noise and change in air quality	Noise nuisance to the neighbouring operations	a) Project Site b) Immediate surroundings	No	Due to the positioning of the construction activities and the distance of surrounding operations, it is unlikely that any noise generated from the site will affect that group. Additionally, modern, well-maintained	Low	During construction	The project team will conduct periodic noise pollution testing and strive to keep within the acceptable parameters of the EPA. These tests will be done by an independent third party and carefully logged for tracking of our performance. All equipment used will be well maintained to prevent the negative noise impact usually produced from old equipment. Noise mufflers will be added if needed. The generator will be equipped with a necessary stack system to prevent any issue to environment and workers. Employees will be issued appropriate Personal

Activity/Area	Potential Impacts/ Consequences	Extent of area affected & Environmental Aspect	Does it cross County or Country Boundaries	Magnitude & Complexity of the Impact	Probability of the Impacts	Frequency /Duration	Mitigation Measures
				equipment will be used in all operations, reducing the likelihood of loud noises from our construction and operations machinery. However, noise from the construction activities may affect nearby fauna.			Protective Equipment (PPE) to protect against prolonged exposure to loud noises, along with only working short intervals via staff rotation. An induction to the construction personnel will be carried on reduction of noise, associated risks, and how to manage it. The NDC will be given the contact numbers of our Project Team so that any affected residents will be able to inform us if they are affected.
	Poor air quality in project area	a) Project Site b) Immediate surroundings	No	This is likely to only occur within the boundaries of the project site.	Medium	During construction	The material transported must be placed in a way that the material is not exposed to the wind or rain in a way that may produce the fall of the material or dispersion of particles. The velocity of all the vehicles within the site will be regulated to less than 30km/h to avoid dispersion of particles into the air, guarantee the safety of the personnel and reduce the probability of potential accidents. Employees will have access to dust masks and safety goggles if ever needed to protect against flying particles.

Activity/Area	Potential Impacts/ Consequences	Extent of area affected & Environmental Aspect	Does it cross County or Country Boundaries	Magnitude & Complexity of the Impact	Probability of the Impacts	Frequency /Duration	Mitigation Measures
Generation of solid waste	Contamination of the land/soil and nearby waterways with various waste.	a) Project Site b) Immediate surroundings	No	This is likely to only occur within the boundaries of the project site	Medium	During construction	We will implement a solid waste management plan which will be shared with all the personnel and must be followed accordingly to their responsibilities. The solid wastes will be classified, stored, transported, and disposed in an appropriate way as outlined in our waste management plans.
Land Stripping	Modification to Project site and potential temporary landscape modification of immediate surroundings	a) Project Site	No	These impacts will only affect the Project site.	Medium	During construction	The areas to be affected by land clearing will be clearly identified and bounded with yellow tape or other material that is visible. After the areas have been identified and marked, all the vegetation will be removed at ground level. The material will be chopped and temporarily piled at the specific sites for this purpose Excavation will be done in stages considering that any organic material cannot be mixed with other types of material like sand or clay. The organic material shall be placed in piles with a maximum height of 4.9 ft. to avoid any fall of the material and control its handling for its final disposition Excavated area will be landfilled will loam and sand to prevent any major flooding to the project site. Further land elevation will be done during construction phase. If possible, any excavated clay may be reused on the project for landfilling

Activity/Area	Potential Impacts/ Consequences	Extent of area affected & Environmental Aspect	Does it cross County or Country Boundaries	Magnitude & Complexity of the Impact	Probability of the Impacts	Frequency /Duration	Mitigation Measures
							purposes to reinforce the sea dam

2.8. PUBLIC CONSULTATIONS/MEETINGS

The project team is procuring all the permits required to start the construction phase through the Neighborhood Democratic Council (NDC), Environmental Protection Agency (EPA), and the Central Housing and Planning Authority (CH&PA). We plan to keep the engagement channels with all regulatory partners open, along with consulting with residents as needed, throughout the life of the project. As such, should we be advised to facilitate public consultations within the confines of the law and towards the benefit of all parties involved, we are prepared to do so.

2.9. ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

The design of wharf, the expected materials to be used and tools have been determined by the core project team. However, there remains several uncertainties that still must be considered to successfully complete the project. Several additional surveying tests will have to be conducted, including the process of procuring material from local and international sources. As such, we acknowledge there is a lot of uncertainty in the market behavior for the next few years, regarding time and costs, considering shipping costs, logistics, political situations, and other global factors that may affect the project in the upcoming years.

3.0. CONCLUSION (NON-TECHNICAL SUMMARY)

The MACORP Wharf is a project conceived to answer the increasing demands of the marine transport network of moving items to and from the interior and along to the coast of Guyana. We are always prepared to adapt to the changes in the industry and to be there to support that change. Additionally, the construction and operation of the new wharf will provide job opportunities for the local community and will reflect the intentions of the company to be more competitive in the market by supplying different solutions for foreign and local companies in the industry.

APPENDIX

1) Pictures of flora and fauna

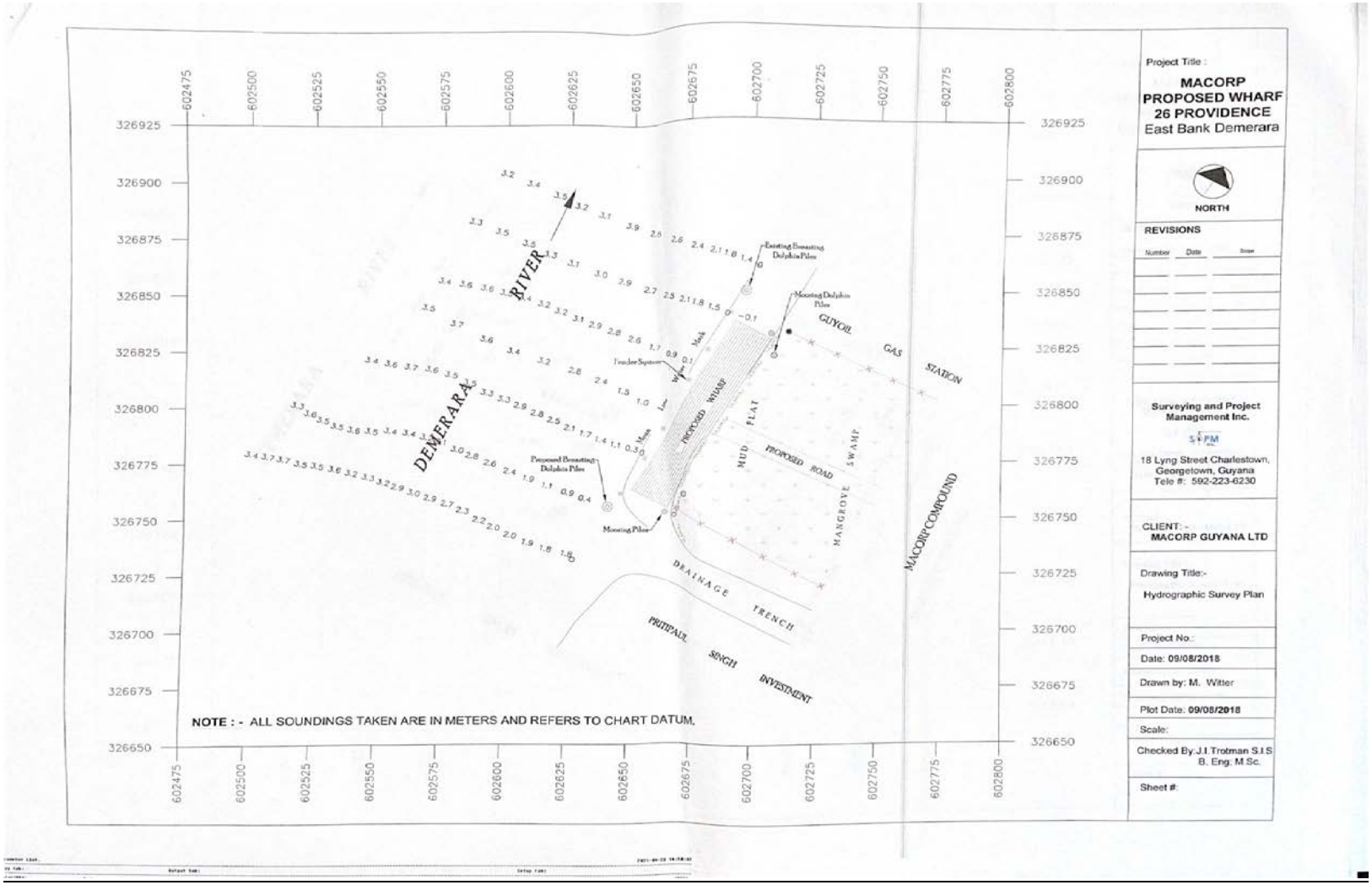
Mudflat snails

Mudflat Snails

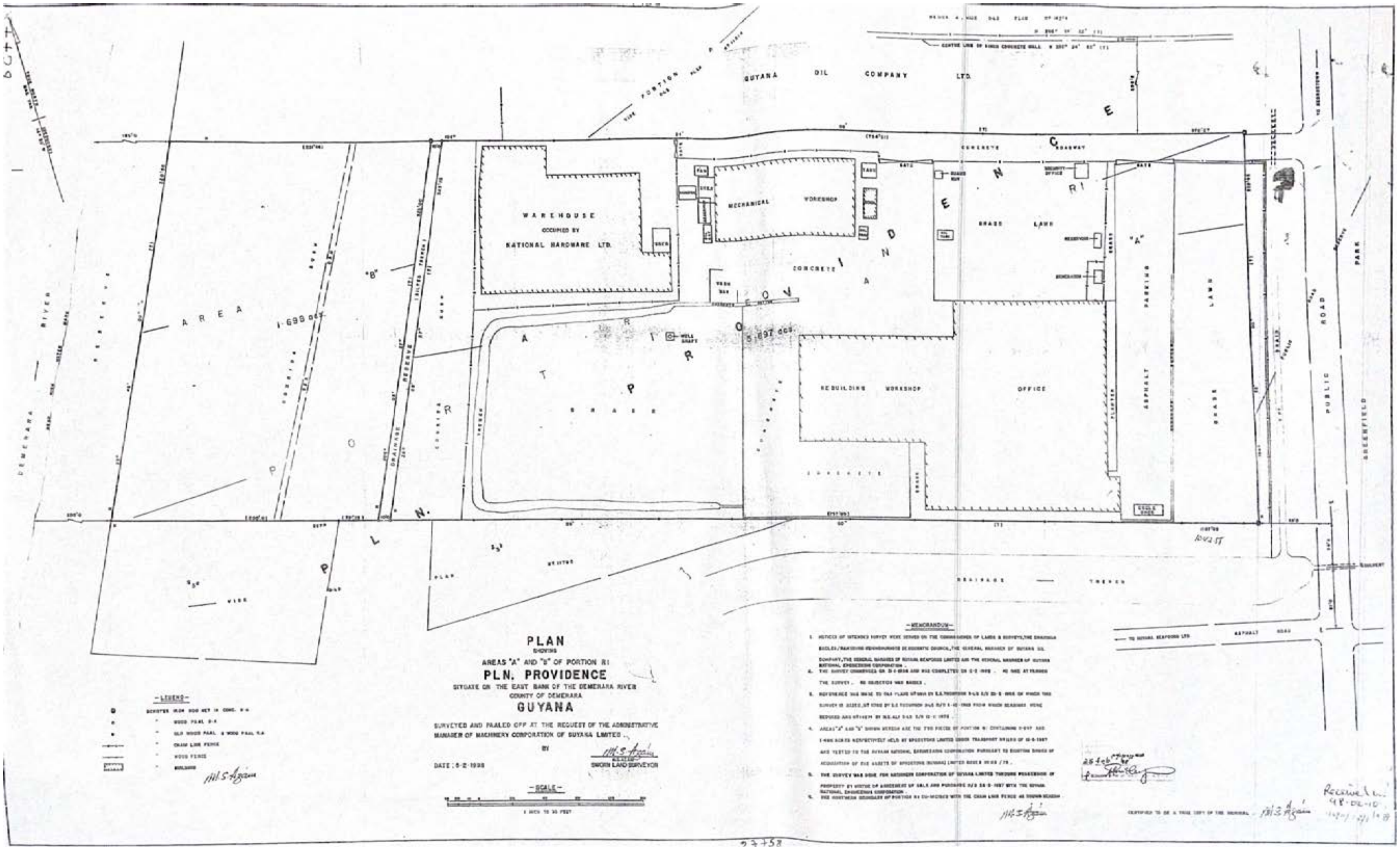
Mud Red Worm

Mud Red Worm

Schematic of the proposed Wharf



Schematic of the proposed Wharf



GUYANA OIL COMPANY LTD.
WAREHOUSE
OCCUPIED BY
NATIONAL HARDWARE LTD.
MECHANICAL
WORKSHOP
CONCRETE
REBUILDING
WORKSHOP
OFFICE
GRASS
LAWN
ASPHALT
PARKING
PUBLIC
ROAD
GREENFIELD
PARK
"A"
"B"
AREA
1·699 acs.
5·897 acs.
PLAN
AREAS "A" AND "B" OF PORTION R1
PLN. PROVIDENCE
SITUATE ON THE EAST BANK OF THE DEMERARA RIVER
COUNTY OF DEMERARA
GUYANA
SURVEYED AND PAALED OFF AT THE REQUEST OF THE ADMINISTRATIVE
MANAGER OF MACHINERY CORPORATION OF GUYANA LIMITED
SWORN LAND SURVEYOR
DATE : 6-2-1998
-SCALE-
-LEGEND-
-MEMORANDUM-

Mangroves On-site

Aerial View