PURAN BROTHERS INC.™

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PROJECT SUMMARY

HAZARDOUS WASTE INCINERATION

JANUARY 9, 2026

PURAN BROTHERS DISPOSAL INC.

PLANTATION LA UNION, WEST COAST DEMERARA

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INTRODUCTION

Puran Brothers Disposal Inc. is an incorporated waste management company with over 35 years of experience in the sector. The company's diverse operations include the collection, transportation, and treatment of hazardous and non-hazardous wastes across six of Guyana's ten administration regions: 2, 3, 4, 5, and 6.

The Company intends to expand its operation to include hazardous waste destruction via incineration at Parcel One (1) of Sub-lot B, South of Railway Line, Plantation Union, Nouvelle Flanders, La Jalousie Village District, West Bank Demerara.

To ensure compliance with environmental regulations, Puran Brothers Disposal Inc. is seeking environmental authorization from the Environmental Protection Agency (EPA) for the new operation at Nouvelle Flanders, La Jalousie Village, West Bank Demerara. This Project Summary supports the application.

PROJECT LOCATION

Puran's Hazardous Waste Incinerator will be located at Plantation La Union, West Coast Demerara, approximately 284.5 meters from the West Coast Public road. Plantation La Union lies within the coastal plain of West Coast Demerara, characterized by:

- Flat to gently undulating terrain
- Low elevation relative to sea level
- Extensive man-made drainage networks
- Predominantly agricultural and light industrial land use

The wider area supports rice farming, concrete manufacturing, agro-processing, logistics, and utility services. Environmental sensitivity is considered low to moderate, primarily due to prior land disturbance and limited ecological diversity.

The project location bearing geographic coordinates ***6°49'18.97"N, 58°12'38.28"W*** was selected to ensure:

- Adequate buffer distances from residential communities
- Access to industrial waste generators (manufacturing, oil & gas, shipping, healthcare)
- Compliance with zoning, land-use planning, and Environmental Protection Agency (EPA) requirements.

Surrounding Land Use

The Project Area of Influence (AOI), which is relative to the immediate and surrounding areas distinguishes between the area of direct influence (ADI) and the area of indirect influence (***AII***). The ADI includes the area occupied by the Project, while the ***AII*** includes surrounding areas. While

different AOIs will have varying degrees of impact, a standard AOI of 500 meters (0.3 miles) was established for ease of reference.

Within the project's Area of Indirect Influence are:

- Active and fallow rice fields
- Agricultural drainage canals
- Scattered industrial and service facilities, including a concrete manufacturing operation
- Low-density residential settlements at significant distances

Protected areas, national parks, wetlands of international importance (e.g., Ramsar sites), or declared conservation zones are **not** present within the immediate vicinity.

The total landholding of the project area measures 57.4 acres, of which approximately 4 acres will be developed for the hazardous waste incineration operation, ancillary infrastructure, internal access roads, and operational areas. The remaining 53.4 acres will remain undeveloped, serving as environmental buffer zones, drainage corridors, and setback areas, thereby significantly reducing the potential for off-site environmental impacts.

The site was previously used for agricultural rice farming. As such, the land has already undergone anthropogenic modification, including land leveling, drainage channel construction, and seasonal flooding typical of rice cultivation. No virgin land, forested areas, or natural habitats were disturbed as part of historical land use.

Sensitive Receptors and Setback Distances

Sensitive receptors were identified based on standard environmental criteria, including residences, schools, healthcare facilities, places of worship, and ecologically sensitive areas.

Sensitive Receptor Type	Approximate Distance from Project Site	Remarks
Nearest residential dwellings	> 1,000 m	Residential areas are sufficiently separated to minimize noise, air quality, and visual impacts.
Schools / educational institutions	> 1,500 m	No schools located within immediate impact radius.
Healthcare facilities	> 2,000 m	No hospitals or clinics in proximity.
Places of worship	> 1,200 m	Located outside the zone of influence.
Surface water bodies (creeks/drains)	> 500 m	No direct discharge; storm water managed on-site.
Ecologically sensitive areas	None within 3 km	No protected or critical habitats identified.
Commercial / industrial receptors	< 500 m	Predominantly industrial land use, compatible with project activities

The extensive buffer land within the property boundary provides additional protection beyond these distances.

Environmental Suitability of Location

The selected location is considered environmentally suitable for the proposed hazardous waste incineration operation due to:

- Adequate separation from residential and sensitive receptors
- Existing industrial land-use designation
- Availability of access roads for waste transportation and emergency response
- Capacity to establish buffer zones and controlled access
- Compatibility with national waste management and environmental protection objectives

The operation layout incorporates internal buffer areas, sealed waste handling systems, and a 15 m chimney to ensure effective dispersion of treated flue gases and further minimize off-site impacts.

The layout of the project referenced in Figure 3 indicates that the hazardous waste incinerator will be operating from a highly ventilated, semi-enclosed warehouse with three sides, a retracting aluminum door, and a zinc roof. The incinerator will be at the northern section of the warehouse. The incoming waste for destruction will be staged within the warehouse or openly depending on the conditions or the quality of the waste storage container.

Figure 1: Google map of the Project Location

Figure 2: Current condition of the project location

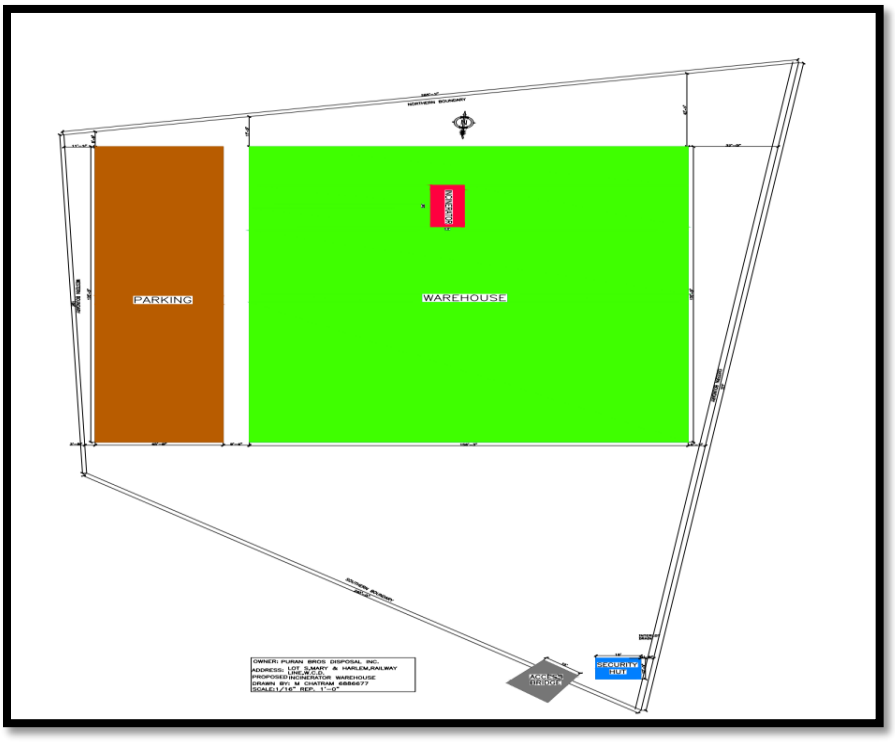

Figure 3: Project Layout

BASELINE ENVIRONMENTAL CONDITIONS

Existing Air Quality Characteristics

Ambient air quality at the project location reflects a rural–agricultural coastal environment with limited industrial influence. Air quality is primarily affected by:

- Agricultural machinery and seasonal farming operations
- Vehicular traffic on nearby access roads
- Wind-blown dust from exposed soils and embankments
- Occasional biomass burning associated with agricultural practices

Based on the surrounding land use and absence of major emission-intensive industries in proximity, ambient air quality is considered to be fair to good, with pollutant concentrations typically within acceptable limits for industrial zones. There are no known major point sources of air pollution in proximity to the project location.

Air Pollutants of Concern

Based on the land use and regional activities, the following pollutants are present at background concentrations:

- Particulate Matter (PM_{10} and $PM_{2.5}$): Generated from soil disturbance and traffic
- Carbon Monoxide (CO): Low-level, intermittent vehicular emissions
- Nitrogen Oxides (NO_x): From combustion engines
- Sulfur Dioxide (SO_2): Minimal, associated with fuel combustion
- Volatile Organic Compounds (VOCs): Trace levels from fuel handling and agricultural chemicals

Continuous ambient air quality monitoring stations are not currently at the project location; however, there are no known reports of persistent air quality exceedances or air pollution complaints in the area.

Meteorological Conditions Influencing Air Quality

Local meteorological conditions play a key role in determining air quality dispersion:

- *Prevailing winds*: Generally moderate, aiding dispersion of airborne pollutants
- *Rainfall*: Frequent rainfall contributes to the natural suppression of dust and particulates
- *Temperature*: Warm tropical conditions promote atmospheric mixing

These conditions are favorable for effective dilution and dispersion of emissions, reducing the likelihood of pollutant accumulation under normal operating conditions.

Odour Environment

Odour conditions are typical of former and current agricultural settings and include:

- Soil and organic matter disturbance
- Fertilizer application residues
- Drainage canal stagnation during dry periods

Odours are episodic, localized, and non-persistent, with no recorded nuisance complaints.

Ambient Noise Environment

Existing noise levels are influenced by:

- Agricultural machinery
- Vehicular movement
- Occasional industrial activity

Baseline noise conditions are consistent with rural–industrial transition zones, with no continuous high-noise sources. Ambient noise levels are considered acceptable and non-intrusive at receptor locations.

Soil Environment - Soil Characteristics

Soils in the project area are typical of coastal alluvial plains, characterized by:

- Fine-grained silty clay to clay textures
- Moderate to poor natural drainage
- High moisture content during wet seasons
- Historical exposure to fertilizers and agricultural amendments

These soils have low permeability, which is advantageous for industrial development when properly managed.

Existing Soil Quality

Given the historical use for rice farming, soils may contain residual nutrients but are not known to be contaminated with hazardous substances. No prior industrial contamination has been recorded for the site.

Surface Water and Drainage - Surface Water Features

The location is served by agricultural drainage canals, which are part of the regional water management system used to control flooding and irrigation.

Surface water characteristics include:

- Slow-moving or stagnant conditions during dry seasons
- Increased turbidity during rainfall events
- Agricultural runoff influences

Ambient Water Quality

Ambient surface water quality reflects agricultural runoff conditions, including:

- Elevated nutrients (nitrogen and phosphorus)
- Suspended sediments during rainfall
- No known industrial contaminants

No surface water bodies are used directly for potable supply in the immediate vicinity.

Groundwater Environment

Groundwater in the coastal plain is generally:

- Shallow
- Influenced by rainfall and tidal conditions
- Of limited potable quality without treatment

There is no evidence of groundwater abstraction for drinking purposes near the project location. Groundwater sensitivity is considered moderate, necessitating proper containment and liner systems for industrial operations.

Ecological Environment

The ecological value of the site is low, dominated by:

- Modified agricultural landscapes
- Drainage vegetation
- Common bird and small mammal species

No threatened or endangered species, critical habitats, or biodiversity hotspots were identified within the project footprint.

Baseline Environmental Sensitivity Summary

Environmental Component	Sensitivity Rating
Air Quality	Low
Noise	Low
Soil	Low–Moderate
Surface Water	Moderate
Groundwater	Moderate
Ecology	Low
Social Receptors	Low

Baseline Conclusion

The baseline environmental conditions at Plantation La Union, West Coast Demerara, reflect a previously disturbed agricultural landscape with:

- Good ambient air quality
- Low ecological sensitivity
- Adequate separation from sensitive receptors
- Sufficient land area for buffers and environmental controls

These conditions are considered suitable for the proposed hazardous waste incineration operation, provided all engineering controls, mitigation measures, and monitoring requirements are fully implemented.

PROJECT DESCRIPTION

Puran's Hazardous Waste Incineration project entails the construction, installation, and operation of a high-temperature hazardous waste destruction operation utilizing a FRCD 250 rotary kiln incinerator with secondary post-combustion and advanced air pollution control systems.

The operation will be designed to meet international best practice emission standards, specifically EU Directive 2010/75/EU, which are more stringent than many regional benchmarks, specifically:

- Incinerate for the destruction of solid, liquid, and sludge hazardous wastes.
- Process approximately 300–450 kg/hour of hazardous wastes, depending on the waste calorific value.
- Achieve full destruction of hazardous organic compounds, pathogens, and VOCs.

Key system components include:

- Sealed automated waste loading systems
- Primary rotary kiln combustion chamber
- Secondary post-combustion chamber (≥850°C, ≥2 seconds)
- Automatic ash removal and quenching system
- Dry flue gas treatment (lime + activated carbon injection)
- Ceramic filtration (>99% efficiency)
- 15 m stack with sampling ports and continuous monitoring capability
- PLC/SCADA-controlled safety and process automation

The incineration system operates under controlled high-temperature conditions, incorporating a primary combustion chamber followed by a secondary post-combustion chamber to ensure complete destruction of hazardous organic compounds.

An advanced flue gas treatment system, including dry reactors, activated carbon injection, and ceramic filtration, ensures emissions comply with international best-practice standards (EU Directive 2010/75/EU).

The facility will operate up to 24 hours per day, 7 days per week, approximately 333 days per year, providing a reliable national solution for hazardous waste management in Guyana.

Waste Acceptance

The FRCD 250 incinerator will be capable of handling hazardous wastes with a wide range of physical characteristics and calorific values, including solids, liquids, sludges, and biohazardous wastes. The primary waste streams proposed for destruction include:

- Waste oil (diesel engine–generated)
- Agricultural chemicals (pesticides and pesticide-contaminated materials)

- Hydrocarbon-contaminated waste (soil, absorbents, rags)
- Waste fuels
- FPSO oily sludge
- Shipping sludge
- Medical (biohazardous) waste.

However, all waste must undergo a **rigorous pre-acceptance and pre-receipt process** to ensure compliance with facility and regulatory standards.

Pre-Receipt Procedure

Before waste is transported to the project site, customers must submit a **Waste Generator Information Sheet (WGIS)**. The project team will review the submitted information to determine whether the waste can be accepted for destruction or if it must be rejected. This step is essential to ensure that only approved waste enters the facility.

1. Generator-Supplied Information

For each new batch of waste, the generator must provide the following details and supporting documentation:

Waste Profile Sheet (WPS)

The Waste Profile Sheet (WPS) contains critical physical and chemical data required to characterize the waste. At a minimum, the waste generator must supply all necessary information to ensure the waste is suitable for destruction.

Standard Waste Profiles

In some cases, a standard profile may be used for multiple waste streams that share similar physical and chemical characteristics. Standard profiles are only applicable when the following criteria are met:

Generating Process – The waste-generating process must be described in detail. For example, if the waste originates from a Liquid Mud Plant (LMP), the description must specify which section or process within the LMP produced the waste.

Raw Ingredients Used in the Generating Process – The waste profile must include a complete list of raw materials used in the process that generates the waste.

2. Waste Sampling and Analysis

A **representative sample** is required for all waste streams, with limited exceptions. The sample will undergo laboratory testing to confirm its characteristics. Table 01 outlines the parameters to be analyzed during pre-acceptance.

Additional Supporting Documentation

Depending on the nature of the waste, additional documentation may be required to supplement the Waste Profile Sheet and waste sample analysis. This may include:

3. Material Safety Data Sheet (MSDS) – Provides additional details on the chemical composition and hazards associated with the waste.

Analytical Results – Any previously conducted tests that provide insight into the composition and properties of the waste.

4. Final Approval and Waste Delivery

Once the facility reviews and approves the waste for destruction:

- The waste generator will receive confirmation that the waste is approved for transport.
- The waste must be delivered under regulated conditions in compliance with safety and environmental guidelines.
- Upon arrival, the waste will be inspected again before being processed for destruction.

This structured pre-receipt and pre-acceptance process ensures compliance with environmental regulations, enhances safety, and optimizes the facility's waste management efficiency.

Waste Rejection

The project will not incinerate plastic waste, including types such as polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC), and polyethylene terephthalate (PET), as these plastics release harmful toxins when burned.

When plastic waste, especially types like polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC), and polyethylene terephthalate (PET), is burned or improperly disposed of, it can release harmful toxins into the environment. These toxins can have severe health and environmental impacts. Some of the most harmful toxins produced include:

1. **Dioxins**: These are highly toxic compounds that are produced during the combustion of chlorine-containing materials like PVC. Dioxins can accumulate in the food chain, posing significant risks to human health, including cancer, reproductive and developmental damage, immune system suppression, and hormonal disruption.
2. **Benzene**: A carcinogenic compound that is released when plastics such as PET are burned. Prolonged exposure to benzene can lead to leukaemia, blood disorders, and other serious health issues.
3. **Polychlorinated Biphenyls (PCBs)**: These are toxic chemicals that can be released during the burning of certain plastics. PCBs are persistent in the environment and can

accumulate in living organisms, leading to long-term health issues such as cancer, immune system suppression, and developmental disorders.

4. **Carbon Monoxide**: This colorless, odorless gas is produced when plastic materials, especially those with high carbon content, are incompletely burned. Exposure to carbon monoxide can lead to headaches, dizziness, confusion, and, in extreme cases, death.
5. **Hydrogen Chloride**: When PVC plastics are burned, hydrogen chloride is released, which can cause respiratory issues, irritation of the eyes, and long-term damage to lung tissue.
6. **Particulate Matter**: Burning plastics can also release tiny particles into the air, which can lead to respiratory problems, cardiovascular issues, and exacerbate existing conditions like asthma.

These toxins can have lasting effects on both human health and the environment, which is why proper plastic waste management and disposal are critical. Avoiding incineration and promoting recycling or other environmentally friendly disposal methods helps reduce the release of these harmful substances.

Additionally, the facility is not equipped to process nuclear or radioactive waste. These types of waste will not be accepted at the facility. If such waste is inadvertently received without prior indication from the generator and is identified during the screening process, the generator will be notified, and the waste will be promptly returned. Incinerating plastic waste can contribute to air pollution, including the release of dioxins, furans, and other toxic chemicals that negatively impact air quality and pose serious risks to human and environmental health.

Transportation of Hazardous Wastes

Where the hazardous waste generator is transporting its waste to the project location, the generator must ensure that the waste is secured and appropriately packaged. The transporter will have to ensure that the appropriate journey management plans are prepared, emergency response measures are in place before transportation, and that wastes are stored in closed containers at all times.

Where the waste is transported by the project primarily in hazardous waste skips, the project will ensure the following:

1. Storage skips are adequate i.e., can withstand corrosiveness, have adequate capacity, lining or seals in place, etc.
2. Safety Data Sheets (SDS) are provided by the generator. If SDS is unavailable, sufficient information is obtained from the generator regarding the characteristics of wastes, particularly corrosive, reactive, ignitable, or toxic. These properties are listed on the label of the storage medium.
3. The waste manifest document must be completed and must be signed by the generator. The project will not accept any hazardous waste unless a completed and detailed WGIS is provided.

Transportation of Sludge (semi-solid) by the Project

Semi-solid wastes will be transported in specially designed bins which are sealed to prevent spillage during transport. The bins are designed with forklift slots to facilitate easy loading and offloading.

Record Keeping

The transport crew will maintain daily field logs. Each daily log will include the date, time, weight/volume, waste/material, truck plate number, driver, and escort vehicles used for each trip. Daily field logs will record the following information:

1. Truck Identification and Company
2. Time scheduled in, or arrival upon return.
3. Manifest Number.
4. Waste type loaded
5. Waste Generator's Location
6. Estimated waste quantity entered on the manifest.
7. Time departed from the Loading Site
8. The time arrived at the Project Location
9. Notes – any incidents or problems during transport.

Hazardous wastes, as per EPA regulations must be accompanied by a Hazardous Waste Manifest that will be signed by both the transporter and the waste generator.

All manifests and shipping documents will be carried in the truck cab within reach of the driver. Other documents furnished to the driver with each load will include either a map or driving directions specifying the approved transportation routes. Drivers will be furnished with a checklist summary of the Transportation Plan and will receive a health and safety briefing. A copy of the Transportation Plan will also be available at the Project.

Waste Receipt

Verification of Incoming Shipments

Verification of incoming waste involves inspection upon entry onto the project site.

Visual and Chemical Inspections

The container receipt inspection is a mandatory element of the confirmation process. Therefore, 100 % of the incoming waste will be inspected and physically verified for damage to ensure the waste containers are those indicated on the documentation. The numbers on the waste transport bins must match the numbers listed on the manifest.

During the inspection, at least one container from each profiled waste will be opened and its contents will be visually inspected to confirm it matches the physical description on its profile. The visual inspection will address color, viscosity, and waste form (e.g., debris, PPE, sludge), at a minimum.

Upon receipt of the wastes, a representative from the Project will collect the necessary WGIS and SDS and verify the incoming wastes against the information submitted in the aforementioned documents. The verification process will entail the measurements of both the physical and chemical properties such as weight, color, consistency (liquid, solid, sludge, powder), pH, etc. which is critical for determining which treatment is applicable for the waste

For waste streams that cannot be identified by the SDS due to physical and chemical changes from the process they were exposed to, the project will require lab testing to be conducted to classify the incoming waste. Waste testing includes:

1. In-house testing with rapid test kits would allow for the profiling of waste streams.
2. Lab testing with local and regional accredited labs to re-evaluate ongoing incoming waste
3. Gas testing/headspace analysis (includes Volatile Organic Compounds (VOCs), Carbon Dioxide (CO2), Hydrogen Sulphide (H2S), Benzene and Lower Explosion Limit)

Discrepancy Resolution

If the mandatory verification of incoming waste identifies a discrepancy with the Waste Profile Sheet (WPS), and the discrepancy cannot be resolved by the generator, then the project will perform **supplemental analysis** of the waste, reject the waste, or send the waste to an alternate treatment, storage, or disposal facility. A possible discrepancy may include any of the following:

1. A generator notifies the project that the process of generating the waste has changed.
2. The results of inspection or analysis indicate that the waste received at the project does not match the identity of the waste designated on the accompanying manifest or acceptance documentation.

Supplemental Verification

Any waste that is subject to a supplemental analysis will be quarantined until the discrepancy with the WPS is resolved. Supplemental analysis will be subcontracted to an independent testing facility approved by the EPA. The results of all supplemental analyses will be documented in a log maintained as part of the project operating record.

Final Acceptance

Upon verification that a batch of waste is consistent with the corresponding Waste Profile Sheet, the waste will be moved from the receiving area to an appropriate staging area in preparation for treatment and/or disposal. Any waste that does not conform to the corresponding WPS will

be quarantined until the discrepancy is resolved with the generator. Upon resolution of the discrepancy, the waste will be moved to an appropriate staging area for processing.

Waste Labelling and Segregation

Waste inspection information will be recorded on a waste log before the waste is labeled and transported to a relevant storage area for treatment. Wastes will be labeled to allow for identification and placement in designated storage/staging areas. The information included on the label is as follows:

1. Source of waste (generator, generation process)
2. Date of receipt
3. Volume
4. Physical description (solid, liquid)
5. Chemical characteristics/properties (acidic, flammable, corrosive, etc.)
6. Expiration date, where applicable

Table 01: Post Treatment Tests and Testing Parameters

Tests Conducted	Rationale	Parameters
TCLP Metals	Determines the concentration of leachable metals in the waste stream (arsenic, barium, cadmium, chromium, lead, mercury, silver, and selenium)	TCLP Extractable Arsenic (mg/L) 5.0 mg/l^3 TCLP Extractable Barium (mg/L) 100 mg/l^3 TCLP Extractable Cadmium (mg/L) 1.0 mg/l^3 TCLP Extractable Chromium (mg/L) 5.0 mg/l^3 TCLP Extractable Lead (mg/L) 5.0 mg/l^3 TCLP Extractable Mercury (mg/L) 0.2 mg/l^3 TCLP Extractable Selenium (mg/L) 1.0 mg/l^3 TCLP Extractable Silver (mg/L) 5.0 mg/l^3

		TCLP Extractable Zinc (mg/L) 10 mg/l[3]
Faecal Coliform	To determine the quantity of faecal matter present in the waste stream	<400 CFU/100ml
TSS	To determine the level of treatment (sedimentation & filtration) required to meet the discharge criteria.	<50 mg/L
BOD	Is used to capture the oxygen consumption for biological degradation of organic matter.	< 50 mg/L
pH	To determine the level of acidity/alkalinity of the waste and the associated corrosively.	5.0-9.0
TPH	Determine the level of Petroleum Hydrocarbons in the waste.	< 40 mg/L
Oil & Grease	Is used to determine oil and grease concentrations	< 10 mg/L
Volatile Organics	Determines if the waste is potentially listed (e.g., contains a volatile organic compound potentially used as a solvent) and if the concentration of any volatile organic compound exceeds the limits	Tested for presence.
Flash Point	Indicates the fire-producing potential of the waste and determines whether the waste is RCRA-ignitable	>93°C
Retort Analysis	Used for determining oil, water, and solids content in the mud, comprising a sample chamber assembly of known volume filled with mud	Tested for presence.

Chlorinated Organics	Test Chlorinated organic carriers are chlorinated organo benzenes, toluenes, and their isomers. These chemical compounds pose potential health risks to human health	Tested for presence.
Specific Gravity/Density	As a verification of the physical property of the waste as referenced on the SDS.	N/A

All ash recovered after destruction will have an analytical test result showing that the waste is within acceptable levels.

HAZARDOUS WASTE INCINERATOR

The FRCD 250 incinerator will be capable of processing waste with a lower calorific value ranging from 3,500 kcal/kg to 10,000 kcal/kg and features a specialized Post-Combustion Chamber where combustion occurs at 850°C. The cylindrical design, combined with a vortex effect from the special secondary air injection system, ensures highly efficient gas mixing for a contact time exceeding 2 seconds.

Incinerator Specification

Model: Industrial Hazardous Waste Incinerator Rotary Kiln FRCD 250 with Ceramic Filter.

Incineration capacity: 450 kg/h at 5 000 kcal/kg, 300 kg at 8 000 kcal/kg

Average calorific value: 5000-8000kcal / kg

DESIGNATION	FRCD 250
Destruction capacity	625 kg/h
Operating time	24h/day
Design Average of Lower Calorific Power (L.C.P)	3.500 kcal/kg
Volume of the combustion chamber	19 m3
Temperatures (°C) Combustion Postcombustion	 <1 200°C <1.200°C
Burners power Combustion Postcombustion	 1 700 kW 2 400 Kw
Chimney Height from the ground	15 m
Ventilation of the local	Natural ventilation and adapted mechanical ventilation

Major Equipment Inventory

Equipment	Type / Description	Quantity
Rotary Kiln Incinerator	FRCD 250, refractory-lined	1
Automatic Waste Loading System	Sealed hydraulic loading hopper	1
Liquid Waste Injection System	Atomizers with compressed air	1 system
Sludge Introduction System	Pump-fed sludge injection	1 system
Post-Combustion Chamber	High-temperature secondary chamber	1

Burners (Primary)	Industrial burner (oil/gas/LPG/biogas)	1
Burners (Secondary)	Monobloc burners	2
Automatic Ash Removal System	Hydraulic ram with quench system	1
Heat Exchanger	Gas cooler (850°C → 200°C)	1
Dry Reactor	Neutralization reactor	1
Ceramic Filter	HEPA-grade ceramic candles	1 system
Induced Draft Fan	Flue gas extraction	1
Chimney	Stainless steel, 15 m with sampling ports	1
Continuous Emission Monitoring System	Optional (gas & dust analyzers)	1
PLC & SCADA System	Schneider/Siemens with PC VUE	1

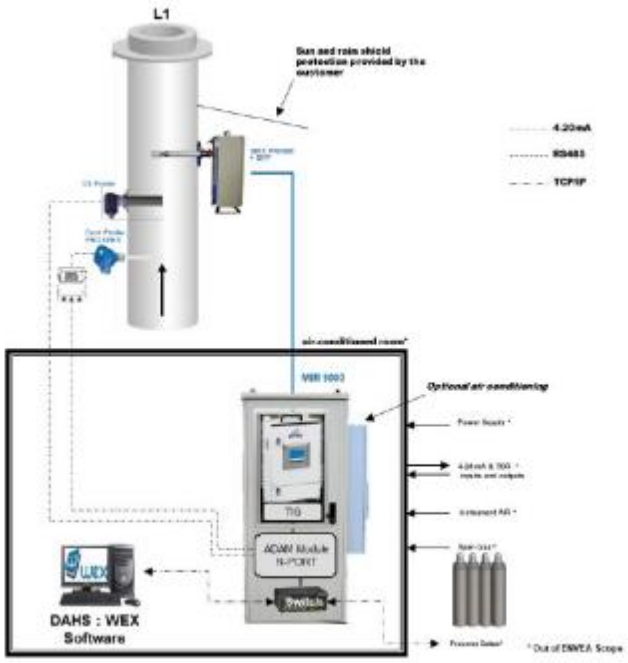

Figure 4: Incinerator illustration

Figure 5: Incinerator

Waste Constituents and Potential Emissions

The table below summarizes the typical constituents of each waste type (but not limited to) intended for destruction by the operation, and the potential emission gases or volatile organic compounds (VOCs) generated during incineration. These emissions are effectively controlled through the plant's combustion and air pollution control systems.

Waste Type	Typical Constituents	Potential Emission Gases / VOCs
Waste Oil (Diesel Engine Generated)	Hydrocarbons, lubricating oil additives, heavy metals (Zn, Pb), sulfur compounds	CO_2, CO, NO_x, SO_2, VOCs, particulate matter
Agricultural Chemicals (Pesticides)	Organophosphates, organochlorines, carbamates, solvent carriers	HCl, VOCs, NO_x, CO, dioxins/furans (trace), acid gases
Hydrocarbon-Contaminated Waste	Petroleum hydrocarbons, PAHs, oily residues	CO_2, CO, VOCs, NO_x, particulate matter
Waste Fuel	Light and heavy hydrocarbons, sulfur, additives	CO_2, CO, SO_2, NO_x, VOCs
FPSO Oily Sludge	Oil, water, sediments, heavy metals, salts	VOCs, SO_2, NO_x, CO, particulate matter
Shipping Sludge	Fuel residues, lubricants, oily water, sediments	CO_2, CO, VOCs, SO_2, NO_x
Medical Waste (Biohazardous)	Organic matter, plastics (PVC), textiles, pathogens	CO_2, CO, HCl, NO_x, VOCs, particulate matter

POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This section identifies and describes the potential adverse environmental impacts of the project. Mitigation measures are described in detail to reduce or mitigate the identified impacts.

Incineration is commonly used for the disposal of **hazardous waste**, such as industrial chemicals, medical waste, petroleum refinery sludge, and contaminated materials. However, burning hazardous waste generates several **byproducts** that require proper management to prevent environmental contamination.

Air Emissions from Hazardous Waste Incineration

The primary concern with hazardous waste incineration is the release of toxic gases and particulates. These emissions depend on the type of waste, combustion efficiency, and pollution control systems in place.

Key Air Pollutants:

Pollutant	**Source**	**Environmental & Health Effects**
Carbon Dioxide (CO_2)	Combustion of organic materials	Greenhouse gas contributing to climate change
Carbon Monoxide (CO)	Incomplete combustion of carbon-based waste	Toxic gas that reduces oxygen in the bloodstream
Nitrogen Oxides (NO_x)	Combustion of nitrogen-containing compounds	Contributes to smog, acid rain, and respiratory issues
Sulfur Oxides (SO_x)	Burning sulfur-rich waste (e.g., oil-based products)	Forms acid rain, damaging ecosystems
Dioxins and Furans	Incineration of chlorinated organic waste (e.g., PVC plastics, pesticides)	Highly toxic, linked to cancer and endocrine disruption
Heavy Metals (Pb, Hg, Cd, As, Cr, etc.)	Found in batteries, paints, electronic waste, medical waste	Bio accumulate in the environment, cause neurological damage
Volatile Organic Compounds (VOCs)	Evaporated chemicals from solvents, fuels, and industrial waste	Cause air pollution, some are carcinogenic

Operation Mitigation / Control Measures

To reduce the release of harmful pollutants from the incineration of hazardous wastes, the incinerator will include built in emission control technologies as describe below:

Potential Environmental Impacts	Mitigation Measures
Air Quality: Emissions of combustion-related pollutants, including: • Particulate matter (PM) • Carbon monoxide (CO) • Nitrogen oxides (NO_x) • Sulphur dioxide (SO_2) • Acid gases (HCl, HF) • Volatile organic compounds (VOCs) • Trace quantities of dioxins, furans, and heavy metals • Short-term emission fluctuations during start-up or waste changeover	1. Use of a two-stage combustion process with controlled air supply and minimum gas residence time of 2 seconds at ≥850°C to ensure destruction of organic compounds. 2. Operation of an advanced dry flue gas treatment system, including: • Hydrated lime injection for neutralization of acid gases • Activated carbon injection for the adsorption of VOCs, dioxins, furans, and heavy metals • High-efficiency ceramic filtration system (>99% particulate removal) 3. Maintenance of emissions below EU Directive 2010/75/EU limits, adopted as best practice. 4. Installation and operation of continuous emissions monitoring systems (CEMS) for key pollutants. 5. Use of a 15 m stack to promote adequate dispersion of treated exhaust gases. 6. Preventive maintenance of burners, fans, and control systems. 7. Immediate corrective actions in response to alarms or abnormal emission readings.
Noise Impacts: Operational noise generated by: • Induced draft (ID) fans. • Air blowers and compressors. • Burners and mechanical handling equipment. • Potential nuisance to nearby receptors if uncontrolled.	1. Installation of equipment within enclosed industrial structures 2. Use of noise-dampening mounts, silencers, and vibration isolators on major mechanical equipment 3. Routine maintenance to prevent abnormal noise caused by worn or faulty components 4. Restriction of high-noise maintenance activities to daytime hours where practicable 5. Monitoring of noise levels to ensure compliance with occupational and environmental noise standards. 6. Maintenance of buffer distances between the facility and sensitive receptors.

Water Resources Impacts: 1. Accidental contamination of surface or groundwater due to: • Spills of liquid waste, fuel, or chemical reagents • Runoff from waste handling or storage areas 2. Domestic wastewater generation from staff facilities.	Recycling water in the scrubber and treating wastewater before disposal ensures minimal environmental impact on water quality.
Soil and Groundwater Contamination: Improper disposal of dust and sludge can lead to contamination of soil and groundwater.	1. Use of a dry flue gas treatment system, eliminating routine process wastewater discharges. 2. Storage of liquid wastes, fuels, and reagents in bunded tanks with adequate secondary containment. 3. Construction of impermeable floors in waste storage and handling areas. 4. Implementation of controlled site drainage to prevent contaminated runoff. 5. Development and enforcement of a Spill Prevention and Emergency Response Plan. 6. Training of staff in spill response and safe handling procedures. 7. Proper treatment or disposal of domestic wastewater in accordance with EPA requirements.
Soil and Land Impacts: 1. Soil contamination from: • Accidental spills or leaks • Improper handling of ash or filter residues 2. Localized land degradation if wastes are not properly managed	1. Automated and sealed ash removal and quenching system to prevent dust release 2. Temporary storage of ash and residues in closed, clearly labelled containers 3. Characterization of ash before disposal 4. Disposal of ash and filtration residues at EPA-approved disposal facilities 5. Use of paved and impermeable surfaces in all waste handling areas 6. Regular inspection and maintenance of tanks, pipelines, and equipment 7. Immediate clean-up and remediation in the event of any accidental release.

Social Impacts 1. Public concern regarding hazardous waste incineration and emissions 2. Increased industrial traffic associated with waste transportation 3. Occupational health risks for facility workers if not adequately controlled	1. Operation of the facility in compliance with international best practice emission standards, ensuring minimal off-site impact 2. Implementation of a community communication mechanism to address public concerns and provide accurate information 3. Traffic management procedures to minimize disruption and ensure safe transportation of waste 4. Strict occupational health and safety protocols, including: • Automated waste handling systems to limit worker exposure • Provision and enforcement of appropriate PPE • Regular training and safety drills 5. Emergency preparedness and response planning coordinated with relevant authorities 6. Creation of employment opportunities and skills development for local personnel

With the implementation of the above mitigation measures, the residual environmental and social impacts during operation are expected to be low, localized, and manageable. The operation will be designed to operate safely within regulatory limits while providing an essential service for the environmentally sound management of hazardous and biohazardous waste in Guyana.

MANAGEMENT PLAN

Environmental Aspect	Potential Impact	Mitigation Measures	Monitoring Indicators	Frequency	Responsibility
Air Quality (Incineration emissions)	Release of particulate matter, NOx, SOx, VOCs, CO	Use of high-efficiency incinerator with stack gas scrubbers- Regular maintenance of incinerator- Use of appropriate incineration temperature for different	Stack gas emission concentrations (PM, NOx, SOx, CO, VOCs)- Visible smoke and odor levels	Continuous stack monitoring- Monthly manual sampling	Environmental Officer / Contractor

		wastes- Enforce controlled waste feed rate			
Water Quality (Runoff, spills)	Contamination of surface/ground water from accidental spills or leachate	- Impermeable containment for waste storage- Spill kits on-site- Secondary containment for liquid wastes	- Water quality testing for hydrocarbons, heavy metals, pH	Quarterly	Environmental Officer / QA Officer
Soil Quality	Soil contamination from spills or improper disposal	- Designated storage areas with bunds- Prompt clean-up of spills- Training on handling hazardous wastes	- Soil sampling around storage/incineration areas	Annually, and post-spill	Environmental Officer / Contractor
Noise (Operation of incinerator & equipment)	Noise disturbance to nearby community	- Enclose noisy equipment- Use of silencers where possible- Limit operating hours	- dB(A) measurements at site boundary	Quarterly	HSE Officer
Health & Safety (Workers and nearby residents)	Exposure to hazardous emissions, burns, or injuries	- PPE for all workers handling waste- Training in safe handling- First aid facilities	- PPE compliance- Number of incidents/accidents	Weekly	HSE Officer / Site Supervisor
Waste Management	Improper segregation or storage leading to cross-contamination	- Segregate wastes by type- Label all containers- Regular inspections	- Audit reports on segregation and labeling	Monthly	Environmental Officer / Site Supervisor
Social / Community Impact	Odor, dust, or perception of risk by community	- Community engagement and notification of operations- Complaints log	- Number of complaints received	Continuous / Monthly review	Environmental Officer / Community Liaison

RISK ASSESSMENT & EMERGENCY RESPONSE

Risk Assessment

Risk	Likelihood	Consequence	Risk Rating	Mitigation
Fire at storage or incineration area	Medium	High	High	- Firefighting equipment on-site- Fire-resistant containment- Staff fire drills
Spillage of hazardous waste	Medium	Medium	Medium	- Secondary containment- Spill kits and trained personnel- Immediate cleanup procedures
Air emissions above allowable limits	Low	High	Medium	- Continuous emissions monitoring- Routine incinerator maintenance- Rapid shutdown protocols
Worker exposure to hazardous chemicals	Medium	High	High	- PPE usage- Training programs- Emergency first aid station
Community complaints/protests	Medium	Medium	Medium	- Community awareness programs- Grievance redress mechanism

Emergency Response Plan

1. Emergency Contact List, Site Manager, HSE Officer, Local Fire Department, Medical Services.

2. Emergency Procedures

   - Fire: Sound alarm, evacuate, activate fire suppression, and notify authorities.
   - Spill/Leak: Isolate area, contain with spill kit, inform Environmental Officer, report to EPA if required.
   - Medical Emergency: Provide first aid, call medical services, record incident.
   - Air Emission Exceedance: Stop incineration, investigate cause, and notify the EPA.

3. Training & Drills

   - Quarterly emergency drills
   - Annual refresher training for all staff

4. Reporting

   - All incidents are documented in Environmental and HSE logbooks
   - Notify Guyana EPA within 24 hours for reportable incidents

CONCLUSION:

The proposed incineration operation will comply with the Environmental Protection Agency's Environmental Authorization requirements and will be designed in accordance with internationally recognized Best Available Techniques (BAT).

Through the application of advanced combustion control and emission abatement systems, the project's environmental impacts will be predictable, measurable, and effectively mitigated, thereby supporting the safe and sustainable management of hazardous and biohazardous waste in Guyana.

The operation will be designed to safely incinerate a wide range of hazardous wastes generated nationally while maintaining strict control over emissions and environmental impacts. By integrating advanced combustion technologies with proven air pollution control systems, the project will provide a robust, compliant, and environmentally sound solution for hazardous and biohazardous waste management.

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