

# **FORM GHANA LIMITED**

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**ENVIRONMENTAL MANAGEMENT PLAN FOR THE TAIN II  
REFORESTATION PROJECT IN  
BEREKUM MUNICIPALITY OF BONO REGION, GHANA.**

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**VALIDITY PERIOD: August 2021- August 2024**

**DATE OF SUBMISSION: July, 2021**

**ENVIRONMENTAL PROTECTION AGENCY**



**ENVIRONMENTAL MANAGEMENT PLAN  
FOR FORESTRY SECTOR PROJECTS (EMP-FSP)**

*IN ACCORDANCE WITH THE*

*ENVIRONMENTAL ASSESSMENT REGULATIONS, 1999 (LI 1652)*

***Read These Instructions Carefully Before Completing The Form***

1. All necessary information required must be provided in full in order to avoid delays in processing the application. Where separate or additional sheets are used and other technical documents provided, these must be labelled appropriately.
2. ***Processing and permit fees are payable in accordance with the Fees and Charges (Amendment) Instrument, 2015 (LI 2228) or subsequent amendments that may be promulgated. Permits will only be issued after full payment of the required processing and permit fees.***
3. ***Attach Certificate of incorporation, Certificate to commence business, Material Safety Data Sheets (MSDS) for chemicals and other relevant attachments (if any)***
4. Submit the completed form with relevant supplementary information ***in triplicate and an electronic copy*** to:  
*The Executive Director*  
*Environmental Protection Agency*  
*P O Box M326 □ Accra-Ghana*  
*Tel: 233 (0) 302 662465; 233 (0) 302 664697/8662465*  
*Fax: 233 (0) 302 662690 □*  
*E-mail: [support@epa.gov.gh](mailto:support@epa.gov.gh)*  
*Web-site: <http://www.epa.gov.gh>*
5. For any other information relating to this form, contact the ***Natural Resources Department*** of EPA via ***[natural.resources@epa.gov.gh](mailto:natural.resources@epa.gov.gh)*** or ***[info@epa.gov.gh](mailto:info@epa.gov.gh)***
6. ***Failure to fully complete the form and attach all relevant document may lead to a delay in Processing***

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**COMPANY INFORMATION**

Registered Name of Form Ghana Ltd. Undertaking			
Type of undertaking	Plantation Business		
Date of Incorporation of Company	24 <sup>th</sup> August, 2007		
Company TIN	C0003417816		
Date of Commencement	28 <sup>th</sup> August, 2007		
Total Land take	14,576 hectares		
Address for Correspondence	Form Ghana P.O. Box SYI 211 Sunyani Bono Region Ghana		
Telephone	+233(0) 544 441 440		
E-mail	<a href="mailto:w.fourie@formghana.com">w.fourie@formghana.com</a>		
Website	<a href="http://www.formghana.com">www.formghana.com</a>		
Contact person from company	Mr. W Fourie, Managing Director Form Ghana Ltd.		
Telephone	+233(0) 544 441 440		
Mobile	+233(0) 544 441 440		
E-mail	w.fourie@formghana.com		
Location of undertaking	Town: Sunyani		
	Region: Bono		
Major Landmark	Tain River		
Global Positioning System Coordinates of the undertaking (WGS 84-UTM)	<i>Point</i>	<i>X-coordinate</i>	<i>Y-coordinate</i>
	1	538.389,80	848.675,76
	2	551.079,34	846.983,81
	3	552.831,69	837.859,44
	4	543.767,75	836.409,21
	5	536.274,87	842.995,68

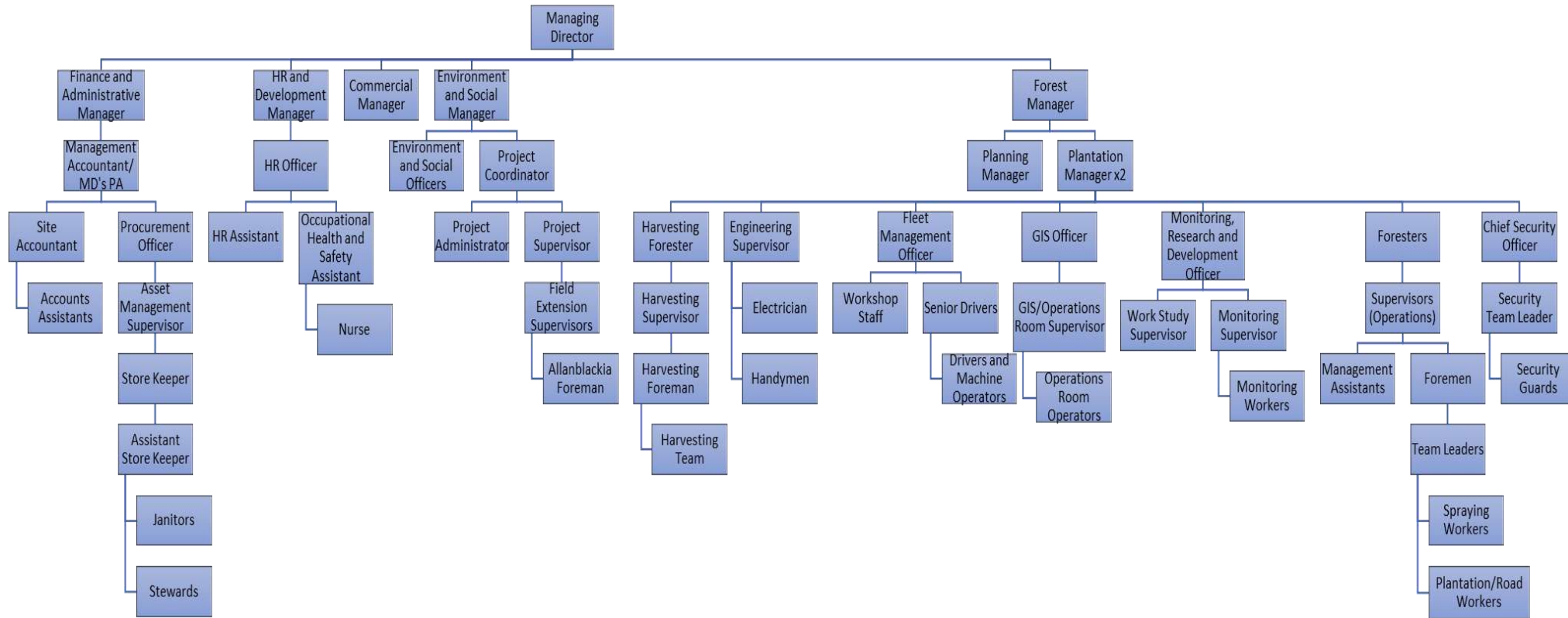
Category of EMP:  1<sup>st</sup> Generation  2<sup>nd</sup> Generation  3<sup>rd</sup> Generation  
 Others (specify)

**WORKFORCE**

Division	General Workers			Management Workers			Total
	Male	Female	Total	Male	Female	Total	
Sunyani (HQ)	4	2	6	8	2	10	16
Akumadan P	120	48	168	11	1	12	180
Akumadan C	83	82	165	1	1	2	167
Allanblakia P	1	0	1	1	0	1	2
Allanblakia C	2	0	2	0	0	0	2
Berekum P	177	43	220	22	6	28	248
Berekum C	223	72	295	0	0	0	295
Palladium P	0	1	1	2	1	3	4
<b>Grand Total</b>	<b>610</b>	<b>248</b>	<b>858</b>	<b>45</b>	<b>11</b>	<b>56</b>	<b>914</b>
<b>Percentage (%)</b>	<b>71.09</b>	<b>28.9</b>	<b>100.00</b>	<b>80.35</b>	<b>19.64</b>	<b>100.00</b>	
Permanent Staff (P)- 450 Casual Staff (C)- 464							



**ORGANIZATIONAL CHART OF FORM GHANA**



**Figure 1: Organizational Chart**

**PERMITS/LICENCES AND CERTIFICATES**

S/N	Institution	Permit		Permit No/License Issue/Expiry	No/Date of
		Yes	No		
1	Environmental Protection Agency	X		CA: 470.2/LG/FO/02	Exp. 14-08-2021
2	Water Resources Commission	X		FGLID 409/18	exp. 31-12- 2021
3	Forestry Service Division		X		
4	Wildlife Division		X		
5	Others				
	Ghana National Fire Service Certificate	X		BC20002A	Exp. 07-01-2021
	Forest Stewardship Council		X		

**MEMBERS OF ENVIRONMENTAL COMMITTEE**

No	Name	Designation	Department
1	Willem Fourie	Managing Director	Management
2	Willem Kotze	Forest Manager	Plantation
3	Paul Ontoaneyin	E&S Manager	Environment and Social
4	Evelyn Affreh	E&S Officer	Environment and Social
5	Bismark Adjei Manu	E&S Officer	Environment and Social
6	Vida Owusu	OHS Assistant	E&S/HR
7	Alex Amoako	Monitoring Officer	Plantation

**PREPARED BY:**

**SIGNATURE & DATE:**

Bismark Adjei Manu  
*(Environment and Social Officer)*

\_\_\_\_\_

Evelyn Affreh  
*(Environment and Social Officer)*

\_\_\_\_\_

**REVIEWED BY:**

Paul Ontoaneyin  
*(Environmental & Social Manager)*

\_\_\_\_\_

**APPROVED BY:** Willem Fourie, Managing Director

**SIGNATURE, STAMP & DATE:** \_\_\_\_\_

## **1.0 INTRODUCTION**

FORM Ghana Limited is a reforestation company established in 2007 with the aim of large-scale reforestation of degraded forest reserves in Ghana, while conserving and restoring natural, riparian forest. FORM Ghana has established plantations within the Asubima & Brohuma Forest Reserves at Akumadan in the Offinso North District of Ashanti Region and the Tain II Forest Reserve in the Berekum Municipal of Bono Region.

In line with Ghana's environmental requirements for Environmental Management Plan for the Forestry Sector Projects as contained in the Environmental Assessment Regulations 1999 (LI 1652), Form Ghana conducted independent environmental impact assessments on the degraded reserves that were acquired for the plantation establishment. The Environmental Protection Agency operating under the legal mandate of Environmental Protection Agency Act, 1994 (Act 490) granted Form Ghana a permit (CA: 470.2/LG/FO/02) to carry out its operations. Also, as part of the requirements for the grant of permit, Form Ghana prepared an Environmental Management Plan (EMP) that spanned from 2018 – 2021. The plan spelled out various mitigation measures that were going to be implemented to manage the environmental and social impact that its operations were yielding.

As part of the conditions for the renewal of environmental permit, FORM Ghana is expected to update its Environmental Management Plan (EMP) and update the Agency in compliance with the Environmental Assessment Regulations, 1999 (LI 1652). This EMP thus seeks to meet this requirement for the renewal of permit. The report specifically presents various environmental and social aspects of the Company's operations and revised management plans that are in place to ensure the avoidance and mitigation of impacts (in case they cannot be avoided). The report is structured according to the specific requirements by the EPA Ghana as outlined in the EMP-Forestry Form in accordance with the Environmental Assessment Regulations, 1999 (LI 1652).

## **2.0 DESCRIPTION OF UNDERTAKING**

### **2.1 Site Description and External Environment**

The Tain II Forest Reserve lies in the Southwestern section of the Berekum Municipal in the Bono Region (see location of site in national context in Figure 1). The forest area is 409.2 km<sup>2</sup>, with a perimeter of 269.43 km. The entire reserve has recorded significant degradation due to unsustainable forest use practices such as deforestation, hunting, poaching and overgrazing. A total of 14,576 hectares GIS area of this reserve was allocated to Form Ghana Ltd. for commercial forest plantation development (see Figure 2 below). Out of the total area of the Tain II forest reserve allocated to Form Ghana, 8731.35 hectares have been reforested from 2013 to 2020 (see Table 1 below for details). Form Ghana had developed a 15-hectare nursery within its concession in the Tain II reserve as of the year 2020.

The Tain II Forest Reserve is named after the Tain River which forms the border of the reserve to the north. The ground level elevation of the Tain sub-basin ranges from 240 to 300 m above sea level with some few areas either undulating or rugged. The topography of the area is gently undulating with moderately steep slopes between 5 – 12%.

Generally, the area is well drained by the Tain River which is a tributary of the Black Volta. Mostly, the Tain River dries up in the dry season. Ground water potential in the area is highly variable. Much depends on the nature of the underlying rock formations and rainfall. In the Tain II Forest Reserve there are a few ephemeral streams that connect to the Tain River.

The Tain II Tributaries Forest Reserve falls in the Dry Semi Deciduous Forest Zone. Originally, the main vegetation type in the reserve was the dry semi-deciduous forest, which generally contains valuable timber trees such as Wawa (*Triplochiton scleroxylon*), Odum (*Milicia excelsa*), Sapele (*Entandrophragma cylindricum*) and Kokrodua (*Pericopsis elata*) (Amponsa-kwatiah, 1993). Prior to Form Ghana's restoration of the reserve, large areas of the reserve were covered by savannah, resulting from human induced land degradation. Due to intensive farming and reported annual fires, very little of the original forest remains. Four main vegetation types were identified and classified as forest, Teak plantation, farmlands and degraded areas.

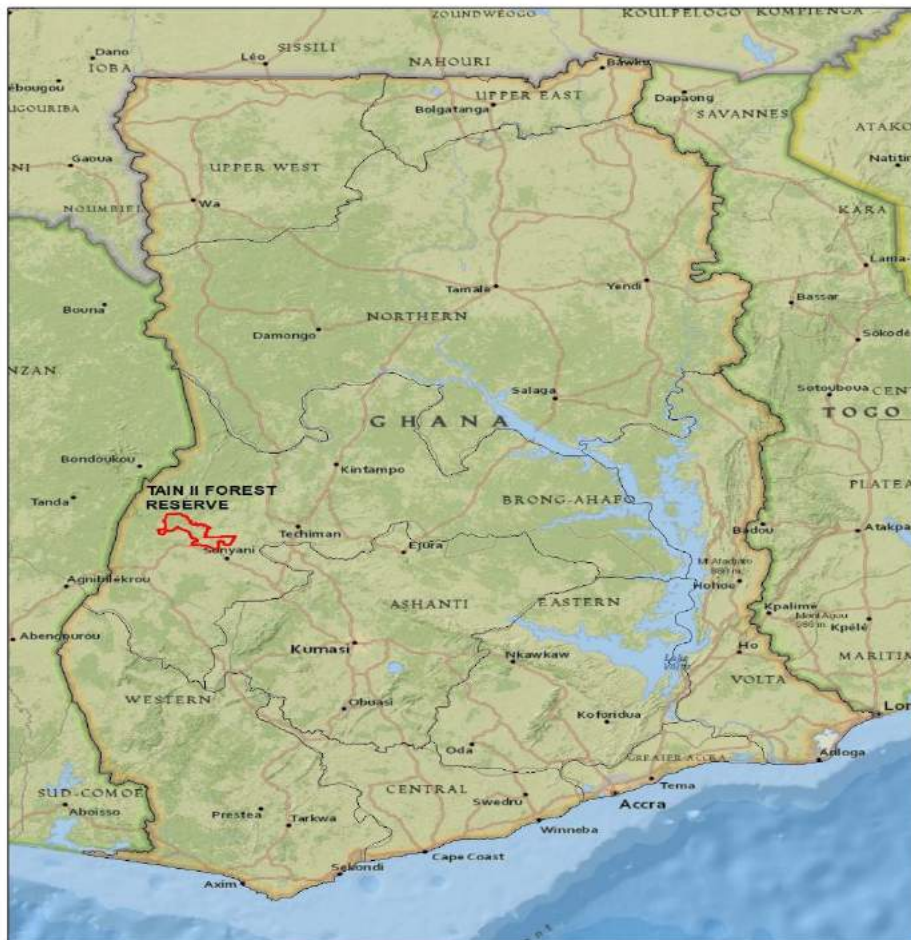
Tain II Forest Reserve has a bi-modal rainfall pattern with a major and minor peak in June and October respectively. The main dry season is from November to March and there is a second

*Environmental Management Plan – Tain II Forest Reserve*

dry spell in August. The mean annual rainfall is 1200mm and the maximum and minimum annual temperature for 26 years were 23.6°C and 26°C (Orgle, 1994). Relative humidity in the dry season ranges from 100% at night to 30% near midday when the Harmattan is strongest.

The soils of the area have been developed in weathered products of rocks of the geological formation of the Lower Birrimian, and in alluvial sediments of the river valleys and the floodplains of the Tain River. Other geologic components found in the area were found to have influenced soil development to a lesser extent. In addition to the role of the parent materials in soil development, the pedogenesis has been influenced by the warm-humid climate, tropical forest vegetation, variable topography and associated hydrologic regimes and, more recently, anthropogenic factors.

Roads in the reserve are all gravel roads in various states of repair. Most of the roads go from Berekum into the reserve from the south northwards. One road goes from Berekum to Seikwa through Oforikrom and Tainso. North of the reserve roads go from Seikwa southward but few of these roads actually enter the reserve.



*Figure 1: Location of Tain II Forest Reserve within national context*

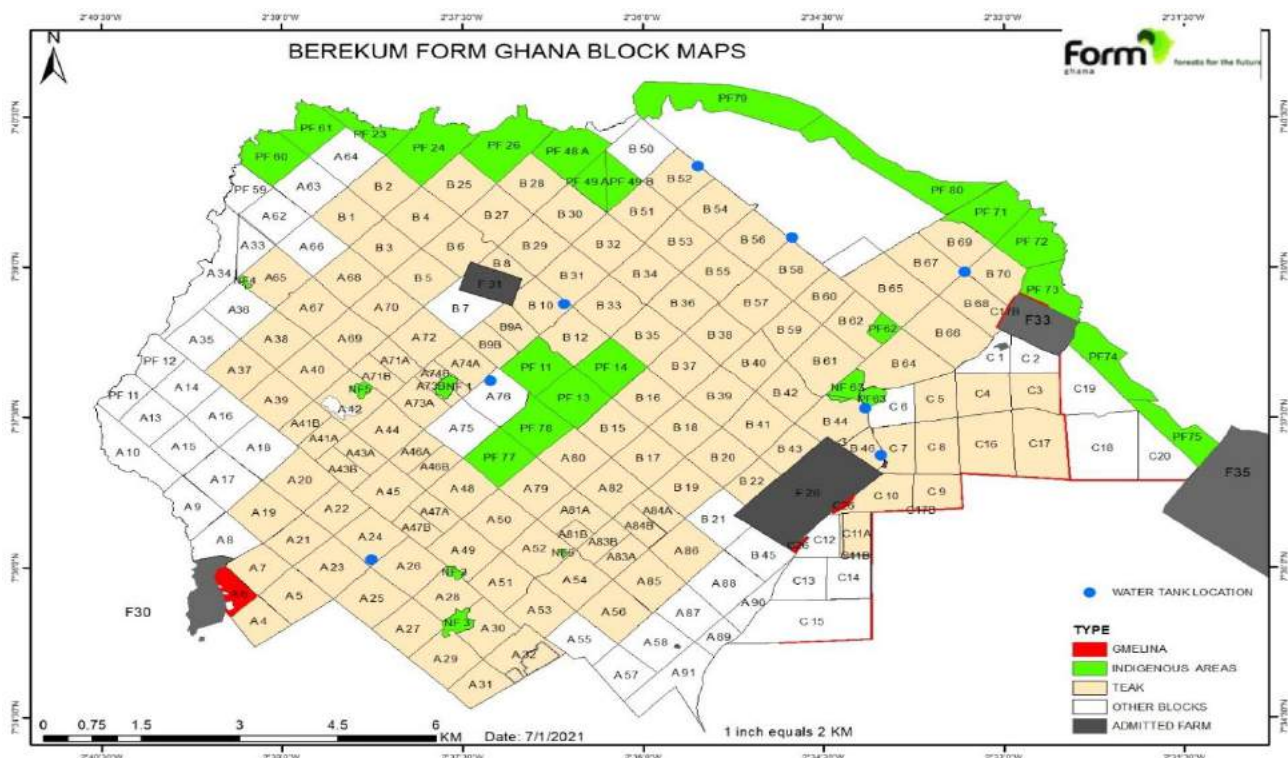


Figure 2: Map of project location

2.1.1 Total Land Take (Hectare)

The total land take for the Tain II Tributaries Forest Reserve is 14,576 hectares GIS area.

2.1.2 Actual area/plot/compartiment developed

Table 2.1: Actual area developed

The actual area forested by Form Ghana in the Tain II Tributaries Forest Reserve is 8731.35 hectares. Details of actual forested area are shown in the table below:

RESERVE	LEASE AREA (ha)	YEAR (ha)	TOTAL AREA (ha)	INDIGENOUS (ha)	TEAK (ha)	UNPRODU C-TIVE (ha)	GMELINA (ha)
TAIN II	14,576	2013	637.11	19.06	582.31	35.74	
		2014	2098.86	194.67	1886.87	17.32	
		2015	124.28	72.10	1042.93	130.25	
		2016	125.69	-	92.63	33.06	
		2017	707.79	82.87	559.04	65.88	
		2018	1941.69	306.51	1610.17	25.01	5.00
		2019	1283.37	363.04	878.34	41.99	27.64
		2020	691.62	406.14	283.26	2.22	
		<b>TOTAL</b>	<b>8731.35</b>	<b>1444.39</b>	<b>6935.55</b>	<b>351.47</b>	<b>32.64</b>

The hectares presented in the table above are updated including the 2020 planting. A slight difference between the total area and the areas in the individual columns is due to teak found in situ that was not cut. This is a total of 32.7 hectares

**2.1.3 Land take (area) under conservation**

<b>Area under conservation</b>	<b>386.5 hectares</b>
Type of Conservation: Strict	0
Type of Conservation: Partial	368.5 hectares

**2.1.4 List fauna /flora species found in the conservation area**

<b>Category of Species:</b>	Species monitoring within the conservation areas is undertaken within every 5-year interval. From the last survey in 2015 & 2018, the following floral, mammal and avifauna species were identified.
<b>Flora:</b>	<i>Azelia africana, Albizia ferruginea. Antiaris toxicaria, Ceiba pentandra, Hildegardia barteri, Erythrophleum ivorense, Khaya an-thoteca, Khaya grandifoliola, Milicia excelsa, Triplochiton scleroxylon, Terminalia superba.</i>
<b>Mammals:</b>	Civet, Cusimanse Mongoose, Genet, Marsh Mongoose, Brush-tailed Porcupine, Giant Rat, Grasscutter, Ground Squirrel, Bushbuck, Maxwell duiker, Red River Hog, Royal Ante-lope
<b>Birds:</b>	Sixty (60) species, belonging to 23 families were recorded on transects (Table 13 and Appendix F). More than 10% of the species recorded belongs to the Weavers and Malimbés family (Ploceidae). Other families included Flycatchers (Muscicapiidae), Bulbuls and Greenbulbs (Pycnonotidae) and Pigeons and doves (Columbidae) with a record of 8% of the species each. The White-throated Bee-eater (relative abundance of 13.861), Black-winged Bishop (7.129), Red-eyed Dove (5.743), Common Bulbul (4.752), Zitting Cisti-cola (4.752), Viellot's black Weaver (3.960) and Grey-backed Cameroptera (3.960), were the most recorded and widespread bird species. The Families Alcedinidae and Accipitri-dae accounted for about less than 1% of the specimen recorded and also produced the least number of species. Most bird species were recorded in the forest vegetation (38), followed by degraded areas (33), teak plantations (21) and then farm-lands (19)
<i>Species monitoring within the conservation areas is undertaken within every 5-year interval. Details provided above are based on the last survey in 2015 &amp; 2018.</i>	

**2.1.5 Total land take of nursery**

The total land of nursery for the year 2020 is 15 hectares.

**2.2 Adjacent Land Uses**

<i>North</i>	Agriculture
<i>South</i>	Agriculture
<i>East</i>	Agriculture
<i>West</i>	Agriculture

## **2.3 Water Resources**

### **1. River(s)/Stream(s) traversing the forestry development project**

Tain River forms the northern border. Some affluents find their source inside the reserve in the wet season. They dry up in the dry season. One of such affluent is the Owusutaka.

### **2. Source of water for nursery**

Rainwater is the source of water for the nursery

### **3. Buffer distance maintained between undertaking and River(s)**

The buffer distance between the teak plantation and the streams, which have about 4-5m wide stream beds is thirty meters (30m).

### **4. Approximate distance of river(s) to the nearest settlement**

The villages close to the reserve are: Akroforo, Arkokrom, Asantekrom, Dadease, Domeabra, Ampenkrom, Kojoakokrom, Kotaa, Kutre#1, Kutre#2, Meremano, Mpatapo, Mpataase, Namasua, Nfodwokrom, Oforikrum, Pepaase and Tainso. These villages are all found within 10 kilometres from the Tain II Reserve.

### **5. List of communities around the Undertaking (at least 200m away from Site)**

The villages close to the reserve are: Akroforo, Arkokrom, Asantekrom, Dadease, Domeabra, Ampenkrom, Kojoakokrom, Kotaa, Kutre#1, Kutre#2, Meremano, Mpatapo, Mpataase, Namasua, Nfodwokrom, Oforikrum, Pepaase and Tainso.

### **6. Do any of the water bodies originate/take their sources from the undertaking?**

Yes  No

## **2.4 Bushfire prevention, control of weeds/pest and biodiversity**

### **a) Measures put in place to prevent bushfires**

FORM Ghana has an intensive fire prevention program. The program is based on:

- Awareness raising among the neighbouring villages and the workers
- The creation of fire breaks
- Fire surveillance using fire towers (manned towers (3) and electronic detection tower systems (3))
- Continuous posting of rapid response teams that have been specifically trained in firefighting.
- Establishment of community fire volunteer squad in fringe communities

### **b) Practices employed to control weeds and pest**

Weeding is an intensive operation which takes place 2 to 3 times a year. The terrain is weeded manually with cutlasses twice and weeded chemically once.



Regular surveillance in line with an operational protocol on integrated pest management (Protocol 29) guides the control of pest in the plantation. For the period, no pest that required control were identified in the plantation.

***c) Practices employed to conserve biodiversity***

Biodiversity conservation is ensured by FORM Ghana through the protection of buffer zones within indigenous vegetation, prohibition of hunting and through fire prevention. The monitoring of the effect of these conservation measures is undertaken periodically within every 5years (latest report on flora monitoring is available at [www.formghana.com](http://www.formghana.com)).

**2.4.1 Soil Management Practices**

FORM Ghana protects the soil through reforestation practices and erosion control. Erosion control is mainly along the roads.

**2.4.1.1 Contribution of soil management practices to increasing production levels**

No increase in production is detected or expected from soil management practices. However, management practices continue to conserve and stabilize the soil for suitable growth of the plantation.

**2.4.1.2 Incidence of disease/pest infestation**

No disease/pest infestation was experienced in the Tain II Forest Reserve for the period under review.

***a) Practices employed to manage admitted farms***

All admitted farms in the reserve are not inhabited. They do however present a potential fire risk. Roads have been constructed around admitted farms within the operational area. FORM Ghana ensures that the admitted farms are managed in a way to prevent fire from starting from there.

***b) Practices employed to manage neighbouring communities***

FORM Ghana actively engages neighbouring communities through the organisation of stakeholder meetings and sensitisation fora. FORM Ghana believes in the building and maintenance of good relations with neighbouring communities and has several protocols to help staff in the interaction with fringe communities.

***c) Practices employed to manage livestock grazing/fire***

Livestock grazing is a threat in the Tain II Reserve. Interaction with community leaders, officials and the Forestry Commission has led to sensitisation and action for the eviction of herds of cattle from the reserve.

**2.5 Public complaint**

*Table 2.5: Complaints received and managed or addressed during the last three years*

EXTERNAL GRIEVANCES - 2018 to 2020								
No	Gender	Date of Complaint	Channel of Complaint	Location	Complaint	Date of Response	Response	Status
1	Male	18 Mar 2020	Community Meeting	Berekum	Farmers request to be allowed to farm at the open canopy areas and be tasked the responsibility of tendering the trees	30 Mar 2021	Management approved that farmers can farm in open areas where teaks are planted and not where indigenous trees are planted. However, they were cautioned not to use chemicals when farming.	Resolved
2	Male	18 Mar 2020	Community Meeting	Berekum	Farmers request that FG allows them use chemicals on their farms especially those cultivating vegetable crops on small scale. They asked that FG makes available approved chemicals they can use on their farms	18 Mar 2020	Chemicals are not allowed in the plantation after Form Ghana has planted its stumps and seedlings. Form Ghana explained the negative effects of the chemicals to the environment. They understood and agreed not to use chemicals on their farms.	Resolved
3	Male	18 Mar 2020	Community Meeting	Berekum	Some farmers said Form Ghana workers cut down their produce during weeding even when their areas have lesser weeds	March, 2020	Team Leaders have been advised and tasked to do proper assessment of the area before workers weed a particular block	Resolved
4	Male	28 Mar 2018	Community Meeting	Berekum	Community Members asked that PPEs for fire fighting should be given directly to the communities and not through Fire Service	December, 2018	PPEs are now given directly to the Community Fire Squads	Resolved

*Environmental Management Plan – Tain II Forest Reserve*



5	Male	28 Mar 2018	Community Meeting	Berekum	Farmers wanted FG to include plantain and cassava as part of the list of crops they can intercrop in FG planted areas	28 Mar 2018	The two crops cannot be added to the list of crops. This is because cassava and plantain will compete with trees planted for nutrition and space for growth.	Resolved
6	Male	20 Jul 2018	Stakeholders Meeting	Berekum	FG should involve community members (as fire volunteer squads) in fire fighting in the plantation and also in the surrounding communities	Dec, 2018	Through the integrated fire management project, community fire squads have been empowered and involved in community fire fighting	Resolved.
7	Male	23 Jul 2020	Community Meeting	Berekum	People staying at Kojoarkokrom and working with Form Ghana do not participate in communal labour organised every Tuesday saying they pay tax to the government thus are justified not to part-take in communal labour	4 Nov 2020	Management of FG met the workers and asked them to take part in the communal labour. Workers agreed to take part and thank management.	Resolved
8	Male	23 Jul 2020	Community Meeting	Berekum	Fire Volunteer Squad at Kojoarkokrom request to be introduced to Seikwa Fire Service Officials because the officials say they have no knowledge of their existence. He also requested for Identity cards for the FVS because their authority have been questioned on several occasions by non resident Kojoarkokrom farmers	23 Jul 2020	Seikwa Fire Service and the Traditional Council are aware of their existence. The badges given to the squad during their inauguration should serve as an ID card.	Resolved
9	Female	15 Dec 2020	Registered with the intercropping Supervisor	Berekum	A farmer complained that some FG workers in constructing fire belt towards the Oforikrom main road stole cassava from her farm	13 Jan 2021	Workers who worked at the area were asked to desist from such acts. Form Ghana supervisor rendered apology to the farmer and she accepted. The farmer urged the supervisor to advice workers to desist from such act.	Resolved

### 2.5.1 Does the company have a mechanism for addressing complaints?

Yes  No

### 2.6 Procedure for addressing complaints

Grievance Redress Mechanism (Protocol 7) describe the ways Form Ghana manages complaints and conflict situations.

***NB: Grievance Redress Mechanism (Protocol 7) prescribes how grievances should be addressed amicably.***

### 2.7 Description of Operations

FORM Ghana carries out sequence of activities from its nursery facility for teak and various indigenous seedlings to the final harvesting of teak. At all stages of production, various environmental, social, and health and safety considerations are made to ensure that impacts are either avoided or mitigated. The following are stages are description of FORM Ghana's operations within the continuum of production management:

- **Plant production:** In the nurseries of Tain II teak plants are produced. The provenances used for main planting are Bouaké (from a stand in Asubima FR) and Kihuhwi (from a stand in Bia Tano FR). For research purposes provenances from other sites in Ghana and from abroad are also used. Sowing of the seeds is done between June and September. Care consists of watering and weeding or weeding alone depending on the presence of irrigation. Each year the terrain for the nursery is cleared of weeds, plowed and beds are created by creating footpaths every 1 by 5 meters. The seeds are then positioned in rows 10 centimeters apart and 15 centimeters apart in the row. Weeding is done every month. Spraying is only foreseen when insects or fungi attack the plants.  
Indigenous trees are produced as potted seedlings with local seed. This only takes place in Akumadan.
- **Terrain preparation:** Terrain preparation is done in several separate activities; land demarcation, land clearing, spraying, ploughing, road construction and pegging.
  - *Land demarcation:* This activity consists of the measuring and marking in the field of planting blocks. The work consists of tracing lines using compass and GPS. Along the lines, pegs are planted and the vegetation is cleared with cutlasses.
  - *Land clearing:* This involves manually cutting weeds and bushes as well as the removal of small trees with chainsaws. When necessary, the vegetation removed is burned to provide clean terrain for ploughing and subsequent work.

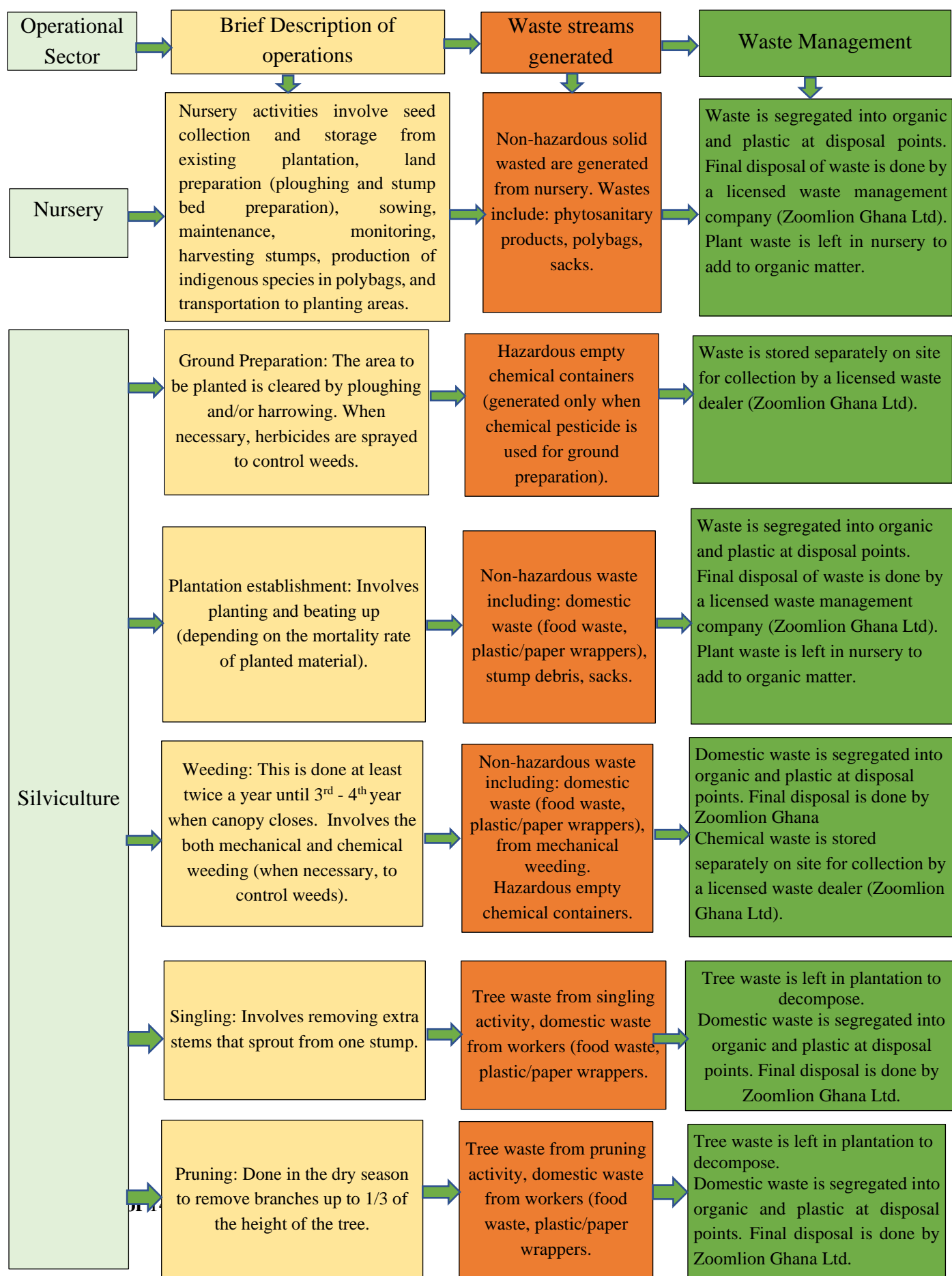
- *Spraying*: This is the application of glyphosate on the weeds that sprout again after land clearing.
- *Ploughing*: This activity consists of opening up and turning the soil with a tractor pulling a disc plough. Ploughing can only be done in areas with few tree stumps present, and where the soil is of a type allowing it. Some soil reacts to this activity by severe concretion forming.
- *Road construction*: This work consists of the removal of the top layer of the soil in a straight line to a width of 6 meters. This work is done using a Bulldozer. The removed soil is pushed to the side of the road. The profile of the roads is rounded with a drainage ditch to either side. At regular intervals exit drains are created to allow water to drain of the surface into the vegetation on the site. Drains are made in such a way that water is not directed into streams.
- *Pegging*: This activity entails the placement of sticks at intervals of 3 by 3 meters in the terrain. It is done to provide a regular grid based on straight lines on which to plant trees. The sticks for this work are collected in the surroundings and are often made of sticks from pruning activities
- **Planting stumps**: Stump planting consists of digging a small hole of 20 centimeters diameter and 25 centimeters depth. In this hole a stump is placed in an upright position, and the soil is filled back into the hole around it. After filling the soil is compacted by the workers using their heel.
- **Planting polybags**: Indigenous trees in polybags are planted in a fashion similar to the planting of stumps. It is done by digging a small hole of 20 centimeters diameter and 25 centimeters depth. In this hole the polybag is placed in an upright position. The polybags are removed from the root ball of the plant, and the soil is filled back into the hole around it. After filling the soil is compacted by the workers using their heel. Polybags are collected from the field and disposed of in an environmentally acceptable way.
- **Weeding**: weeding consists of the removal of vegetation growing up around the Teak or indigenous trees. This needs to be removed in order to avoid competition. The weeding technique employed are manual and chemical weeding. Chemical weeding with glyphosate (done by teams using droplet applicators) and circle weeding (done by teams using hoes to scrape the soil in a circle around the young plants).
- **Pruning**: the branches that the tree produces have to be removed at regular two-year interval. Trees can be removed to a height of about one third of total tree height. Taking

of more branches reduces the growth speed of trees. Work is done manually using telescopic hand saws.

- **Thinning:** When the trees grow, they start competing with each other for space and resources such as nutrients, water and light. In order to assure continued growth part of the trees will need to be removed. These trees are sawn down using chainsaws or harvester machines. The first thinning's have no commercial value and are left to decompose and enrich the soil. In subsequent thinning's the stems are taken to the road side for loading on trucks.
- **Final felling:** At the end of the rotation the trees will be harvested. This activity consists of the felling and cross-cutting of the trees. This activity will be done using harvesters.
- **Monitoring:** The project activities and intended results are monitored according to a pre-defined plan (see monitoring plan) to see how effective project implementation is and whether the intended results (growth, biodiversity development etc.) are achieved. Monitoring can consist of measurements in plots (in Teak or indigenous planting for instance), inventories (biodiversity studies) or regular checks (cleanliness of the site, waste disposal etc.).
- **Other production management:** Buffer zones of approximately 30 meters to each side of streams and swamps are respected. This concerns permanent streams only. If tree cover in these zones is insufficient, additional trees are planted of indigenous species. Management of the trees consists of weeding for the initial years. Then the trees will be left in their natural environment to allow other types of plants to recolonize the area as well (shrubs, herbs and climbers).

A brief description of operations in an environmentally based process flow chart from nursery to harvesting is attached in Figure 2.7 below.

**Brief description of operations from nursery to harvesting (attached is an environmentally based process flow chart, indicating waste streams) and how waste is management**



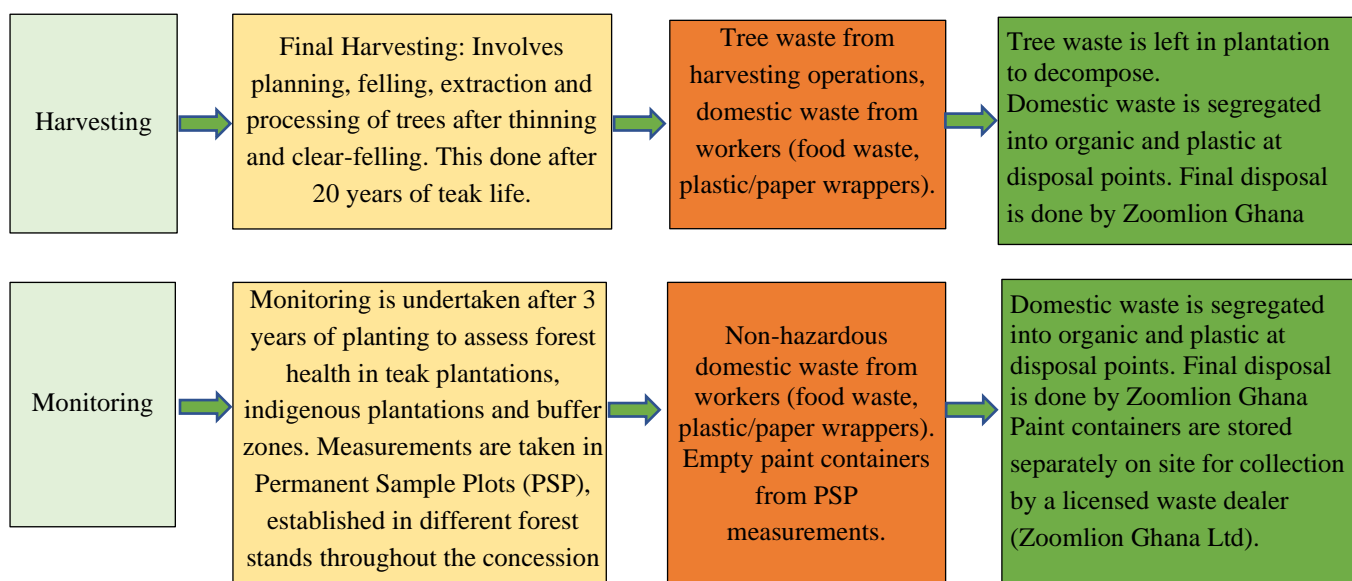


Figure 2.7: An environmental-based flow chart of FORM Ghana’s operations from nursery to harvesting

**2.7.2 Any value addition processing done?**

Yes  No

**2.7.3 Description of harvesting methods and post harvesting operations**

Harvesting methods and post-harvest operations are described in Protocol 25 (Harvesting Protocol). This protocol describes the harvesting strategies adopted by Form Ghana for the planning, felling, extraction and processing of trees after thinning and clear-felling. These strategies are derived from the reduced impact logging guidelines stipulated in the Ghana logging manual.

**NB:** The protocol is aimed at teak harvesting. Protocol 25 (Harvesting Protocol)



**2.8 Production Details**

**2.8.1 Planting Material Information**

*Table 2.8.1: Planting material information*

<b>Species cultivated/Planted</b>	<b>Source</b>	<b>Area (Ha)</b>	<b>% of Planted Area</b>
<b>Teak</b>	Own nursery	6909.86	82.10%
<b>Indigenous:</b> <i>Ofram, Awiem-fosamina, Kokrodua, Potrodom, Onyina, Emeri, Watapuo</i>	Own nursery and contract nursery	1443.73	17.15%
<b>Gmelina</b>	Own nursery and contract nursery	62.28	0.75%
<i>Expected Products from the development</i>	Teak billets/saw logs		
	Teak poles		
	Carbon Credits		

### 2.8.2 Input materials/Agro-chemicals (Sources, types and use)

Table 2.8.2: Input/ agrochemical use

Name of Agro-chemical	Type	Source (Supplying Company)	Quantities			Mode of application
			2018	2019	2020	
Glyphosate (Kalach/Sunphosate/Glyphader)	Weedicide	<ul style="list-style-type: none"> <li>• Cali Ghana Ltd,</li> <li>• Louis Dreyfus Company Ltd</li> <li>• Wynca Sunshine Company Ltd</li> </ul>	29,332 kg	7566 kg	15242 kg	Manual Foliar application
Clethodium (Select 120 EC)	Weedicide	<ul style="list-style-type: none"> <li>• Cali Ghana Ltd</li> <li>• Graobeng Ventures</li> </ul>	0	300 Litres	2819 kg	Manual Foliar application
Triclopyr (Corta 240 EC)	Weedicide	Louis Dreyfus Company Ltd	650 Litres	0	348 Litres	Manual Foliar application

\*MSDS for chemical attached in Appendix

### 2.8.3 List of farm Equipment

Name/Type of Equipment	Purpose	Power rating	Country of Origin/year of manufacture	Capacity
<b>Tractor (2)</b>	Used for harvesting operations	John Deere-55.2kw New Holland-59kw	-	John Deere-74hp New Holland-80hp
<b>Chainsaw</b>	Used for thinning/ harvesting	-	-	2.4hp
<b>Grader</b>	Used for road maintenance	128kw	-	171hp
<b>TLB</b>	Used for road maintenance	68.5kw	-	93hp
<b>Knapsacks</b>	Used for spraying	-	-	-

**2.8.4 Resources Use for the last three years (Water, electricity, fuel). Attach a graphical trend of the resource used over the period**

**2.8.4.1 Water use**

*Table 2.8.4.1: Water use*

Sources (surface, underground, pipe borne)	Quantity (m <sup>3</sup> )		
	2018	2019	2020
Domestic			
Underground	7,923 m <sup>3</sup>	1,2086 m <sup>3</sup>	6,938 m <sup>3</sup>
Nursery			
N/A	N/A	N/A	N/A

**2.8.4.2 Electricity Use**

*Table 2.8.4.2: Electricity Use*

	Consumption (KWh)		
	2018	2019	2020
Solar Generation	119,142	54,919	54,795

2.8.4.3 Fuel Use

Table 2.8.4.3: Fuel Use

Type (Gasoline, diesel, LPG, RFO, biomas etc)	Process stage used	Consumption (Litres)		
		2018	2019	2020
Diesel	Outsourced	139,376	136,208	45,607
Petrol	Outsourced	16,101	9,946	3,336

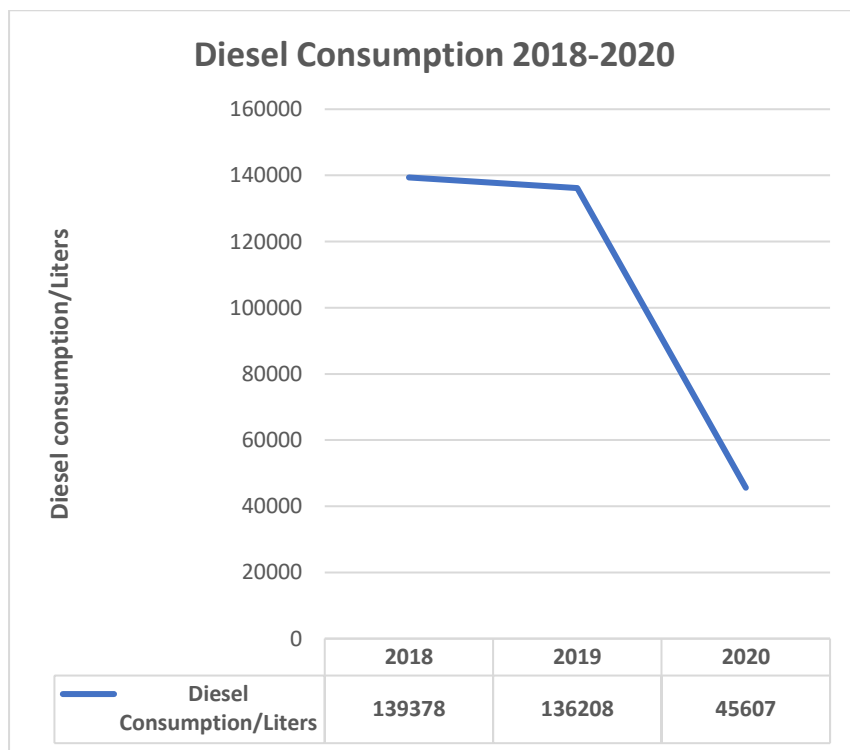
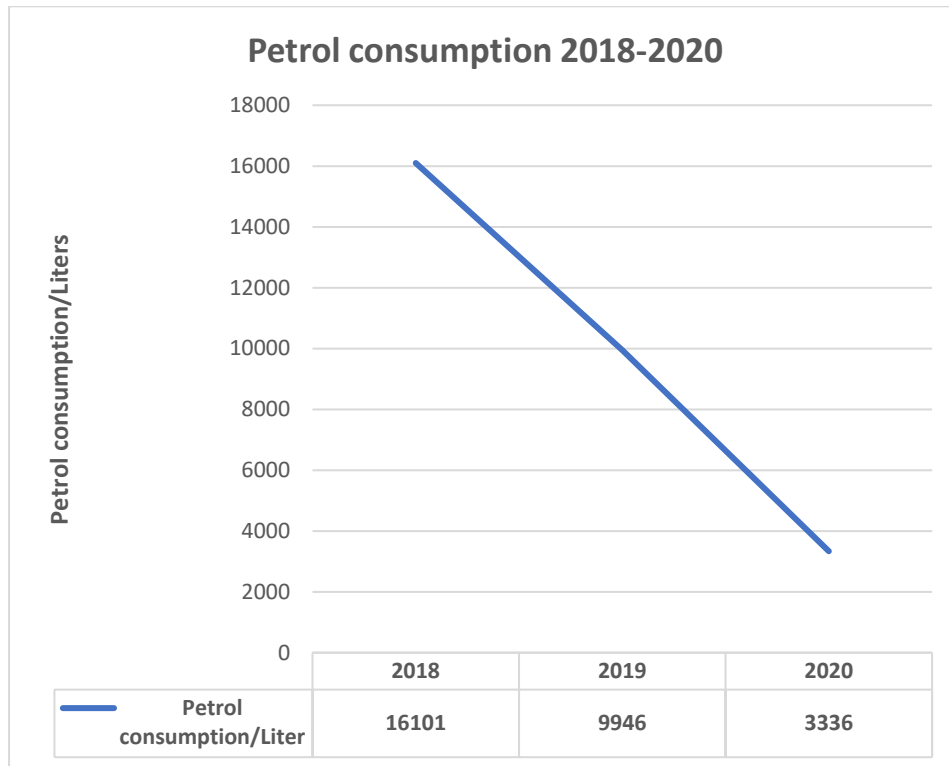


Figure 2.8.4.3a: Diesel consumption 2018-2020



*Figure 2.8.4.3b: Petrol consumption 2018-2020*

**2.8.5 Waste Oil Generation (hydraulic and engine oils)**

Table 2.8.5: Waste oil generation

Sources (genset, chainsaw, caterpillars)	Quantities (Litres)		
	2018	2019	2020
Engine Oils	6,125.5	1,179	3,322

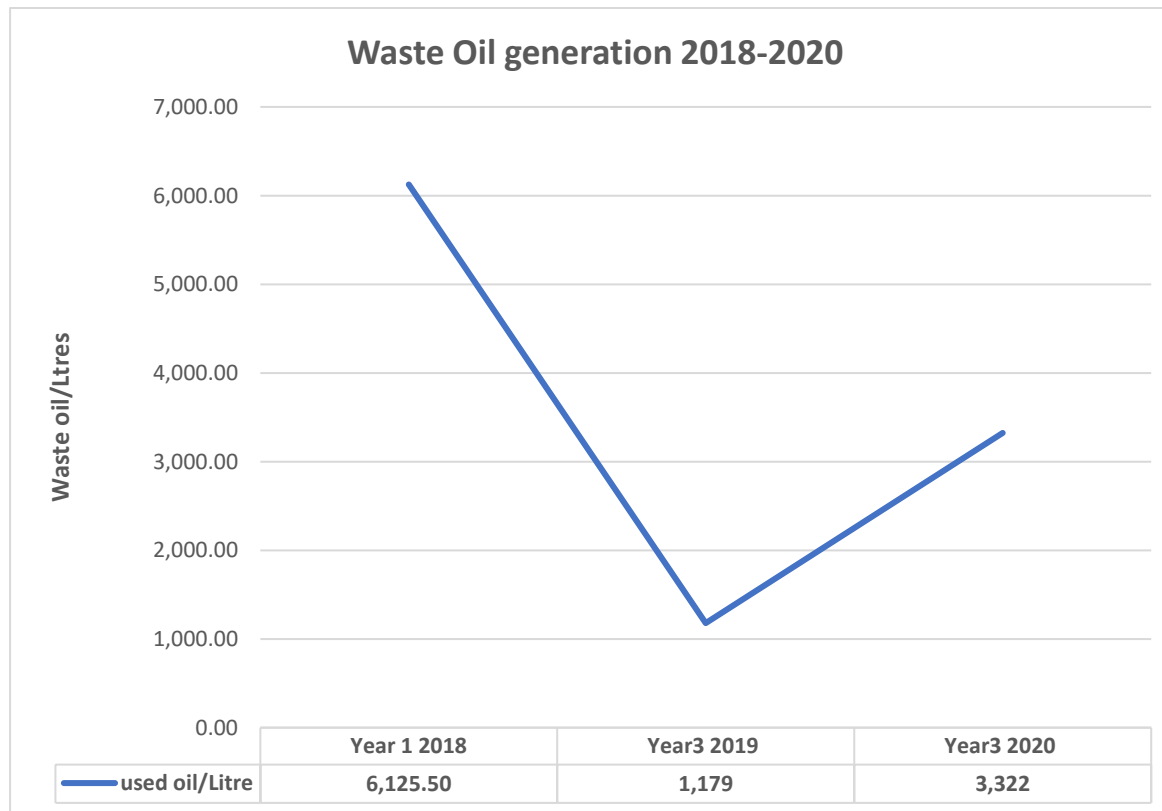


Figure 2.8.5: Waste oil generation 2018-2020

**2.8.6 Solid Waste Generation**

Table 2.8.6: Solid waste generation

Type of waste Solid (biomass, poly pots, chemical containers)	Quantity generated per annum (tonnes)			Type of treatment/disposal method (Composting, recycling/incineration)	Quantity disposed
	2018	2019	2020		
Solid waste	145	79	90	Waste is sorted and stored in designated containers on site (Organic, Plastic, Medical, HazMat) and finally disposed by waste management company- Zoomlion Ghana Limited	314tonnes

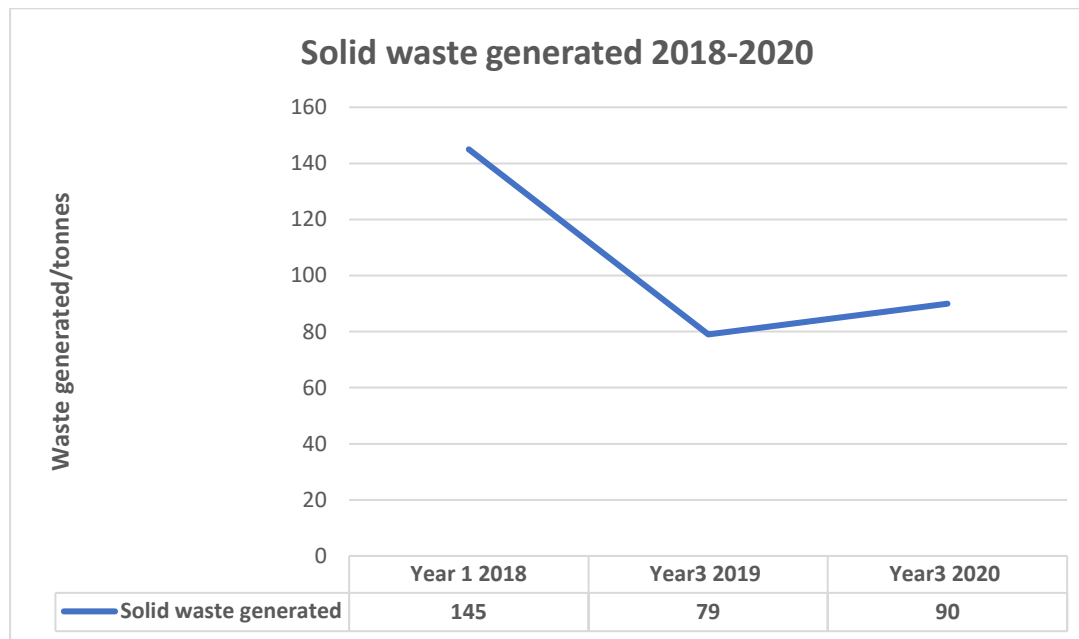


Figure 2.8.6: Solid waste generation 2018-2020

**2.8.7 Obsolete/ Expired chemicals**

Name of chemical	Approximate Qty (specify units)	Current mode of storage	Planned method of disposal
N/A			

*NB: No chemicals expired within the period*

**Water Quality Monitoring data for the previous years**

The Tain River traverses the Northern boundary of the plantation. There are no streams/rivers within FORM Ghana concession within the Tain II Forest Reserve except for ephemeral water bodies that are found in the plantation. These water bodies are usually found during the raining season and are mostly contained in low land areas. No monitoring is carried out in these water bodies. However, the quality of underground water for domestic purposes is assessed quarterly.

**2.8.8 Environmental Challenges Encountered (e.g. Pest infestation, erosion, diseases, pollution of water bodies, waste management bushfires)**

For the period 2018-2020, Form Ghana encountered a number of environmental challenges relating to waste management, bushfires, and illegal grazing. Continuous surveillance and efficient management practices as defined in the EMP and operational protocols have served as safeguard mechanisms to prevent pest and disease infestation in the plantation. Table 2.8.8 below gives details of the various environmental challenges, description and responses for the period between 2018 – 2020.



Table 2.8.8: Environmental challenges

Type of challenge	Description	Response
<b>Waste segregation</b>	Waste generated are sometimes placed in the wrong container provided for waste separation.	Continues sensitization and regular training of all staff on waste management. Regular monitoring carried out both on site and in plantation
<b>Bushfire</b>	The plantations of Form Ghana are situated in a landscape with savannah characteristics. Grass species such as Elephant grass, Guinea grass and Spear grass, that grow up to 5m tall, cover most of the area. This vast area of combustible material easily catches fire in the dry season (November-March), either naturally or human induced. Due to a strong desert wind from the North, the harmattan, these fires can spread extremely fast	FORM Ghana has an intensive fire prevention program. The program is based on: <ul style="list-style-type: none"> <li>• Awareness raising among the neighbouring villages and the workers</li> <li>• The creation of fire breaks</li> <li>• Fire surveillance using fire towers (manned towers (3) and electronic detection tower systems (3))</li> <li>• Continuous posting of rapid response teams that have been specifically trained in firefighting.</li> <li>• Establishment of community fire volunteer squad in fringe communities</li> </ul>
<b>Animal grazing</b>	Within the Tain II FR and around the project area, cattle grazing takes place, led by Fulani herdsmen.	The herdsmen are not allowed inside the FG lease. Security officers are positioned at the various location within the plantation to monitor illegal activities including cattle movement. Interaction with community leaders, officials and the forestry commission has led to sensitization and action for the eviction of herds of cattle from the reserve

**2.8.9 OHS trainings undertaken during the last three years under review**

*Table 2.8.9: OHS trainings undertaken*

<b>Topic</b>	<b>Organizers/Resource persons</b>	<b>Date</b>	<b>Duration of training</b>	<b>No. Of workers</b>
HIV/AIDS Refresher Training	FORM Ghana	27 <sup>th</sup> July, 2018	2hrs	170
Lassa Fever	FORM Ghana	26 <sup>th</sup> Feb, 2018	3hrs	561
Urinary truck infection	FORM Ghana	22 <sup>nd</sup> Jan, 2018	2hrs	430
Domestic fires	Ghana National Fire Service	8 <sup>th</sup> Dec, 2018	1hr	27
Dehydration	FORM Ghana	12 <sup>th</sup> Dec, 2018	1hr	361
First Aid Procedures and emergency evacuation (Protocol 8)	FORM Ghana	1 <sup>st</sup> Oct, 2019	2hrs	17
First Aid for Envenomation and Rabies (Protocol 23)	FORM Ghana	1 <sup>st</sup> Oct, 2019	1hr	19
Storage of lubricants and toxins (Protocol 16)	FORM Ghana	8 <sup>th</sup> Oct, 2019	1hr	5
Responsible use of Chemicals (Protocol 7)	FORM Ghana	14 <sup>th</sup> Oct, 2019	2hrs	61
First Aide Training	FORM Ghana	18 <sup>th</sup> Oct, 2019	1hr	19
COVID 19 Training	FORM Ghana	16 <sup>th</sup> Mar, 2020	2hrs	352
COVID 19 Training	Holy Family Hospital	31 <sup>st</sup> April, 2020	1hr	270
First Aide refresher Training	FORM Ghana	22 <sup>nd</sup> Jun, 2020	1hr	7
Personal hygiene	FORM Ghana	21 <sup>st</sup> Jul, 2020	1hr	311
HIV/AIDS and Blood Pressure	Holy Family Hospital	28 <sup>th</sup> Aug, 2020	3hrs	138
Communicable diseases	FORM Ghana	30 <sup>th</sup> Oct, 2020	1hr	188
Use of Fire extinguishers and fire	GNFS- Sunyani	8 <sup>th</sup> Dec, 2020	1hr	20
HIV/AIDS and COVID19 Training	HIV/AIDS	12 <sup>th</sup> Mar, 2020	1hr	8
COVID19 Protocol Training	FORM Ghana	9 <sup>th</sup> Sep 2020	1hr	10

**2.8.10 Environmental Management Roles and Responsibilities**

**Management requirements & responsibilities Senior Staff (Protocol 17);** Describes environmental management roles and responsibilities of employees.

*Table 2.8.10 Environmental Management Roles and Responsibilities of E&S Team*

S/N	Designation	Roles and Responsibilities
1.	Managing Director	<ul style="list-style-type: none"> <li>• Oversees that implementation of entire project conforms with environmental specifications.</li> <li>• Approves all documents relating to the environment for implementation.</li> </ul>
2.	Forest Manager	<ul style="list-style-type: none"> <li>• Ensures that all forest development activities consider environmental requirements</li> <li>• Provides technical recommendations for continuous improvement of forest operations.</li> </ul>
3.	E&S Manager	<ul style="list-style-type: none"> <li>• Supervises the implementation of all environment and social requirements within the project area of influence.</li> <li>• Collaborates with necessary institutions/stakeholders for resolution of any environmental issues.</li> <li>• Reviews all environmental documentations and reports.</li> </ul>
4.	E&S Officer	<ul style="list-style-type: none"> <li>• Develops implementation plan of environment and social issues.</li> <li>• Collects environmental data for analysis and documentation.</li> <li>• Provides support to monitoring environmental issues.</li> <li>• Conducts training on environmental issues.</li> </ul>
5.	OHS Assistant	<ul style="list-style-type: none"> <li>• Provides training on all occupational health and safety issues within the Company.</li> <li>• Conducts incident investigations and make necessary recommendations to management.</li> <li>• Conducts compliance monitoring on occupational health and safety protocols set by the Company.</li> </ul>
6.	Monitoring Officer	<ul style="list-style-type: none"> <li>• Ensures all activities within plantation comply to project design details.</li> <li>• Carries out periodic environmental auditing to identify areas for continuous improvement.</li> <li>• Provides recommendations based on research and development for improvement of operations.</li> </ul>

**2.8.11 Corporate Social Responsibilities (CSR) undertaken within the period under review**

*Table 2.8.11: Corporate Social Responsibilities (CSR) undertaken*

<b>CSR Actions</b>	<b>Beneficiary(s)</b>	<b>Amount Budgeted</b>
Training of intercroppers and fringe communities on alternative livelihood possibilities	Fringe communities	100,000.00
Construction/Maintenance bore holes, poly tanks and pumps	Kotaa and Arkokrom	45,000.00
Road rehabilitation & maintenance	Fringe communities	3,369,915.98
Inter-cropping	Fringe communities	
Ablution facility	Kotaa	
Community fire management Program	Fringe communities	1,723,218.68
Bore holes poly tanks and pumps in Tain plantation for inter-croppers	Intercroppers	108,000.00

### **3.0 CORPORATE POLICY ON ENVIRONMENT, HEALTH AND SAFETY**

The company's objective is to reforest 20,000 hectares of degraded forest reserve in Ghana whilst operating according to the highest technical, social and environmental benchmarks set by the Forest Stewardship Council (FSC™) and by the Verified Carbon Standard (VCS).

The vision of Form Ghana is that reforestation of degraded forest land should be done in accordance with the highest standards for sustainable forest management, serving the needs of the local communities and restoring vital environmental services within an economically viable business model.

#### **3.1 Company's policy statement on environment**

Form Ghana commits itself to have an environmental management system in place which is in line with the principles and criteria for sustainable forest management of the FSC™. This is the highest standard for forestry activities available. This objective is translated into work methods that always have the environment in scope. For all activities that may have an impact on the environment protocols have been developed that explain how to act in order to avoid damaging the environment.

These protocols are the subject of annual training sessions.

#### **3.2 Environmental Objectives:**

- To ensure that our operational activities throughout 2020 are in conformance with the specified standards by local regulators such as Environmental Protection Agency, Water Resources Commission, Forestry Commission; and International organizations such as Forest Stewardship Council and African Development Bank.
- To achieve best environmental performance through periodic monitoring of water quality, biodiversity restoration and conservation in the year 2020.
- To continuously improve waste segregation, disposal and reporting throughout 2020.

#### **3.3 Specific targets on environment**

*Table 3.3: Environmental targets*

Target	Timeline
To achieve minimal environmental pollution from waste and operational activities of the Company	December 2020
Meet all environmental monitoring and reporting timelines for both local and international regulators/ institutions.	December 2020
To restore biodiversity by planting not less than 350ha of indigenous tree species	December 2020

### **3.4 Company’s policy statement on health and safety**

Form Ghana is committed to providing a safe and healthy work environment for its employees. Form Ghana achieves this through annual work place evaluations, training of workers, provision of PPE’s, first aid training, health checks, clean drinking water, National Health Insurance Scheme and an on-site nurse for emergency treatments and for minor medical issues. The various systems and protocols concerning health and safety and annually monitored for continuous improvement.

### **3.5 Occupational Health and Safety Objectives:**

- To attain a Disability Injury Frequency Rate of not more than 1.0 by the end of 2020.
- To ensure the regular use of appropriate PPE’s by employees throughout the year 2020.
- To conduct monthly Occupational Health and Safety trainings for employees throughout 2020.

### **3.6 Specific targets on health and safety**

*Table 3.6 Health and safety targets*

Target	Timeline
A reduction in the number of work-related accidents and incidents	December 2020
An improvement in the investigation and reporting of incidents (major and minor accidents)	December 2020
Increased awareness among employees on Occupational Health and Safety.	December 2020

### **3.7 Legal/Regulatory Requirements**

- a) 1992 Constitution of the Republic of Ghana
- b) Environmental Protection Agency Act, 1994 (Act 490) – Section 44 and 48
- c) Environmental Assessment Regulations, 1999 (LI 1652) – Section 24(1)
- d) Fees and Charges (Amendment) Instrument, 2019 (LI 2386)
- e) Water Use Regulations, 2001 (LI 1692)
- f) Local Governance Act, 2016 (Act 936)
- g) Forests Act, 1927 (CAP. 157)
- h) Forest Protection Act, 1974 (NRCD 243)
- i) Forestry Commission Act, 1999 (Act 571)
- j) Plants and Fertilizer Act, 2010 (Act 803)
- k) African Convention on the Conservation of Nature and Natural Resource
- l) Workmen's Compensation Law, 1987 (PNDC 187)

- m) Children’s Act, 1998 (Act 560)
- n) Labour Law, 2003 (Act 651)
- o) Riparian Buffer Zone Policy for Managing Freshwater Bodies in Ghana, 2013
- p) Ghana National Environmental Policy, 2013
- q) Ghana National Climate Change Policy (NCCP), 2012
- r) National Gender Policy, 2015
- s) Nationally Determined Contributions (NDCs)
- t) Ghana Standards for Environment and Health Protection
- u) Hazardous and Electronic Waste Control and Management Act, 2016 (Act 917)
- v) Hazardous, Electronic and other Wastes (Classification), Control and Management Regulations 2016 (LI 2250)

### **3.8 Company’s obligations under EPA legislation and standards**

#### ***Environment:***

- Have Environmental Impact Assessments done for its operations.
- Develop Environmental Management plans based on the EIA’s
- Obtain environmental permits for the operations
- Report annually to the EPA on matters concerning the Environmental Permits
- Obtain relevant permits when importing plant material

#### ***Water:***

- Have a water use permit from Ghana Water Resources Commission (WWRC)
- Report quarterly on water use and water quality to the GWRC

#### ***Health and safety:***

- Ensure a safe work environment
- Provide the necessary PPEs to workers

**4.0 CURRENT ENVIRONMENTAL PRACTICES AND MANAGEMENT OF IDENTIFIED IMPACTS**

*Table 4.0: Environmental practices and management of identified impacts*

<b>Identified Impact/Management Issue</b>	<b>Current environmental management practices</b>	<b>Limitations to management practice</b>	<b>Improvement required</b>	<b>Timelines for the implementation of improvement action</b>
<b>Land preparation</b>	Protocol 15. Technical Performance in the plantation. This describes the work procedures for all plantation activities	No limitations identified	N/A	NIL
<b>Nursery development and Mgt. (mgt. of poly pots)</b>	Protocol 14 Nursery Management and Propagation This document describes all the activities in the nursery and presents quality standards	Reliance on rainfall for irrigation at Berekum	N/A	NIL
<b>Management of water bodies (buffer zones, pollution mgt.)</b>	<p>Buffer zones of approximately 30metres to each side of streams and swamps are respected. This concerns permanent streams only.</p> <p>If tree cover in these zones is insufficient, additional trees are planted of indigenous species.</p> <p>Management of the trees consists of weeding for the initial years. Then the trees will be left to their own devices in order to allow other types of plants to recolonize the area as well (shrubs, herbs and climbers).</p> <p>Monitoring (Protocol 13)</p>	No limitations identified	N/A	NIL



<b>Identified Impact/Management Issue</b>	<b>Current environmental management practices</b>	<b>Limitations to management practice</b>	<b>Improvement required</b>	<b>Timelines for the implementation of improvement action</b>
<b>Chemicals Management</b>	Responsible use of chemical (Protocol 5). This document describes how pesticides needs to be handled. It also describes the necessary safety measures. Storage of fuel, lubricants and toxins (Protocol 16). This document prescribes how hazardous substances must be handled and stored.	No limitations identified	N/A	NIL
<b>Handling, storage and use</b>	Storage of fuel, lubricants and toxins (Protocol 16). This document prescribes how hazardous substances must be handled and stored. Responsible use of chemical (Protocol 5). This document describes how pesticides are used and the necessary safety measures instituted.	No limitations identified	N/A	NIL
<b>Disposal of waste chemical containers)</b>	Waste Management Protocol (Protocol 4). Form Ghana produces several types of waste including waste chemical containers. Form Ghana has therefore adopted a clear strategy on waste management. This strategy is described in this protocol.	No limitations identified	N/A	NIL
<b>Management of obsolete and expired chemicals (weedicides, fungicides, arboricides)</b>	Form Ghana only procures chemicals required for specific activities within a specific period with special consideration to the expiry dates of these chemicals.	No limitations identified	N/A	NIL

<b>Identified Impact/Management Issue</b>	<b>Current environmental management practices</b>	<b>Limitations to management practice</b>	<b>Improvement required</b>	<b>Timelines for the implementation of improvement action</b>
<b>Solid Waste management.</b>	Waste Management Protocol (Protocol 4). This Protocol describes how solid waste is handled and managed.	No limitations identified	N/A	NIL
<b>Management of fuel and oil including biomass</b>	Storage of fuel, lubricants and toxins (Protocol 16). This document prescribes how hazardous substances must be handled and stored.	No limitations identified	N/A	NIL
<b>Management of waste oil</b>	Waste Management Protocol (Protocol 4). This Protocol describes how waste oil is handled and managed.	No limitations identified	N/A	NIL
<b>Land and soil conservation methods</b>	<p>Annually the soil is supplemented with NPK fertilizer at the recommended dose. The terrain is ploughed annually and provisions are made to prevent erosion in the drains (fascines to slow the speed of the water).</p> <p>A system of alternating fallow is in place to restore the organic matter content of the soil and reduce the weed pressure.</p> <p>The site of the nursery in the Tain II FR is only used once in a year and then it shifts to another location.</p> <p>The terrain for nursery and plantation establishment is cleared manually,</p>	No limitations identified	N/A	NIL

Identified Impact/Management Issue	Current environmental management practices	Limitations to management practice	Improvement required	Timelines for the implementation of improvement action
	<p>sown/planted with teak seeds/stumps and weeded as needed.</p> <p>After harvesting of the stumps, the area is planted with teak (or teak plants left in place) and turns to plantation. This means no special attention is needed for soil conservation.</p> <p>Cleared terrain exposes the soil to potential erosion. Plantations are thinned regularly so as to allow light on the soil and to allow the development of an undergrowth that can reduce the impact of rainwater on the soil and thus reduce erosion.</p> <p>During road construction special care is needed in order avoid erosion of the soils along the roads.</p> <p>The activities undertaken by Form Ghana are covered in the protocols:</p> <p>P 15 Technical performance in the plantation This document describes all the activities in the plantation and presents quality standards</p> <p>P 24 Road construction and maintenance This document prescribes how roads are to be constructed and maintained.</p>			

<b>Identified Impact/Management Issue</b>	<b>Current environmental management practices</b>	<b>Limitations to management practice</b>	<b>Improvement required</b>	<b>Timelines for the implementation of improvement action</b>
<b>Bush fire prevention and control</b>	Fire prevention and firefighting (Protocol 21). This document describes how fires are prevented and combated.	No limitations identified	N/A	NIL
<b>Biodiversity conservation and reservation of natural vegetation as refugia</b>	Form Ghana engages in the management and restoration of 10% of the planted area as natural forest specifically to enhance and conserve biodiversity. The effectiveness of this measure is checked through 5-year monitoring activities.	No limitations identified	N/A	NIL
<b>Pest and disease control</b>	Integrated Pest Management (Protocol 29). This protocol describes how to manage pest damage by the most economical means and with the least possible hazard to people, property and environment.	No limitations identified	N/A	NIL
<b>Occupational, health and safety management.</b>	Several protocols are geared toward the maintenance of health and safety in the plantation and elsewhere. P 08 First Aid Procedures & Emergency Evacuation This document prescribes how to deal in cases of emergency. P 09 Transport of personnel This document prescribes how personnel can be transported. P 10 Personal protection	No limitations identified	N/A	NIL

<b>Identified Impact/Management Issue</b>	<b>Current environmental management practices</b>	<b>Limitations to management practice</b>	<b>Improvement required</b>	<b>Timelines for the implementation of improvement action</b>
	<p>This document assesses the risks related to the various work places and prescribes the safety gear people need for various jobs.                      P 11 Training of personnel                      This document presents the general recurrent planning for training                      P 14 Technical performance in the nursery                      This document describes all the activities in the nursery and presents quality standards                      P 23 Envenomation by snakes and insects                      This document describes the possible snakes and insects that may harm people and how to act in case of bites and stings.                      P 27 information on contagious diseases                      This document serves as a basis for sensitization on contagious diseases.                      P 21 Fire prevention and fire-fighting – Tain                      This document describes how fires will be prevented and when needed combatted.</p>			
<b>Mgt. of wood offcuts (pruning, thinning, fallen trees etc.)</b>	Offcuts are left in the plantation to decompose to enrich the soil.	No limitations identified	N/A	NIL
<b>Road Maintenance</b>	Road construction and maintenance (Protocol 24). This Protocol describes how roads are constructed and maintained	No limitations identified	N/A	NIL

## 5.0 EVALUATION OF ENVIRONMENTAL PERFORMANCE

### 5.1 Previous environmental management commitments, actions and environmental permit conditions

Table 5.1: Previous environmental management commitments, actions and environmental permit conditions

Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
<b>5.1</b>	<b>Commitment to Project Specification</b>			
	Comply with all project specifications, mitigation, monitoring and other environmental management provisions as indicated in the project’s Environmental Management Plan (EMP). The project involves the following: plantation development and maintenance using the following under listed species: <i>Tectona grandis</i> (Teak), <i>Mansonia altissima</i> (Mansonia), <i>Triplochiton scleroxylon</i> (Wawa), <i>Bombax buonopuense</i> (Bombax), <i>Erythrophleum ivorense</i> (Potrodom), <i>Terminalia superba</i> (Ofram), <i>Terminalia ivorensis</i> (Emere), <i>Nauclea diderichii</i> (Kusia), <i>Cola gigantea</i> (Watapuo), <i>Albizia ferruginea</i> (Awiemfosamina), <i>Pericopsis elata</i> (Kokrodua).	All project specifications, mitigation, monitoring and other environmental management provisions as indicated in the ESIA are implemented.	Continuous planting of specified tree species	<b>Compliant</b>
<b>5.1.2</b>	At least 10% of the Forest Reserve should be reforested with indigenous tree species.	Planting is still underway and provisions are made in each planting season for indigenous tree species to reach the 10% cover	Continuous planting of specified tree species	<b>Compliant</b>

Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
<b>5.2</b>	<b>Location and Coverage:</b>			
	i. The project is located in the Tain II Forest reserve in the Berekum District of the Bono Region. ii. Grid Reference: 7N35,2W30. iii. Labour force of 155.	Location and coverage of the project remains the same. However, administrative names have changed from Berekum District to Berekum Municipal and from Brong-Ahafo Region to Bono Region. Labour force has also changed (543).	<b>Maintenance of facilities</b>	<b>Compliant</b>
<b>5.3</b>	<b>Pesticide and Chemical Usage</b>			
<b>5.3 i.</b>	Use only pesticides that have been registered with the EPA according with part II of the EPA Act (Act 490).	Form Ghana uses only pesticides through registered dealers in Ghana	<b>Continuous monitoring</b>	<b>Compliant</b>
<b>5.3 ii.</b>	Ensure that the applicators of pesticides and chemicals are trained and licensed in accordance with the EPA Act (Act 490)	Pesticide applicators are trained at the beginning of every spraying season alongside medical screening.	<b>In progress</b>	<b>Compliant</b>
<b>5.3 iii.</b>	Comply with the requirements of the EPA Act, 1994 (Act 490), Part II on Chemicals/Pesticides Management.	Form Ghana uses only pesticides through registered dealers in Ghana.	<b>Continuous monitoring</b>	<b>Compliant</b>
<b>5.3 iv.</b>	Provide appropriate storage facilities for pesticides and other agrochemicals.	Form Ghana stores chemicals according to its protocol on <b>Storage of fuel, lubricants and toxins (P 16)</b> . This document prescribes how hazardous substances must be handled and stored.	<b>Continuous monitoring</b>	<b>Compliant</b>

Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
		<p><b>P 05 Responsible use of pesticides</b> This document prescribes how pesticides need to be handled. It also describes the necessary safety measures.</p>		
5.3 v.	Ensure adequate measures to contain accidental spillage of pesticide and chemicals to avoid contamination of soil and water.	<p><b>P 05 Responsible use of pesticides</b> This document prescribes how pesticides need to be handled including measures to contain accidental spillage of pesticides to prevent contamination of water and soil.</p>	<b>Continuous monitoring</b>	<b>Compliant</b>
5.3 vi	Ensure that empty pesticide and chemical containers and packaging materials are managed and disposed off in an environmentally sound manner in accordance with EPA guidelines for disposal of waste chemical containers.	<p>Empty containers and packaging materials are stored on site and hauled by Zoomlion Ghana Limited for safe disposal. <b>Waste Management Protocol (P 04)</b> serves as a guide to the management and disposal of waste.</p>	<b>Continuous monitoring</b>	<b>Compliant</b>
5.3 vii	Keep an inventory of quantities of pesticides and agrochemicals	<p>The store at Form Ghana is responsible for keeping stock data. <b>P 05 Responsible use of pesticides</b></p>	<b>Continuous monitoring</b>	<b>Compliant</b>



Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
		This document prescribes how pesticides need to be handled. It also describes the necessary safety measures.		
5.3 viii.	Pesticides should be sprayed during periods when drift is expected to be minimal	<p><b>P 05 Responsible use of pesticides</b> This document prescribes how pesticides need to be handled. It also describes the necessary safety measures.</p>	Continuous monitoring	Compliant
5.4	<b>Land Preparation and Water Resources Protection</b>			
5.4.1	Undertake land preparation and cultivation in such a way to minimise disruption of soil structure and exposure of soil to erosion. Institute appropriate drainage control measures to minimise flooding.	<p><b>Protocol 13. This protocol entails</b> Monitoring and evaluation of forest conditions and management performance are necessary to assure the sustainability of forest management</p>	Continues monitoring	Compliant
	Comply with national buffer zone policy by establishing and maintaining the appropriate buffer zone distances along the water bodies traversing the project areas	<p><b>Protocol 13. This protocol entails</b> Monitoring and evaluation of forest conditions and management performance are necessary to assure the sustainability of forest management</p>	Continues monitoring	Compliant
	Monitor the water quality parameters is conducted for ground water which is used for domestic purposes. Water from the various sampling points are analyzed quarterly and included in the Annual Environmental Reports.	Water quality parameters are submitted to GWCL on quarterly basis for lab analysis to determine variations from standard parameters.	Continues monitoring	Compliant

Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
	GPS coordinates of the sampling stations/locations should be determined for all sampling sites and reported.	GPS sampling locations are identified and reported on quarterly basis.	<b>Continues monitoring</b>	<b>Compliant</b>
<b>5.5</b>	<b>Solid Waste Management</b>			
	Explore conversion of solid waste from plant materials into compost for use on the farm/plantation	P04(Waste Management) Form Ghana produces several types of waste that should each be treated in a different way. Form Ghana therefore adopted a clear strategy on waste management. This strategy is described in this protocol.	<b>Continues monitoring</b>	<b>Compliant</b>
	Provide garbage bins for solid waste generated to prevent littering	Waste is collected separately and disposed of as described by the Protocol <b>(P04 Waste Management)</b>	<b>Continues monitoring</b>	<b>Compliant</b>
	Plastic wastes from the plantation should be disposed off at approved disposal points as directed by Berekum Municipal Assembly	Waste is collected separately and disposed of as described by the Protocol <b>(P04 Waste Management)</b>	<b>Continues monitoring</b>	<b>Compliant</b>
	Disposal of solid waste should be done at Berekum Municipal Assembly approved landfill sites	Waste is collected separately and disposed of as described by the Protocol <b>(P04 Waste Management)</b>	<b>Continues monitoring</b>	<b>Compliant</b>
	Consult EPA for advice before disposing any expired chemicals	Expired chemicals are collected by the suppliers in consultation with EPA as <b>provided in Protocol 04</b>	<b>Continues monitoring</b>	<b>Compliant</b>

Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
	In order to prevent soil contamination at the mechanical workshops, all exposed surfaces at the workshop should be concreted	<p><b>Protocol 16</b> (Storage of fuel, lubricants and chemicals) This protocol describes procedures for the purchase, storage and distribution of all fuels and chemicals used by Form Ghana.</p>	<b>Continues monitoring</b>	<b>Compliant</b>
	Over aged trees felled should be used for fuel or composted to be used as soil amendments	<p><b>Waste from harvest operations</b> Branches and tree tops that are left after felling are left in the forest. Felling waste is minimized by proper felling techniques as outlined in <b>Protocol 04 (Waste Management)</b></p>	<b>Continues monitoring</b>	<b>Compliant</b>
<b>5.6</b>	<b>Health and Safety</b>			
	Ensure good housekeeping in the office areas and residential camp where applicable	<p><b>Protocol 11(Training of personnel)</b> Training of personnel is essential for the safety on the work floor and the quality of the work. Trainings are given on various subjects and some types of training will be periodically refreshed to assure the highest level of capacity</p>	<b>Continues monitoring</b>	<b>Compliant</b>

Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
	Field workers handling chemical products must have adequate training on the appropriate use of products	<b>Protocol 5 (Responsible use of chemicals)</b> Form Ghana’s company policy is to minimize the use of pesticides and to avoid possible risks for the safety and health of the employees. This is also valid for situations in which dangerous or toxic material is used.	Continues monitoring	Compliant
	Ensure that persons applying pesticides and chemicals undergo periodic medical check-ups	<b>Protocol 5 (Responsible use of chemicals)</b> Form Ghana’s company policy is to minimize the use of pesticides and to avoid possible risks for the safety and health of the employees. This is also valid for situations in which dangerous or toxic material is used	Continues monitoring	Compliant
	Provide appropriate personnel protective clothing/gear such as rubber, gloves, overall, safety boots, hand gloves etc. to workers	<b>Protocol 10(Personal protection)</b> Safety is of the utmost importance to Form Ghana. To ensure that everybody works in a safe manner in a safe environment three approaches are used: Use of individual protective gear Training of personnel in the safe use of equipment and in safe working techniques. (Protocol 11)	Continues monitoring	Compliant
	Provide a well-stocked first aid kit for minor injuries that might occur	<b>Protocol 8 B (First Aid Procedures &amp; Emergency Evacuation)</b> This protocol describes the procedures for first aid	Continues monitoring	Compliant

Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
		training, usage and composition of the first aid kit and handling of accidents		
	Adhere to the Health and Safety Action Plan indicated in the project EMP	<p><b>Protocol 10 (Personal protection)</b> Safety is of the utmost importance to Form Ghana. To ensure that everybody works in a safe manner in a safe environment three approaches are used. The use of protective equipment is based on the ILO Standard ‘Health and Safety in Forestry Work’. This can be modified due to local conditions.</p>	<b>Continues monitoring</b>	<b>Compliant</b>
	Ensure adequate record keeping and establish an inventory of accidents and disease outbreak and treatment on the farms	<p>All work-related injuries, even those not requiring medical attention, must be reported and recorded by the operational health practitioner. A summary is presented to the Management every month, and an annual summary of these reports is presented in the Public Monitoring Report.</p> <p><b>Protocol 8 B (First Aid Procedures &amp; Emergency Evacuation)</b></p>	<b>Continues monitoring</b>	<b>Compliant</b>

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Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
	Workers must undergo medical check-ups at least twice a year to assess their health status with respect to operations on the farm	Form Ghana personnel is subject to regular medical checks	<b>Continues monitoring</b>	<b>Compliant</b>
	<b>Protection of Biodiversity Resources</b>		<b>Continues monitoring</b>	<b>Compliant</b>
	Implement measures to conserve biodiversity by maintaining vegetation along the various streams in the concession	<b>Protocol 15 (Technical performance in the Plantation)</b> Monitoring and evaluation of forest conditions and management performance are necessary to assure the sustainability of forest management	<b>Continues monitoring</b>	<b>Compliant</b>
	Create conservation areas that act as corridors and avoid harvesting in the corridors	<b>Protocol 25 (Harvesting)</b> This protocol describes the harvesting strategies adopted by Form Ghana for the planning, felling, extraction and processing of trees after thinning and clear-felling. These strategies are derived from the reduced impact logging guidelines stipulated in the Ghana logging manual. The protocol is aimed at teak harvesting. Growth of indigenous trees is much slower than teak, so harvesting of planted indigenous trees is not expected to take place in the near future.	<b>Continues monitoring</b>	<b>Compliant</b>

Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
	Ensure that rare floral identified and indigenous species are retained within the plantation	Form Ghana is managing / planting 10% of the plantation for biodiversity conservation and wildlife. In addition, the planting program will include rare and endangered species if these can be successfully grown in the nursery.	<b>Continues monitoring</b>	<b>Compliant</b>
	Avoid contiguous harvesting of large areas in order to minimize disruption to landscape	Harvesting will be done in accordance with the growth performance of the trees. It is certain, this will be patchier than the planted areas.	<b>Continues monitoring</b>	<b>Compliant</b>
	Foliage should be left on the soil to protect against moisture loss and provide nutrients to the soil	All slash is left in situ, with the exception of the fire strips	<b>Continues monitoring</b>	<b>Compliant</b>
	<b>Soil and Water Quality Monitoring</b>			
	Establish an environmental monitoring programme in the adjacent or traversing water bodies to cover the following:			
	Water quality: pH, Turbidity, Colour, TSS, TDS, Phosphates, Ammonia- Nitrogen, Nitrate-Nitrogen, Potash, Total Coliforms, E. Coli etc	Form Ghana monitors the water in the streams twice yearly as per it's monitoring protocol:	<b>Continues monitoring</b>	<b>Compliant</b>

Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
		<b>P 13 (Monitoring)</b> This protocol describes the various monitoring activities		
	Monitor the nutrient status of the soil in respect of soil organic carbon every year	The need for nutrient application is under investigation.	<b>Continues monitoring</b>	<b>Compliant</b>
	Submit the results of the monitoring as part of Annual Environmental Reports (AER)	The findings from the nutrients investigated will be reported on in the Annual Environmental Report	<b>Continues monitoring</b>	<b>Compliant</b>
	<b>Social Economic Impacts</b>			
	Ensure that the livelihoods of adjoining communities are not impacted negatively by the project operations	Form Ghana believes that investing in local communities is very important and this is as such incorporated in the company’s Corporate Social Responsibility policy. Communities are important stakeholders in the area and play a key role in the company’s operations. <b>(Protocol 28 Community Development)</b>	<b>Continues monitoring</b>	<b>Compliant</b>
	Integrate social and environmental agreements/clauses in suppliers' contracts	Form Ghana is aware of all applicable legislation. This protocol describes the system implemented to collect relevant Ghanaian legislation and international conventions ratified by Ghana, and keep these texts up to date. <b>Protocol</b>	<b>Continues monitoring</b>	<b>Compliant</b>



Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
		<b>1(Follow-up of legislation and international conventions)</b>		
	Undertake corporative social responsibility activities in accordance with the company's policy and agreement with the relevant communities	FG has a corporate social responsibility statement and a community development plan. Activities are executed as planned and will be reported upon annually.	<b>Continues monitoring</b>	<b>Compliant</b>
<b>5.10</b>	<b>Compliance with Mitigation Measures</b>			
	Comply with all the mitigation, monitoring and environmental management commitments made in the Environmental Management Plan (EMP)	Compliant	<b>Continues monitoring</b>	<b>Compliant</b>
	<b>Compliance with the Factories, Offices and Shops Act 1979 (328)</b>			
	Comply with the requirements of the Factories, Offices and Shops Act, 1979 (328). Consult with the Factories Inspectorate Department in order to satisfy the requirements of the Act	All regulatory requirements governing the Factories, Offices and Shops Act are duly adhered to.	<b>Continues monitoring</b>	<b>Compliant</b>
	<b>Compliance with Fire Precaution (premises) Regulation, 2003 (L. I 1724)</b>			
	Provide appropriate fire extinguishers and other requirements as recommended by the Ghana National Fire Service	Appropriate fire extinguishers are installed at vantage places	<b>Continues monitoring</b>	<b>Compliant</b>
	Install fire alarm system and smoke detectors at vulnerable areas to give early warning of any fire outbreak	There are adequate fire alarm system and smock detectors installed	<b>Continues monitoring</b>	<b>Compliant</b>
	No smoking signs should be posted at areas where flammable solvents and fuel are stored	There are adequate signages in place with various inscriptions	<b>Continues monitoring</b>	<b>Compliant</b>

Req.	Environmental management Actions/Conditions in the permit schedule	Actions implemented	Outstanding actions to be implemented	Proposed actions to be implemented to ensure compliance
	Fire belts or boundary lines should be created to prevent fire spreading to adjoining areas	Five-metre fire buffer constructed to prevent wild fire from entering the project area and to ensure that fire emanating from one subplot does not enter the other subplots	<b>Continues monitoring</b>	<b>Compliant</b>
<b>Compliance with Water Resources Commission Act, 1996, (Act 522)</b>				
	Comply with the requirements of the Water Resources Commission Act, 1996, Act 522 and obtain water abstraction Permits	All regulatory requirement outlined by the WRC are duly followed and reports generated and submitted on quarterly basis.	<b>Continues monitoring</b>	<b>Compliant</b>

**5.2 Variations (trends) between baseline and current values of rivers that traverse the farm**

There are no rivers within FORM Ghana’s concession in the Tain II Forest Reserve. Although the Tain River is bounded to the Northern sector of the Reserve, it is not affected by the Company’s operations because it is not within 1 km of the area reforested by FORM Ghana.

**6.0 ENVIRONMENTAL ACTION PLAN**

*Table 6.0: Develop an action plan for environmental measures and other commitments not implemented in section 4 and 5*

Improvement Programme as identified in Section 4 and 5 and any other actions for improvement and to ensure compliance to EPA Standards	Actual proposed implementation	Actions for quality objectives	Environmental Targets/scope	Time frame <sup>1</sup> (specific dates for Implementation including month and Year)			Budget	Responsible Officer
				2022	2023	2024		
Continue to plant specified species and ensure that at least 10% of the entire area is planted with indigenous species for biodiversity conservation.	<ul style="list-style-type: none"> <li>• Continuous development of nursery and planting area.</li> <li>• Planting seedlings</li> </ul>	Improve biodiversity conservation in degraded forest areas	Entire area leased to Form Ghana	Every planting season	Every planting season	Every planting season	Part of designated duties and budgeting	Plantation Team
Continue to adopt behavioural change strategies through training, sensitization and motivation schemes.	<ul style="list-style-type: none"> <li>• Sensitization</li> <li>• Training</li> <li>• Internal auditing</li> </ul>	Improve environmental awareness and employee participation in environmental management.	Total compliance to FSC Principles and Criteria, and national regulatory requirements.	Throughout the year	Throughout the year	Throughout the year	Part of designated duties and budgeting	Environmental and Social Team
Continue to monitor all environmental and social parameters to ensure that operations of Form Ghana do not contaminate the environment.	<ul style="list-style-type: none"> <li>• Monthly monitoring and reporting.</li> <li>• Training on use of the environment</li> </ul>	Ensure that all operational activities meet best standard practices.	All year-round monitoring of environmental parameters and subsequent reporting	Throughout the year	Throughout the year	Throughout the year	Part of designated duties and budgeting	<ul style="list-style-type: none"> <li>• Environmental and Social Team</li> <li>• Plantation Team</li> </ul>

**1 Indicate the end date or the Actual month within which the programme will be implemented**

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Improvement Programme as identified in Section 4 and 5 and any other actions for improvement and to ensure compliance to EPA Standards	Actual proposed implementation	Actions for	Environmental quality objectives	Targets/scope	Time frame <sup>1</sup> (specific dates for Implementation including month and Year)			Budget	Responsible Officer
					2022	2023	2024		
Ensure that employees health and safety is prioritized	<ul style="list-style-type: none"> <li>• Provision of required PPEs</li> <li>• Incident investigation and reporting</li> <li>• Training and sensitization</li> </ul>	Provide a safe working environment for undertaking operational activities	All employees	Throughout the year	Throughout the year	Throughout the year	Part of designated duties and budgeting	<ul style="list-style-type: none"> <li>• Environmental and Social Team</li> <li>• Plantation Team</li> </ul>	
Continue to foster cordial relationship with fringing communities	<ul style="list-style-type: none"> <li>• CSR projects</li> <li>• Employment opportunities to communities</li> <li>• Stakeholder engagement</li> </ul>	Reduce public/community complaints	Minimize community complaints	Throughout the year	Throughout the year	Throughout the year	Variable	<ul style="list-style-type: none"> <li>• Environmental and Social Team</li> <li>• Plantation Team</li> </ul>	
Implement measures to manage pollution	<ul style="list-style-type: none"> <li>• Timely and efficient servicing of vehicles and machinery.</li> <li>• Continue to maintain buffer zones along rivers and riparian areas.</li> <li>• Create bunds around chemical mixing areas and provide spill containment measures.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce environmental footprints</li> <li>• Reduce the incidence of surface and ground water pollution</li> <li>• Reduce air pollution</li> </ul>	<ul style="list-style-type: none"> <li>• Close to zero environmental footprints.</li> <li>• Close to zero pollution of surface and ground water.</li> </ul>	Throughout the year	Throughout the year	Throughout the year	Part of designated duties and budgeting	<ul style="list-style-type: none"> <li>• Environmental and Social Team</li> <li>• Plantation Team</li> <li>• Fleet Management Team.</li> </ul>	

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Improvement Programme as identified in Section 4 and 5 and any other actions for improvement and to ensure compliance to EPA Standards	Actual proposed implementation	Actions for quality objectives	Environmental Targets/scope	Time frame <sup>1</sup> (specific dates for Implementation including month and Year)			Budget	Responsible Officer
				2022	2023	2024		
	<ul style="list-style-type: none"> <li>Waste is managed using standard practices</li> </ul>	<ul style="list-style-type: none"> <li>Comply with all legal requirements of EPA, WRC, FC, FSC, AfDB.</li> </ul>						
Continuous management of conservation areas.	<ul style="list-style-type: none"> <li>Non-disturbance of conservation areas</li> </ul>	<ul style="list-style-type: none"> <li>Enhance biodiversity through conservation practices</li> </ul>	<ul style="list-style-type: none"> <li>Indigenous /remnant species conservation areas</li> </ul>	Throughout the year	Throughout the year	Throughout the year	Part of designated duties and budgeting	<ul style="list-style-type: none"> <li>Environmental and Social Team</li> <li>Plantation Team</li> </ul>

**7.0 PROGRAMMES FOR MEETING REQUIREMENTS OF ACTION PLAN**

*Table 7.1: Environmental Management Priority*

<b>Immediate/short term (up to 1 year) Programme</b>	<b>Timeline</b>	<b>Responsible Officer</b>
Continue to plant specified species and ensure that at least 10% of the entire area is planted with indigenous species for biodiversity conservation.	Throughout the year	<ul style="list-style-type: none"> <li>• Environmental and Social Team</li> <li>• Plantation Team</li> </ul>
Continue to adopt behavioural change strategies through training, sensitization and motivation schemes.	Throughout the year	<ul style="list-style-type: none"> <li>• Environmental and Social Team</li> <li>• Plantation Team</li> </ul>
Continue to monitor all environmental and social parameters to ensure that operations of Form Ghana do not contaminate the environment.	Throughout the year	<ul style="list-style-type: none"> <li>• Environmental and Social Team</li> <li>• Plantation Team</li> </ul>
Ensure that employees health and safety is prioritized	Throughout the year	<ul style="list-style-type: none"> <li>• Environmental and Social Team</li> <li>• Plantation Team</li> </ul>
Continue to foster cordial relationship with fringing communities	Throughout the year	<ul style="list-style-type: none"> <li>• Environmental and Social Team</li> <li>• Plantation Team</li> </ul>
Implement measures to manage pollution	Throughout the year	<ul style="list-style-type: none"> <li>• Environmental and Social Team</li> <li>• Plantation Team</li> <li>• Fleet Management Team</li> </ul>
Continuous management of conservation areas.	Throughout the year	<ul style="list-style-type: none"> <li>• Plantation Team</li> <li>• Environmental and Social Team</li> </ul>
<b>Long term (3 or more years) Programme</b>		
Protect plantation from bushfires, illegal grazing, hunting and poaching	Throughout the year	<ul style="list-style-type: none"> <li>• Security team</li> <li>• Plantation Team</li> <li>• Environmental and Social Team</li> </ul>

*Environmental Management Plan – Tain II Forest Reserve*



Continue to foster cordial relationship with fringing communities	Throughout the year	<ul style="list-style-type: none"> <li>• Environmental and Social Team</li> <li>• Plantation Team</li> </ul>
Continue to monitor all environmental and social parameters to ensure that operations of Form Ghana do not contaminate the environment	Throughout the year	<ul style="list-style-type: none"> <li>• Environmental and Social Team</li> <li>• Plantation Team</li> </ul>
Implement measures to manage pollution	Throughout the year	<ul style="list-style-type: none"> <li>• Environmental and Social Team</li> <li>• Plantation Team</li> <li>• Fleet Management Team</li> </ul>
Continue to adopt behavioural change strategies through training, sensitization and motivation schemes.	Throughout the year	<ul style="list-style-type: none"> <li>• Environmental and Social Team</li> <li>• Plantation Team</li> </ul>

*Table 7.2: Trainings, awareness and competence building programme(s)*

<b>Training/Awareness/ Competence Programme</b>	<b>Budget</b>	<b>Timeline</b>	<b>Frequency</b>	<b>Responsible Officer</b>
Firefighting Training	In house training	September	Annually	Plantation Manager
Waste Management Training	In house training	June	Annually	E&S Manager
Conflict Resolution/Mediation Training	GHS10,000.00	December	Annually	E&S Manager
Health and Safety Training	GHS4,000.00	October	Half yearly	Human Resource/Development Manager
Security Alert Training	In house training	December	Annually	Chief Security Officer

*Table 7.3: Management commitments to environmental/performance reviews and corrective actions*

<b>Action/commitment</b>	<b>Timeline</b>	<b>Comments</b>
Conduct annual internal audit to ensure that operations meet required standards.	Annually	Audits are carried out annually and corrective actions implemented.
Ensure that workers health and safety is prioritized	Throughout the year	Management is committed to ensuring that PPEs are supplied to employees every year per the specifications in the Personal Protection Protocol (P 10).
Monitor underground water quality	Quarterly	Management devotes resources to ensure that the quality of underground water used for domestic purposes is assessed in every quarter.
Monitor resource use efficiency	Monthly	Energy use meters, water use meters, fuel pump meters and other resource use metrics are monitored and reported at the end of each month.
Adopt strategies to promote ecological, economic and social sustainability principles.	Daily	Operational protocols are in place to guide daily decision making in the plantation.
Ensure compliance with all permits/ licenses/ certification requirements for operations.	Variable	All permits/ licenses/ including EPA, WRC, Fire Certificate are constantly monitored for renewal. All reporting conditions/ requirements are met.



**8.0 STANDARD OPERATING PROCEDURE MANUALS AND AVAILABLE DOCUMENTS**

*Table 8.0: List of Standard Operating Manuals and other documents*

<b>Type of Standard Operating Procedure</b>	<b>Area of Operation</b>	<b>Date Developed</b>	<b>Responsible Officer to ensure implementation</b>
<b>Follow up of legislation and convention (Protocol 1)</b>	International/National	5 <sup>th</sup> June, 2019	Project Accountant
<b>Prevention of illegal activities (Protocol 2)</b>	Form Ghana land lease area	19 <sup>th</sup> June, 2019	Chief Security Officer
<b>Periodical review of documentation (Protocol 3)</b>	Form Ghana Management	5 <sup>th</sup> June, 2019	Project Accountant
<b>Waste Management (Protocol 4)</b>	Form Ghana land lease area	25 <sup>th</sup> Nov, 2019	Plantation Manager
<b>Responsible use of chemicals (Protocol 5)</b>	Form Ghana land lease area	27 <sup>th</sup> May, 2019	Chemical Supervisor and Plantation Manager
<b>Stakeholder Management (Protocol 6)</b>	Form Ghana and stakeholders	25 <sup>th</sup> Nov, 2019	Environmental and Social Manager
<b>Grievance Redress Mechanism (Protocol 7)</b>	Form Ghana, employees and public	17 <sup>th</sup> Aug, 2019	Human Resources Manager
<b>First Aid Procedures and Emergency Evacuation (Protocol 8)</b>	Form Ghana workplace	17 <sup>th</sup> June, 2019	Nurse
<b>Employee Transport and vehicle and equipment policy and procedure (Protocol 9)</b>	Form Ghana employees and fleet	20 <sup>th</sup> Aug, 2018	Fleet Management Officer
<b>Personal Protection (Protocol 10)</b>	Form Ghana Employees	1 <sup>st</sup> Nov, 2019	Plantation Manager
<b>Training of Personnel (Protocol 11)</b>	Form Ghana Employees	10 <sup>th</sup> Oct, 2017	Human Resource/Development Manager

Type of Standard Operating Procedure	Area of Operation	Date Developed	Responsible Officer to ensure implementation
<b>Internal Audit (Protocol 12)</b>	Form Ghana	20 <sup>th</sup> May, 2019	Consultant
<b>Monitoring (Protocol 13)</b>	Form Ghana Plantation	7 <sup>th</sup> Oct, 2018	Monitoring, Research & Development Officer
<b>Nursery Management and Plant Propagation (Protocol 14)</b>	Nursery	30 <sup>th</sup> May, 2019	Nursery Supervisor
<b>Technical Performance in Plantation (Protocol 15)</b>	Plantation	10 <sup>th</sup> June, 2019	Plantation Manager
<b>Storage of Fuel, Lubricants and Chemicals (Protocol 16)</b>	Stores	14 <sup>th</sup> June, 2019	Storekeeper
<b>Management Requirement and Responsibility of senior Staff (Protocol 17)</b>	Senior Staff	25 <sup>th</sup> Nov, 2019	Human Resource/Development Manager
<b>Machine maintenance (Protocol 18)</b>	Form Ghana equipment	4 <sup>th</sup> June, 2019	Fleet Management Officer
<b>FSC Trade Map Usage (Protocol 19)</b>	Form Ghana	20 <sup>th</sup> May, 2019	Consultant
<b>Meeting Schedule (Protocol 20)</b>	Form Ghana	24 <sup>th</sup> June, 2019	Plantation Manager
<b>Fire Prevention and Fire Fighting (Protocol 21)</b>	Plantation	24 <sup>th</sup> June, 2019	Plantation Manager
<b>Chain of Custody (Protocol 22)</b>	Form Ghana	24 <sup>th</sup> May, 2019	Forest Engineer
<b>First Aid Envenomation and Rabies (Protocol 23)</b>	Employees	11 <sup>th</sup> June, 2019	Nurse

*Environmental Management Plan – Tain II Forest Reserve*



Type of Standard Operating Procedure	Area of Operation	Date Developed	Responsible Officer to ensure implementation
<b>Road Construction and Maintenance (Protocol 24)</b>	Plantation	24 <sup>th</sup> June, 2019	Plantation Manager
<b>Harvesting (Protocol 25)</b>	Form Ghana Plantation	24 <sup>th</sup> May, 2019	Forest Engineer
<b>Information on contagious Diseases (Protocol 27)</b>	Employees and Visitors	11 <sup>th</sup> June, 2019	Nurse
<b>Community Development (Protocol 28)</b>	Fringe communities	20 <sup>th</sup> May, 2019	Managing Director
<b>Integrated Pest Management (Protocol 29)</b>	Plantation and Nursery	24 <sup>th</sup> June, 2019	Plantation Manager
<b>Intercropping (Protocol 30)</b>	Intercropping farmers	18 <sup>th</sup> Feb, 2020	Intercropping Supervisor
<b>Prevention, Control and Management of Coronavirus Disease 2019 (COVID-19)</b>	Form Ghana	May 2020	Environment & Social Manager

**8.1 Data collection, documentation and archiving methods**

*Table 8.1: Data collection, documentation and archiving methods*

<b>Type of Data Required</b>	<b>Laboratory responsible for analysis</b>	<b>Responsibility for collection at the facility</b>	<b>Responsibility for collection from third party</b>	<b>Responsibility for verification</b>	<b>Procedure for Data Collection, Storage/Archiving Method</b>
<b>Solid Waste</b>	N/A	Zoomlion Ghana Limited	N/A	Environmental & Social team	Waybills issued upon collection from Form Ghana
<b>Quality of Surface waterbodies</b>	Ghana Water Company Limited (GWCL)	Environmental & Social team	N/A	Environmental & Social team	Water samples are collected from the plantation and submitted to Ghana Water Company Ltd lab for quality analysis
<b>Used Chemical containers</b>	N/A	Zoomlion Ghana Limited	N/A	Environmental & Social team	Waybills issued upon collection from Form Ghana
<b>Plastics (seedling bags, etc)</b>	N/A	Zoomlion Ghana Limited	N/A	Environmental & Social team	Waybills issued upon collection from Form Ghana
<b>Used Oil</b>	N/A	JOPONAP Waste Management Solutions - (Sunyani)	N/A	Environmental & Social team	Waybills issued upon collection from Form Ghana

**8.2 Monitoring and Reporting**

**8.2.1 Performance Indicators**

*Table 8.2.1: Performance indicators*

<b>Performance indicator</b>	<b>Frequency</b>	<b>Actual actions to be implemented</b>	<b>Responsibility for Implementation</b>	<b>Responsibility for Monitoring</b>
<b>Energy Consumption</b>	Daily	Meter reading and recording of figures on monthly basis	Site Engineer	E & S team
<b>Water Consumption</b>	Daily	Meter reading and recording of figures on monthly basis	Site Engineer	E & S team
<b>Fuel Consumption</b>	Daily	Use of log book to record issuance of fuel and mileage covered	Asset management Supervisor	Fleet Management Officer
<b>Raw Material Usage</b>	N/A	N/A	N/A	N/A
<b>Chemical Use</b>	Daily	Waybills issued on supply on daily basis	Storekeeper	Chemical Supervisor
<b>Annual Environmental Reporting</b>	Yearly	Annual reports generated	Environmental & Social team	Managing Director
<b>Quality of surface water bodies</b>	Biannual	Water Samples submitted to GWCL Lab for quality analysis on biannual basis (Dry season & Rainy season)	Environmental & Social team	Forest Manager
<b>Solid Wastes Generated e.g. Plastics</b>	Daily	Waste generated is collected in bins from various collection points into a skip container for disposal by Zoomlion Ghana Limited	Environmental & Social team	E & S Manager

**9.0 EMERGENCY PREPAREDNESS AND RESPONSE/CONTINGENCY PLAN**

FORM Ghana has a protocol which outlines the actions to be taken in the case of an emergency. This is Protocol 08 First Aid Procedures & Emergency Evacuation. The protocol makes provisions for first aid training, usage and composition of the first aid kit and handling of accidents. In addition to the protocol, Form Ghana has put in place emergency control measures such as installation of smoke detectors, creation of assembly point, posting of warning/caution signages on buildings and equipping every vehicle and building with fire extinguishers.

Does company have an emergency Response Plan?  Yes  No

**9.1 Potential hazards and response procedure (eg fire outbreak, flooding, hazardous and flammable materials etc)**

*Table 9.1: Potential hazards and response procedure*

Potential Hazard	Emergency Response procedure	System in place to handle hazard
<b>Conflict</b>	Entry and registration of complaint and instant resolution by the Conflict Resolution Staff.	Grievance Redress Mechanism (Protocol 7) describe the ways Form Ghana manages complaints and conflict situations
<b>Fire outbreak</b>	The fire Rapid Response Team moves to the fire scene to extinguish it upon detection by the fire detection system in place	Fire Prevention and Fighting (Protocol 21) Describes how fires will be prevented and combated when needed
<b>Snakes and insect bites</b>	A first aider stabilizes the victim following the instructions in Protocol 23. First Aid for envenomation and rabies and subsequently reported to the nurse	First Aid for Envenomation and Rabies (Protocol 23) describes the preventative measures as well as the procedures in case of an emergency
<b>Fuel, lubricants or chemicals spillage</b>	Filling station equipped with fire extinguishers and buckets of sand to control spillage	Storage of fuel, lubricants and chemicals (Protocol 16) describes procedure for the purchase, storage and distribution of all fuel and chemicals used by Form Ghana. Prorocol5 also outlines the responsible use of chemical.

**9.2 Incidence /Accidents**

Procedure for environmental incidence/accidents investigation

- The first Aider reports incidence/accidents to the OHS Officer within 24hours
- The OHS Officer immediately follows up to the accident/accident scene for investigation
- An accident/incident docket is opened for the case
- Recommendations are made to prevent future occurrences of such incidence after investigation

**9.3 Information on emergencies during last permit implementation period**

*Table 9.3: Emergencies recorded over the period*

<b>Emergency</b>	<b>Date of occurrence</b>	<b>Response action</b>	<b>Remark</b>
<b>Cut (1)</b>	June 2018	Cut was treated at site clinic	Referral- Major incident Non-referral- Minor incident
<b>Cut (9), insect bite (2)</b>	July 2018	All cases treated at the site clinic; 2 cases of insect bite referred to the hospital	Referral- Major incident Non-referral- Minor incident
<b>Cut (11), insect bite (10)</b>	August 2018	2 cases of cut referred to hospital and the remaining 7 treated at the site clinic. All insect cases treated at site	Referral- Major incident Non-referral- Minor incident
<b>Insect bite (2), cut (2), snake bite (1)</b>	September 2018	All cases treated at site clinic. Snake bite referred to hospital	Referral- Major incident Non-referral- Minor incident
<b>Insect bite (5)</b>	October 2018	All cases treated at site clinic	Referral- Major incident Non-referral- Minor incident
<b>Insect bite (12), cut (3)</b>	November 2018	All cases treated at site clinic	Referral- Major incident Non-referral- Minor incident
<b>Insect bite</b>	January 2019	Treated at clinic	Referral- Major incident Non-referral- Minor incident
<b>Insect bite (2)</b>	February 2019	First aid treatment	Referral- Major incident Non-referral- Minor incident
<b>Insect bite (3), cut (2)</b>	March 2019	Treated at clinic	Referral- Major incident Non-referral- Minor incident
<b>Insect bite (3), cut (4)</b>	April 2019	Insect bite treated at site clinic, 3 incidents of cut treated at site clinic and 1 referred to hospital	Referral- Major incident Non-referral- Minor incident

<b>Emergency</b>	<b>Date of occurrence</b>	<b>Response action</b>	<b>Remark</b>
<b>Cut (7), insect bite (1)</b>	May 2019	Insect bite treated at site clinic, 4 incidents of cuts treated at site clinic and 3 referred to hospital	Referral- Major incident Non-referral- Minor incident
<b>Insect bite (4), cuts (4)</b>	June 2019	1 cut incident referred to hospital, 3 treated at site clinic and all 4 cases of insect bite treated at clinic	Referral- Major incident Non-referral- Minor incident
<b>Cut (5), insect bite (4)</b>	July 2019	2 cases of cuts referred to hospital and 3 treated at site clinic and all 4 cases of insect bite treated at site clinic	Referral- Major incident Non-referral- Minor incident
<b>Cut (7), insect bite (5)</b>	August 2019	2 cases of cut referred to hospital and five treated at site clinic, all five cases of insect bite treated at site clinic	Referral- Major incident Non-referral- Minor incident
<b>Cut (4)</b>	September 2019	1 referred to hospital and the remaining 3 treated at site clinic	Referral- Major incident Non-referral- Minor incident
<b>Cut (5), insect bite (5)</b>	October 2019	1 case of cut referred to hospital and 4 treated at site clinic, 1 case of insect bite referred to hospital and 4 treated at site clinic,	Referral- Major incident Non-referral- Minor incident
<b>Cut (4), insect bite (2)</b>	November 2019	All 6 cases treated at site clinic	Referral- Major incident Non-referral- Minor incident
<b>Cut (2)</b>	December 2019	All 2 cases treated at sit clinic	Referral- Major incident Non-referral- Minor incident
<b>Cut (14), insect bite (3)</b>	January 2020	3 cases of cut referred to hospital and the rest treated at site clinic; all 3 cases of insect bite treated at site clinic	Referral- Major incident Non-referral- Minor incident
<b>Cut (3)</b>	February 2020	All 3 cases received first aid treatment	Referral- Major incident Non-referral- Minor incident
<b>Cut (6)</b>	March 2020	All cases received first aid treatment	Referral- Major incident Non-referral- Minor incident



<b>Emergency</b>	<b>Date of occurrence</b>	<b>Response action</b>	<b>Remark</b>
<b>Cut (3)</b>	April 2020	1 received first aid, 1 case referred to hospital and 1 case received treatment at site clinic	Referral- Major incident Non-referral- Minor incident
<b>Cut (5)</b>	May 2020	4 cases referred to hospital and 1 case treated at site clinic	Referral- Major incident Non-referral- Minor incident
<b>Cut (10), insect bite (1)</b>	June 2020	Insect bite treated at clinic, 3 cases of cut received first aid, 4 cases of cut treated at site clinic and 3 cases referred to hospital.	Referral- Major incident Non-referral- Minor incident
<b>Cut (7), insect bite (2)</b>	July 2020	5 cases of cut received first aid treatment, 2 treated at site clinic and all two cases of insect bite treated at site clinic	Referral- Major incident Non-referral- Minor incident
<b>Cut (9), insect bite (6)</b>	August 2020	3 cases of cut received first aid, 3 treated at clinic and the other 3 referred to hospital. All 4 cases of insect bite treated at site clinic.	Referral- Major incident Non-referral- Minor incident
<b>Cut (4), insect bite (4), splinter (1)</b>	September 2020	All 4 cases of insect bite treated at site clinic, 1 case of splinter treated at clinic, 2 cases of cut treated at clinic and 2 cases of insect bite referred to hospital	Referral- Major incident Non-referral- Minor incident
<b>Cut (6), insect bite (4)</b>	October 2020	3 cut cases treated at site clinic and 3 referred, all 4 cases of insect bite treated at site clinic	Referral- Major incident Non-referral- Minor incident
<b>Cut (1), insect bite (1)</b>	December 2020	Cut referred to hospital and insect bite treated at site clinic	Referral- Major incident Non-referral- Minor incident

**10.0 COST/BENEFIT OF IMPLEMENTING THE ENVIRONMENTAL  
MANAGEMENT PLAN**

*Table 10.0: Costs and benefits of implementation of previous EMP (& or current EMP)*

<b>Activity</b>	<b>Benefits</b>	<b>Costs</b>
Biodiversity study	To assess the impact of the Form Ghana’s project on biodiversity.	100,000.00
Soil quality analysis	To assess the impact of the project on soil quality.  Provides information for effective soil conservation and management practices.	100,000.00
Fire management	To protect lives and property from fires.	281,932.17
Community Development projects (CSR)	To invest in local communities to improve and protect their livelihoods	746,424.24
Weed/pest/disease Management	To manage and prevent damages from pests/weeds and diseases in the plantation.	2,651,540.99
Waste Management	To effectively manage waste generation	293,125.32
Training/ Capacity building	To equip employees with the requisite skills and knowledge for effective job execution.	333,933.14
Health and Safety	To create a conducive work environment and healthy workforce.	1,779,330.25

## **11.0 CONCLUSION**

As a result of the expiry of the Environmental Protection permit which was issued to Form Ghana in 2016 based on the information published in the Environmental Management Plan December 2016, Form Ghana wishes to apply for a new Permit to enable the company carry out its operational activities. This is in fulfilment of the all the permit conditions and commitment to project specification issued thereafter.

Secondly, an evaluation of environmental performance of previous environmental management plan, actions and permit conditions prove that Form Ghana has implemented the environmental requirement presented in the environmental permit and thus the basis for the renewal of the environmental permit to enable the company carry out its operations in accordance with Environmental Assessment Regulation, 1999 (LI 1652) for forestry sector projects.

As a company, we endeavour to continually improve our environmental performance and prevent pollution of any kind. All employees shall continue to support our environmental goals while we strive to provide clean and environment friendly means of working practices and minimise incident rate.

Based on the presentations and as a statutory requirement, meeting all regulatory requirement for the issuance of a new permit, meeting and followed all conditions in the first-generation Environmental Management Plan we wish to submit a new Environmental Management Plan to enable us execute our project objectives.

**APPENDICES/ATTACHMENTS**

**Appendix 1: EPA Permit and Schedule to the Permit**

• Tel: (0302) 664697 / 664698 / 662465  
667524 / 0289673960 / 1 / 2  
• Fax: 233 (0302) 662690  
Email: info@epa.gov.gh



**Environmental Protection Agency**

P. O. Box MB 326  
Ministries Post Office  
Accra, Ghana  
Website: <http://www.epa.gov.gh>

CA: 470.2/LG/FO/02

**ENVIRONMENTAL PROTECTION AGENCY**

**ENVIRONMENTAL PERMIT**

ENVIRONMENTAL ASSESSMENT REGULATION, 1999 L.I. 1652

This is to authorize

**FORM GHANA LIMITED**

To continue operating an existing 14,576 hectare Reforestation project located within the degraded Tain II Forest Reserve in the Berekum District of the Brong Ahafo Region, as per the attached schedule

Date Issued: AUGUST 15, 2018

Expiry Date: AUGUST 14, 2021

EBENEZER APPAH – SAMPONG  
DEPUTY EXECUTIVE DIRECTOR/TECHNICAL  
FOR: Ag. EXECUTIVE DIRECTOR

NB: This Permit is only valid with the Seal of the Environmental Protection Agency.

Tel: (0302) 664697 / 664698 / 662465  
667524 / 0289673960 / 1 / 2  
Fax: 233 (0302) 662690  
Email: info@epa.gov.gh



**Environmental Protection Agency**

P. O. Box MB 326  
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Accra, Ghana  
Website: <http://www.epa.gov.gh>

**SCHEDULE TO THE ENVIRONMENTAL PERMIT**

- 1.0 CONTACT PERSON : THE MANAGING DIRECTOR
- 2.0 PROPONENT : FORM GHANA LIMITED
- 3.0 CONTACT : +233-0542181950
- 4.0 REGISTRATION NO. : CA: 470/2
- 5.0 PERMIT NUMBER : CA: 470.2/LG/FO/02
- 6.0 ENVIRONMENTAL ASSESSMENT OF AN EXISTING 14,576 HECTARE REFORESTATION PROJECT LOCATED WITHIN THE DEGRADED TAIN II FOREST RESERVE - IN THE BEREKUM DISTRICT OF THE BRONG AHAFO REGION

In pursuance of the Environmental Protection Agency Act 1994, Act 490 (Sections 2 (i) and 12 (I) and the Environmental Assessment Regulations, 1999, L.I. 1652 and on the basis of the information published in the Environmental Management Plan (EMP) December, 2016, this Environmental Permit is issued to **FORM GHANA LIMITED** authorising the company to continue operating the existing 14,576 hectare Reforestation project located within the degraded Tain II Forest Reserve in the Berekum District of the Brong Ahafo Region.

**7.0 CONDITIONS OF PERMIT**

**7.1 COMMITMENT TO PROJECT SPECIFICATION**

- Comply with all project specifications, mitigation, monitoring and other environmental management provisions indicated in the project's Environmental Management Plan (EMP).
- The project involves the following: plantation development and maintenance using the following under listed species:
  - *Tectona grandis* (Teak)
  - *Mansonia altissima* (Mansonia)
  - *Triplochiton scleroxylon* (Wawa)
  - *Bombax buonopozense* (Bombax)
  - *Erythrophleum ivorensis* (Potrodom)
  - *Terminalia superba* (Ofram)
  - *Terminalia ivorensis* (Emere)
  - *Nauclea diderrichii* (Kusia)
  - *Cola gigantea* (Watapuo)
  - *Albizia ferruginea* (Awiemfosamina)
  - *Pericopsis elata* (Kokrodua)

7.1.2 At least 10% of degraded forest area should be reforested with indigenous tree species.

**7.2 Location and Coverage**

- i. The project is located in the Tain II Forest Reserve in the Berekum District of the Brong Ahafo Region.
- ii. Grid Reference: 7N35, 2W30.
- iii. Land Take: 14.576 hectares.
- iv. Labour force of 155.

**7.3 Pesticide and Chemical Usage**

- i. Use only pesticides and chemicals that have been registered with the EPA in accordance with the EPA Act, 1994 (Act 490).
- ii. Ensure that applicators of pesticides and chemicals are trained and licensed in accordance with the EPA Act, 1994 (Act 490).
- iii. Comply with the requirements of the EPA Act, 1994 (Act 490), Part II on Chemicals/Pesticides Management.
- iv. Provide appropriate storage facilities for pesticides and other agrochemicals.
- v. Ensure adequate measures to contain accidental spillage of pesticides and chemicals to avoid contaminated of soil and water.
- vi. Ensure that empty pesticides and chemical containers and packaging materials are managed and disposed off in an environmentally sound manner in accordance with EPA guidelines for disposal of waste chemical containers.
- vii. Keep inventory of quantities of pesticides and agro chemical usage.
- viii. Pesticides should be sprayed during periods when drifts are expected to be minimal.

**7.4 Land Preparation and Water Resources Protection**

- i. Undertake land preparation and cultivation in such a way to minimise disruption of soil structure and exposure of soil to erosion. Institute appropriate drainage control measures to minimise flooding.
- ii. Comply with the national buffer zone policy by establishing and maintaining the appropriate buffer zone distances along the water bodies traversing the project area.
- iii. Monitor the water quality parameters of the various streams quarterly and include returns in the Annual Environmental Reports. The parameters to be monitored are as indicated in Section 7.8. The preferred sampling times should be close to sunrise and sunset.
- iv. GPS coordinates of the sampling stations/locations should be determined for all sampling sites and reported.

**7.5 Solid Waste Management**

- i. Explore conversion of solid waste from plant materials into compost for use on the farm.
- ii. Provide garbage bins for solid waste generated to prevent littering.
- iii. Plastic wastes from the plantation should be disposed off at approved disposal points as directed by Berekum District.
- iv. Disposal of solid waste should be done at Berekum District approved landfill sites.
- v. Consult the EPA for advice before disposing any expired chemicals.
- vi. In order to prevent soil contamination at the mechanical workshop, all exposed surfaces at the workshop should be concreted.
- vii. Over aged trees felled should be used for fuel or composted to be used as soil amendments.

- 7.6 Health and Safety**
- i. Ensure good housekeeping in the office areas and residential camp where applicable
  - ii. Field workers handling chemical products must have adequate training on the appropriate use of products.
  - iii. Ensure that persons applying pesticides and chemicals undergo periodic medical check-ups.
  - iv. Provide appropriate personnel protective clothing/gear such as rubber, gloves, overall, safety boots, hand gloves, etc. to workers.
  - v. Provide a well-stocked first aid kit for minor injuries that might occur.
  - vi. Adhere to the Health and Safety Action Plan indicated in the project EMP.
  - vii. Ensure adequate record keeping and establish an inventory of accidents and disease outbreak and treatment on the farms.
  - viii. Workers must undergo medical check-up at least twice a year to assess their health status with respect to operations on the farm.
- 7.7 Protection of Biodiversity Resources**
- i. Implement measures to conserve biodiversity by maintaining vegetation along the various streams in the concession.
  - ii. Create conservation areas that act as corridors and avoid harvesting in the corridors.
  - iii. Ensure that rare floral identified and indigenous species are retained within the plantation.
  - iv. Avoid contiguous harvesting of large areas in order to minimize disruption to landscape.
  - v. Foliage should be left on the soil to protect against moisture loss and provide nutrients to the soil.
- 7.8 Soil and Water Quality Monitoring**
- i. Establish an environmental monitoring programme in the adjacent or traversing water bodies to cover the following:
  - ii. Water quality: pH, Turbidity, colour, TSS, TDS, Phosphates, Ammonia-Nitrogen, Nitrate-Nitrogen, Nitrite – Nitrogen, Potash, Total Coliforms, E. Coli, etc.
  - iii. Monitor the nutrient status of the soil in respect of soil organic carbon every year.
  - iv. Submit the results of the monitoring as part of Annual Environmental Reports (AER).
- 7.9 Social Economic Impacts**
- i. Ensure that the livelihoods of adjoining communities are not impacted negatively by the project operations.
  - ii. Integrate social and environmental agreements/clauses in suppliers' contracts.
  - iii. Undertake corporate social responsibility activities in accordance with the company's policy and agreements with the relevant communities.
- 7.10 Compliance with Mitigation Measures**
- i. Comply with all the mitigation, monitoring and environmental management commitments made in the Environmental Management Plan (EMP).

- 7.11 Compliance with the Factories Offices and Shops Act 1979 (Act 328)**
  - i. Comply with the requirements of the Factories, Offices and Shops Act, 1979 (Act 328). Consult with the Factories Inspectorate Department in order to satisfy the requirements of the Act.
- 7.12 Compliance with Fire Precaution (Premises) Regulations, 2003 (L.I. 1724)**
  - i. Provide appropriate fire extinguishers and other requirements as recommended by the Ghana National Fire Service.
  - ii. Install fire alarm system and smoke detectors at vulnerable areas to give early warning of any fire outbreak.
  - iii. No smoking signs should be posted at areas where flammable solvents and fuel are stored.
  - iv. Fire belts or boundary lines should be created to prevent fire from spreading to adjoining areas.
- 7.13 Comply with Water Resources Commission Act, 1996, (Act 522)**
  - i. Comply with the requirements of the Water Resources Commission Act, 1996, Act 522 and obtain water abstraction Permits.
- 7.14 Notification of Changes**
  - i. Notify EPA of any changes in the planned development of the project contrary to the specification provided in the project's Environmental Management Plan (EMP).
- 7.15 Annual Environmental Report**
  - i. Submit Annual Environmental Reports on the company's operations in accordance with Section 25 of L.I 1652. The first report should be submitted by August 15, 2019.
- 7.16 Permit Awareness**
  - i. A copy of this Permit shall be displayed prominently on the premises at all times.
  - ii. All operations staff at the premises shall be familiar with the conditions of the Permit.
- 7.17 Renewal of Permit**
  - i. This Permit should be renewed by August 14, 2021 upon submission of a satisfactory Environmental Management Plan (EMP).
- 7.18 Accessibility to the Site**
  - i. Make all facilities available for inspection and cooperate with EPA officials during inspections.
- 7.19 Other Permits**
  - i. Notwithstanding this Permit, the project is further subject to other relevant regulations and Permits pertaining to the sector and must be observed.



**7.20 Permit Transferability and Limitation**


- i. This Permit is not transferable. It can be used only for FORM GHANA LIMITED's existing 14,576 hectare Reforestation project located within the degraded Tain II Forest Reserve in the Berekum District of the Brong Ahafo Region.
- ii. This Permit does not cover the company's processing activities. A separate Permit must be obtained for all produce processing operators.

**7.21 Revocation, Suspension and Refusal of Permit**

- i. The Agency shall revoke or suspend a Permit issued or shall refuse to renew a Permit where:
  - a) The provisions and conditions of this Permit are not being satisfactorily complied with.
  - b) The continued operation of the project poses a risk to the environment, public health and safety.
  - c) The operations by the proponent have deteriorated below the required standard.
  - d) Different species of plant have been introduced into the farm without approval of the Agency.

**7.22 Penalty for Breach of Conditions of Environmental Permit**

- i. Providing false information or failure to comply with or observe any or all the Permit conditions above shall:
  - a) Attract administrative penalties and or the necessary fines as shall be prescribed by the Agency, in line with the Fees and Charges (Amendment) Instrument 2015, (L.I. 2228).
  - b) Attract the necessary sanctions prescribed under Regulation 26 of the EAR 1999, LI 1652.
  - c) Render this Environmental Permit invalid.
  - d) Lead to the suspension or revocation of this Permit or Prosecution.

  
**EBENEZER APPAH – SAMPONG**  
**DEPUTY EXECUTIVE DIRECTOR/TECHNICAL**  
**FOR: AG. EXECUTIVE DIRECTOR**

**August 15, 2018**  
**Date Issued**

**August 14, 2021**  
**Expiry Date**

**Notification:**

The Hon. Minister Ministry of Environment Science Technology and Innovation, Accra  
The Ag. Executive Secretary, Water Resources Commission, Accra.  
The District Chief Executive, Berekum District Assembly, Berekum.  
The Regional Director, Environmental Protection Agency, Brong Ahafo Region, Sunyani

**Appendix 2: Water Resources Commission Permit**

**WATER RESOURCES COMMISSION**



**Permit No: FGLID409/18**

**WATER USE PERMIT**

This is to certify that a Water Use Permit has been issued to:


**FORM GHANA LIMITED**

To abstract groundwater from four (4) boreholes at Berekum in the Berekum Municipal of the Brong Ahafo Region for industrial purposes as per attached schedule

**Commencement: January 1, 2019**

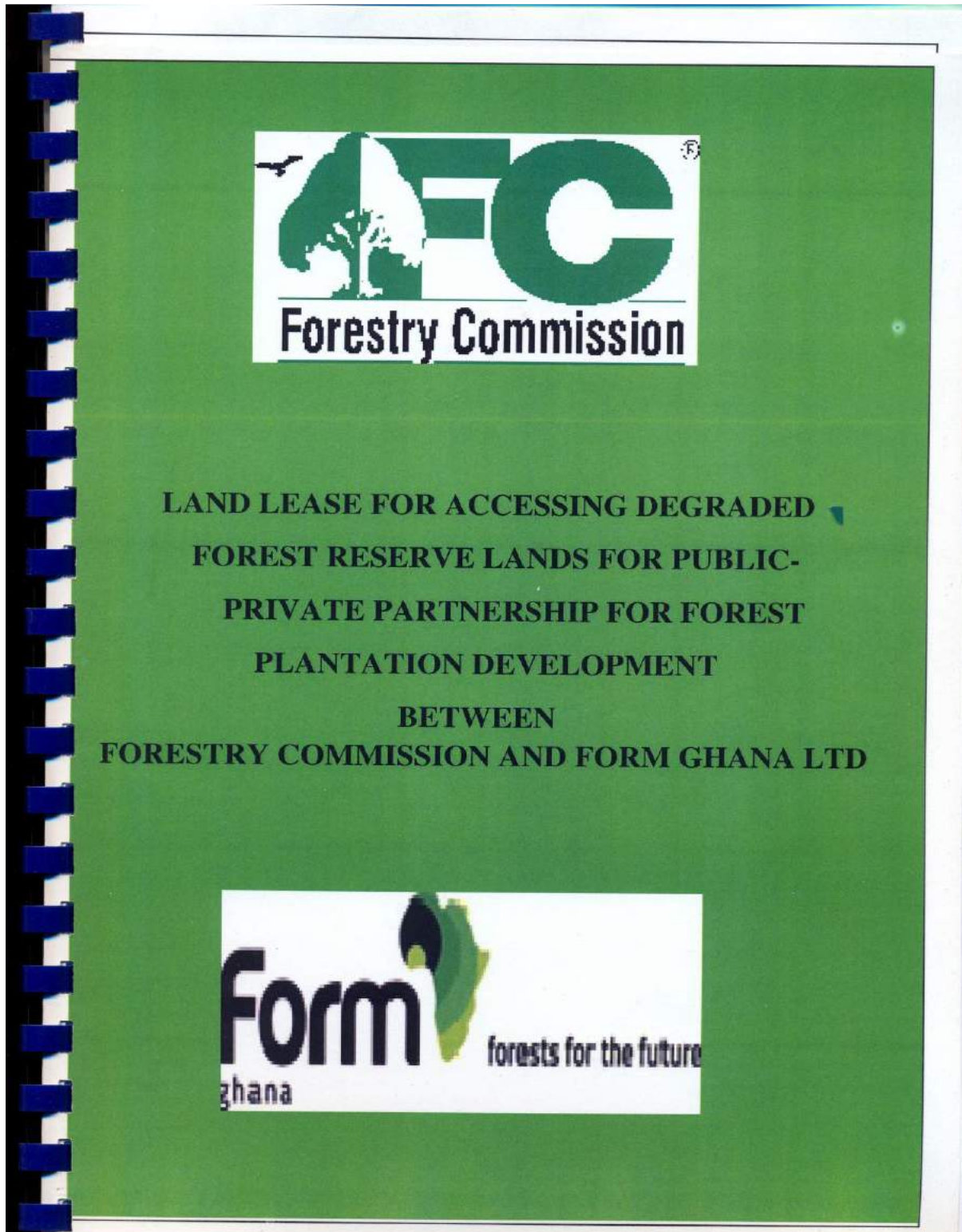
**Validity Period: 3 Years**

**Expiry Date: December 31, 2021**

  
**BEN Y. AMPOMAH**  
**EXECUTIVE SECRETARY**


This Permit is issued in accordance with the Water Use Regulations 2001, LI 1692 and is only valid with the Seal of the Water Resources Commission

**Appendix 3: Forestry Commission Permit**



**Appendix 4: Certificate of incorporation**

No. CA-37,338



REPUBLIC OF GHANA

## Certificate of Incorporation


I hereby certify that the


**FORM GHANA LIMITED**

---

is this day incorporated under the Companies Code, 1963 (Act 179) and that the liability of its members is limited.

Given under my hand and official seal at Victoriaborg, Accra,  
this 24TH day of AUGUST, 20 07.

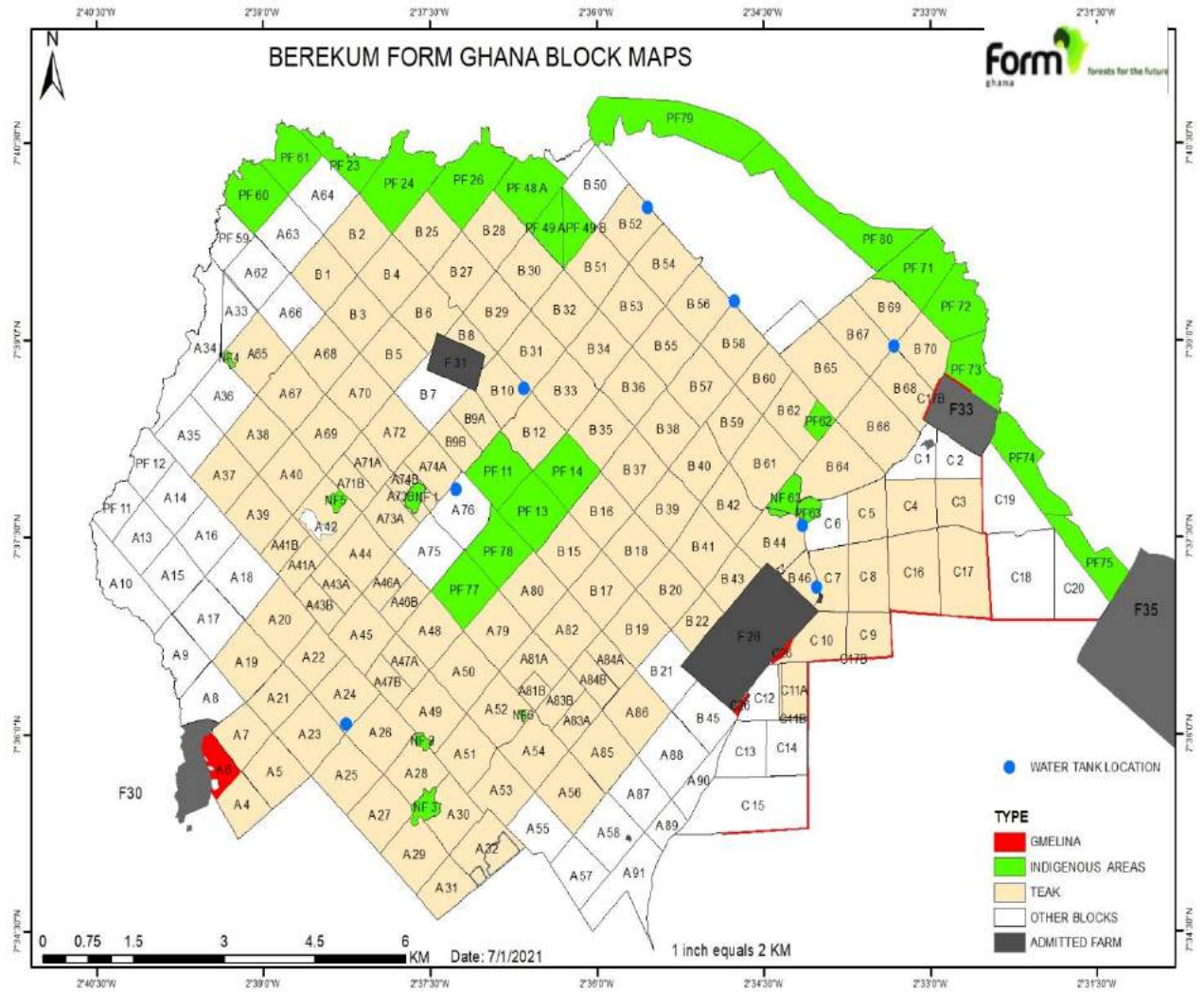


FOR:   
Registrar of Companies, Ghana

Appendix 5: Certificate to commence business

No. CA-37,338	TIN-824V025997
COMPANIES CODE, 1963	
	
REPUBLIC OF GHANA	
<b>CERTIFICATE TO COMMENCE BUSINESS</b>	
<i>I hereby certify that</i>	
FORM GHANA LIMITED	
having complied with the provision of Sections 27 and 28 of the Companies Code, 1963 is entitled to commence business with effect from 28TH AUGUST, 2007.	
Given under my hand at Accra this 28TH day of AUGUST, 20 07.	
	 Assistant Registrar of Companies

Appendix 6: Layout Plan/Compartment Plan



Appendix 7: Water quality analysis report

# GHANA WATER COMPANY LIMITED

**Main Bankers:** Social Security Bank  
Ghana Commercial Bank



**Brong Ahafo Region**  
Post Office Box 88  
Sunyani – B/A

**My Ref. No.:**.....

29<sup>th</sup> Jan, 2018

**Your Ref. No.:**.....

Attn; Form Ghana (Berekum)

### CERTIFICATE OF ANALYSIS

<b>Sample Description:</b>	Borehole water sample	<b>Product Date</b>
<b>Brand Name :</b>	Form Ghana Berekum(Tower 2.) Borehole Water.	<b>Expiry date</b>
<b>Country of Origin:</b>	Ghana	<b>Batch No.</b>
<b>Net wt/ volume:</b>	-	
<b>Packaging Type:</b>	Bulk	

### TEST RESULTS

PHYSICO-CHEMICAL ANALYSIS:				DATE OF ANALYSIS: 23/01/2018	
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	STANDARD SPECIFICATION	Borehole (2)	
Temperature		°C	-	25.6	
pH	Electrometric	-	6.5-8.5	6.58	
Residual free chlorine	Colorimetric	-	0.0	0.0	
Colour	Platinum-cobalt	Pt.Co	0-15	5.0	
Turbidity	Nephelometric	FTU	5	0.02	
Conductivity	Electrometric	µs/cm	-	400.0	
Total Dissolved Solids	Electrometric	ppm	1000	200.0	
Total Hardness	Titrimetric	ppm	500	170.0	
Calcium Hardness	Titrimetric	ppm	-	90.0	
Dissolved Oxygen	Electrometric	mg/l	-	3.0	
Chemical Oxygen Demand	Reactor Digestion	0.0-1500ppm	250	0.0	
Alkalinity	Titrimetric	ppm	-	178.0	
Biochemical Oxygen Demand	Manometric Method	0.0-600ppm	50	0.0	

Chloride	Argentometric titration	ppm	250	35.0
Nitrite	Diazotization	0.0-0.300ppm	3.0	0.020
Nitrate	Cadmium reduction	0.0-30ppm	50	25.0
Ammonia(Nitrogen)	Nessler	0.0-2.50ppm	1.5	0.61
Fluoride	Spands	0.0-2.00ppm	1.5	0.06
Iron	FerroVer	0.0-3.00ppm	0.3	0.11
Sulphate	Sulfaver 4	0.0-70ppm	250	10.0
Manganese	Periodate oxidation	0.0-20.0ppm	0.5	0.03
Phosphate	PhosVer 3	0.0-2.5ppm	0.3	0.044
Aluminium	Aluminon method	0.0-0.80ppm	0.2	0.0
Cyanide	Pyridine-pyrazalone	0.0-0.200ppm	0.07	0.0
Arsenic	2822800(EZ arsenic)	0.0-500ppm	0.01	0.0

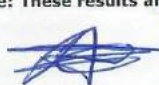
23/01/2018

PARAMETER	TEST METHOD	UNIT	SPECIFICATION/ METHOD DETECTION LIMIT	Borehole
E.Coli	Multiple tube	MPN Index/ 100mL	0.0	0.0
Faecal coliform	Multiple tube	MPN Index/ 100mL	0.0	0.0
Total Viable Count	Total plate count	CFU	0-3	0.0

**REMARKS:**

The source water sample as submitted to the laboratory does satisfy the required Standard for its parameters and is recommended for domestic use.

**Note:** These results are only applicable to the samples submitted to the laboratory.



REGIONAL W. Q. A. MANAGER  
GHANA WATER CO. LTD.  
SUNYANI BRONG AHAFO

Water Quality Assurance Supervisor

(Unity.k. Agudogo)

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr. Clifford Braimah ( Managing Director), Mr Joseph Obeng- Poku , Mr Michael Ayesu., Naaba Sigr Gewong ,Hon. Kwame Twumasi Amporfo, Mr.Clement Alosebuno Kaba ,Dr.Forster Kum-Ankama Sarpong , Madam Maria Aba Lovelace-Johnson.Mr.Alexander K.B. Bonney, Mrs.Serena Kwakye-Mintah  
Registered Office: 28<sup>th</sup> February Road, (Near Independence Square)  
Telephone: 233-0302-666781-7 Fax: 233-0302-663552 Telegrams: DIRWAT  
website: www.gwcl.com.gh e-mail: info@gwcl.com.gh



# GHANA WATER COMPANY LIMITED

**Main Bankers:** Social Security Bank  
Ghana Commercial Bank



**Brong Ahafo Region**  
**Post Office Box 88**  
**Sunyani – B/A**

**My Ref. No.:**.....

29<sup>th</sup> Jan, 2018

**Your Ref. No.:**.....

Attn; Form Ghana (Berekum)

## CERTIFICATE OF ANALYSIS

<b>Sample Description:</b>	Borehole water sample	
<b>Brand Name :</b>	Form Ghana Berekum(site) Borehole Water.	<b>Product Date</b>
<b>Country of Origin:</b>	Ghana	<b>Expiry date</b>
<b>Net wt/ volume:</b>	-	<b>Batch No.</b>
<b>Packaging Type:</b>	Bulk	

### TEST RESULTS

<b>PHYSICO-CHEMICAL ANALYSIS:</b>				<b>DATE OF ANALYSIS: 23/01/2018</b>
<b>PARAMETER</b>	<b>TEST METHOD</b>	<b>METHOD DETECTION LIMIT/UNITS</b>	<b>STANDARD SPECIFICATION</b>	<b>Borehole</b>
Temperature		°C	-	24.5
pH	Electrometric	-	6.5-8.5	6.3
Residual free chlorine	Colorimetric	-	0.0	0.0
Colour	Platinum-cobalt	Pt.Co	0-15	4.0
Turbidity	Nephelometric	FTU	5	0.04
Conductivity	Electrometric	µs/cm	-	215.0
Total Dissolved Solids	Electrometric	ppm	1000	108.0
Total Hardness	Titrimetric	ppm	500	56.0
Calcium Hardness	Titrimetric	ppm	-	37.0
Magnesium Hardness	Titrimetric	ppm	-	19.0
Chemical Oxygen Demand	Reactor Digestion	0.0-1500ppm	250	0.0
Alkalinity	Titrimetric	ppm	-	42.0

Biochemical Oxygen Demand	Manometric Method	0.0-600ppm	50	0.0
Chloride	Argentometric titration	ppm	250	38.0
Nitrite	Diazotization	0.0-0.300ppm	3.0	0.030
Nitrate	Cadmium reduction	0.0-30ppm	50	1.15
Ammonia(Nitrogen)	Nessler	0.0-2.50ppm	1.5	0.3
Fluoride	Spands	0.0-2.00ppm	1.5	0.10
Iron	FerroVer	0.0-3.00ppm	0.3	0.005
Sulphate	Sulfaver 4	0.0-70ppm	250	18.0
Manganese	Periodate oxidation	0.0-20.0ppm	0.5	0.002
Phosphate	PhosVer 3	0.0-2.5ppm	0.3	0.010
Aluminium	Aluminon method	0.0-0.80ppm	0.2	0.0
Cyanide	Pyridine-pyrazalone	0.0-0.200ppm	0.07	0.0
Arsenic	2822800(EZ arsenic)	0.0-500ppm	0.01	0.0


23/01/2018

PARAMETER	TEST METHOD	UNIT	SPECIFICATION/ METHOD DETECTION LIMIT	Borehole
E.Coli	Multiple tube	MPN Index/ 100mL	0.0	0.0
Faecal coliform	Multiple tube	MPN Index/ 100mL	0.0	0.0
Total Viable Count	Total plate count	CFU	0-3	0.0

**REMARKS:**

The source water sample as submitted to the laboratory does satisfy the required Standard for its parameters except pH which is low and it need to be treated before domestic use.

Note: These results are only applicable to the samples submitted to the laboratory.



Water Quality Assurance Supervisor  
(Unity.k. Agudogo)

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr. Clifford Braimah (Managing Director), Mr Joseph Obeng-Poku, Mr Michael Ayesu., Naaba Sigr Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr. Alexander K.B. Bonney, Mrs. Serena Kwakye-Mintah  
Registered Office: 28<sup>th</sup> February Road, (Near Independence Square)  
Telephone: 233-0302-666781-7 Fax: 233-0302-663552 Telegrams: DIRWAT  
website: www.gwcl.com.gh e-mail: info@gwcl.com.gh

# GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank  
Ghana Commercial Bank



Brong Ahafo Region  
Post Office Box 88  
Sunyani – B/A

My Ref. No.:.....

29<sup>th</sup> Jan, 2018

Your Ref. No.:.....

Attn; Form Ghana (Berekum)

## CERTIFICATE OF ANALYSIS

Sample Description:	Borehole water sample	
Brand Name :	Form Ghana Berekum(Tower 1.) Borehole Water.	Product Date
Country of Origin:	Ghana	Expiry date
Net wt/ volume:	-	Batch No.
Packaging Type:	Bulk	

### TEST RESULTS

PHYSICO-CHEMICAL ANALYSIS:				DATE OF ANALYSIS: 23/01/2018	
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	STANDARD SPECIFICATION	Borehole (1)	
Temperature		°C	-	25.7	
pH	Electrometric	-	6.5-8.5	6.87	
Residual free chlorine	Colorimetric	-	0.0	0.0	
Colour	Platinum-cobalt	Pt.Co	0-15	5.0	
Turbidity	Nephelometric	FTU	5	0.01	
Conductivity	Electrometric	µs/cm	-	553.0	
Total Dissolved Solids	Electrometric	ppm	1000	277.0	
Total Hardness	Titrimetric	ppm	500	235.0	
Calcium Hardness	Titrimetric	ppm	-	193.0	
Dissolved Oxygen	Electrometric	mg/l	-	4.2	
Chemical Oxygen Demand	Reactor Digestion	0.0-1500ppm	250	0.0	
Alkalinity	Titrimetric	ppm	-	257.0	
Biochemical Oxygen Demand	Manometric Method	0.0-600ppm	50	0.0	

Chloride	Argentometric titration	ppm	250	42.0
Nitrite	Diazotization	0.0-0.300ppm	3.0	0.016
Nitrate	Cadmium reduction	0.0-30ppm	50	4.9
Ammonia(Nitrogen)	Nessler	0.0-2.50ppm	1.5	0.3
Fluoride	Spands	0.0-2.00ppm	1.5	0.10
Iron	FerroVer	0.0-3.00ppm	0.3	0.090
Sulphate	Sulfaver 4	0.0-70ppm	250	15.0
Manganese	Periodate oxidation	0.0-20.0ppm	0.5	0.03
Phosphate	PhosVer 3	0.0-2.5ppm	0.3	0.011
Aluminium	Aluminon method	0.0-0.80ppm	0.2	0.0
Cyanide	Pyridine-pyrazalone	0.0-0.200ppm	0.07	0.0
Arsenic	2822800(EZ arsenic)	0.0-500ppm	0.01	0.0

23/01/2018


PARAMETER	TEST METHOD	UNIT	SPECIFICATION/ METHOD DETECTION LIMIT	Borehole
E.Coli	Multiple tube	MPN Index/ 100mL	0.0	0.0
Faecal coliform	Multiple tube	MPN Index/ 100mL	0.0	0.0
Total Viable Count	Total plate count	CFU	0-3	0.0

**REMARKS:**

The source water sample as submitted to the laboratory does satisfy the required Standard for its parameters and is recommended for domestic use.

**Note:** These results are only applicable to the samples submitted to the laboratory.

REGIONAL W. Q. A. MANAGER  
GHANA WATER CO. LTD.  
KURTAN BRONG AHAFO



Water Quality Assurance Supervisor

(Unity.k. Agudogo)

**Board of Directors:** Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr. Clifford Braimah ( Managing Director), Mr Joseph Obeng- Poku , Mr Michael Ayesu., Naaba Sigr Gewong ,Hon. Kwame Twumasi Amporfo, Mr.Clement Alosebuno Kaba ,Dr.Forster Kum-Ankama Sarpong , Madam Maria Aba Lovelace-Johnson.Mr.Alexander K.B. Bonney, Mrs.Serena Kwakye-Mintah  
Registered Office: 28<sup>th</sup> February Road, (Near Independence Square)  
Telephone: 233-0302-666781-7 Fax: 233-0302-663552 Telegrams: DIRWAT  
website: www.gwcl.com.gh e-mail: info@gwcl.com.gh

# GHANA WATER COMPANY LIMITED

**Main Bankers:** Social Security Bank  
Ghana Commercial Bank



**Brong Ahafo Region**  
**Post Office Box 88**  
**Sunyani – B/A**

**My Ref. No.:**.....

26<sup>th</sup> June, 2018

**Your Ref. No.:**.....

Attn. FORM GHANA P.O. BOX 211, SUNYANI- B/A

## CERTIFICATE OF ANALYSIS

<b>Sample Description:</b> Borehole water samples	
<b>Brand Name :</b> Form Ghana Berekum Borehole Water	<b>Product Date</b>
<b>Country of Origin:</b> Ghana	<b>Expiry date</b>
<b>Net wt/ volume:</b> 500ml	<b>Batch No.</b>
<b>Packaging Type:</b>	

### TEST RESULTS

<b>PHYSICO-CHEMICAL ANALYSIS:</b>				<b>DATE OF ANALYSIS: 21/05/2018</b>		
<b>PARAMETER</b>	<b>TEST METHOD</b>	<b>METHOD DETECTION LIMIT/UNITS</b>	<b>STANDARD SPECIFICATION</b>	<b>RESULTS</b>		
				<b>Borehole (Tower 1)</b>	<b>Borehole (Tower 3)</b>	<b>Borehole (Site)</b>
Temperature		°C	-	26.3	26.4	26.9
pH	Electrometric	-	6.5-8.5	7.0	6.9	6.5
Dissolved Oxygen	Electrometric	ppm	-	2.0	1.4	1.7
Colour	Platinum-cobalt	Pt.Co	0-15	7.0	6.0	5.0
Turbidity	Nephelometric	FTU	5	2.77	1.23	0.62
Conductivity	Electrometric	µs/cm	-	524.0	418.0	320.0
Total Dissolved Solids	Electrometric	ppm	1000	263.0	209.0	159.0
Total Hardness	Titrimetric	ppm	500	189.0	126.0	42.0
Calcium Hardness	Titrimetric	ppm	-	167.0	80.0	26.0
Magnesium Hardness	Titrimetric	ppm	-	22.0	46.0	16.0
Alkalinity	Titrimetric	ppm	-	227.0	174.0	82.0
Chloride	Argentometric titration	ppm	250	28.0	25.0	27.0
Nitrite	Diazotization	0.0-0.300ppm	3.0	0.022	0.015	0.015
Nitrate	Cadmium reduction	0.0-30ppm	50	0.8	0.7	0.2

Ammonia(Nitrogen)	Nessler	0.0-2.50ppm	1.5	0.27	0.20	0.29
Fluoride	Spands	0.0-2.00ppm	1.5	0.86	0.76	1.4
Iron	FerroVer	0.0-3.00ppm	0.3	0.25	0.23	0.05
Sulphate	Sulfaver 4	0.0-70ppm	250	4.0	7.0	5.0
Manganese	Periodate oxidation	0.0-20.0ppm	0.5	0.269	0.259	0.302
Phosphate	PhosVer 3	0.0-2.5ppm	0.3	0.035	0.030	0.050
Aluminium	Aluminon method	0.0-0.80ppm	0.2	0.075	0.051	0.047
Cyanide	Pyridine-pyrazalone	0.0-0.200ppm	0.07	0.0	0.0	0.0
Arsenic	2822800(EZ arsenic)	0.0-500ppm	0.01	0.0	0.0	0.0

MICROBIOLOGICAL ANALYSIS:			DATE OF ANALYSIS: 21/05/2018			
PARAMETER	TEST METHOD	UNIT	SPECIFICATI ON/ METHOD DETECTION LIMIT	RESULTS		
				Borehol e (Tower 1)	Borehole (Tower 3)	Borehol e (Site)
E.Coli	Multiple tube	MPN Index/ 100mL	0.0	0.0	0.0	0.0
Faecal coliform	Multiple tube	MPN Index/ 100mL	0.0	0.0	0.0	0.0
Total Viable Count	Total plate count	CFU	0-3	0.0	0.0	0.0
Pseudomonas	Membrane filter technique	P/A	+/-	-ve	0.0	-ve
Clostridium	Membrane filter technique	P/A	+/-	-ve	0.0	-ve
Streptococcus	Membrane filter technique	P/A	+/-	-ve	0.0	-ve

P/A: PRESENT/ABSENCE

REMARKS: The Source water samples as submitted to the laboratory do satisfy the required standards for their parameters and are recommended for domestic use.

Note: These results are only applicable to the samples submitted to the laboratory.

  
 REGIONAL W. Q. A. MANAGER  
 WATER CO. LTD.  
 BRONG AKAFO  
 Ag. Water Quality Assurance Manager

{Hadisu Alhassan}

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr.Clifford Braimah (. Managing Director), Mr.Joseph Obeng-Poku, Mr.Michael Ayesu, Naaba Sigrí Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr.Alexander K.B. Bonney, Mrs.Serena Kwakye-Mintah  
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 Telephone: 233-0302-666781-7 Fax: 233-0302-663552 Telegrams: DIRWAT  
 Website: www.gwcl.com.gh E-mail: info@gwcl.com.gh

# GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank  
Ghana Commercial Bank



Brong Ahafo Region  
Post Office Box 88  
Sunyani – B/A

My Ref. No.:.....

19<sup>th</sup> March, 2019

Your Ref. No.:.....

Attn. FORM GHANA P.O. BOX 211, SUNYANI- B/A

## CERTIFICATE OF ANALYSIS

Sample Description: Boreholes water samples	
Brand Name : Form Ghana Berekum Boreholes Water	Product Date
Country of Origin: Ghana	Expiry date ; 19/03/2020
Net wt/ volume: 500ml	Batch No.
District: Berekum	

## TEST RESULTS

PHYSICO-CHEMICAL ANALYSIS:				DATE OF ANALYSIS: 01/03/2019	
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	STANDARD SPECIFICATION	RESULTS	
				Borehole A24	Borehole (Site)
Temperature		°C	-	32.0	32.0
pH	Electrometric	-	6.5-8.5	6.7	6.8
Dissolved Oxygen	Electrometric	mg/l	-	1.5	1.9
Colour	Platinum-cobalt	Pt.Co	0-15	6.0	5.0
Turbidity	Nephelometric	NTU	5	1.24	0.58
Conductivity	Electrometric	µs/cm	-	160.0	222.0
Total Dissolved Solids	Electrometric	mg/l	1000	76.0	111.0
Total Hardness	Titrimetric	mg/l	500	71.0	42.0
Calcium Hardness	Titrimetric	mg/l	-	40.0	28.0
Magnesium Hardness	Titrimetric	mg/l	-	31.0	14.0
Alkalinity	Titrimetric	mg/l	-	66.0	84.0
Chloride	Argentometric titration	mg/l	250	50.0	40.0
Nitrite	Diazotization	mg/l	3.0	1.0	0.016
Nitrate	Cadmium reduction	mg/l	50	3.0	0.2
Ammonia(Nitrogen)	Nessler	mg/l	1.5	0.020	0.28


Fluoride	Spands	mg/l	1.5	0.45	1.4
Iron	FerroVer	mg/l	0.3	0.15	0.049
Sulphate	Sulfaver 4	mg/l	250	6.0	5.0
Manganese	Periodate oxidation	mg/l	0.5	0.195	0.301
Phosphate	PhosVer 3	mg/l	0.3	0.055	0.050
Aluminium	Aluminon method	mg/l	0.2	0.0	0.047
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.0	0.0
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.0	0.0

MICROBIOLOGICAL ANALYSIS:				DATE OF ANALYSIS: 01/03/2019	
PARAMETER	TEST METHOD	UNIT	SPECIFICAT ION/ METHOD DETECTION LIMIT	RESULTS	
				Borehole (Tower 1)	Borehole (Site)
E.Coli	Multiple tube	MPN Index/ 100mL	<2.2	<2.2	<2.2
Faecal coliform	Multiple tube	MPN Index/ 100mL	<2.2	15.0	12.0
Total Viable Count	Total plate count	CFU	0-3	60.0	55.0
Pseudomonas	Membrane filter technique	P/A	0.0	0.0	0.0
Clostridium	Membrane filter technique	P/A	0.0	0.0	0.0
Streptococcus	Membrane filter technique	P/A	0.0	0.0	0.0

P/A: PRESENT/ABSENCE

REMARKS: The borehole water samples, as submitted to the laboratory, do satisfy the required standards for their chemical parameters except that of the Microbiological parameters.

Note: These results are only applicable to the samples submitted to the laboratory.



Ag. Water Quality Assurance Manager

**REGIONAL W. Q. A. MANAGER**  
**GHANA WATER CO. LTD.**  
**SUNYANI BRONG AHAFO**

{Hadiu Alhassan}

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman) , Ing. Dr.Clifford Braimah (. Managing Director) , Mr.Joseph Obeng-Poku ,Mr.Michael Ayesu , Naaba Sigr Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong  
 Madam Maria Abu Lovelace-Johnson,Mr.AlexanderK.B. Bonney, Mrs.Serena Kwakye-Mintah  
 Registered Office: 28<sup>th</sup> February Road, (Near Independence Square)  
 Telephone: 233-0302-666781-7 Fax: 233-0302-663552 Telegrams: DIRWAT  
 Website: [www.qwcl.com.gh](http://www.qwcl.com.gh) E-mail: [info@qwcl.com.gh](mailto:info@qwcl.com.gh)



# GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank  
Ghana Commercial Bank



Brong Ahafo Region  
Post Office Box 88  
Sunyani – B/A

My Ref. No.:.....

19<sup>th</sup> March, 2019

Your Ref. No.:.....

Attn. FORM GHANA P.O. BOX 211, SUNYANI- B/A

## CERTIFICATE OF ANALYSIS

Sample Description: Boreholes water samples	Product Date
Brand Name : Form Ghana Berekum Boreholes Water	Expiry date ; 19/03/2020
Country of Origin: Ghana	Batch No.
Net wt/ volume: 500ml	
District: Berekum	

## TEST RESULTS

PHYSICO-CHEMICAL ANALYSIS:				DATE OF ANALYSIS: 01/03/2019	
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	STANDARD SPECIFICATION	Borehole (Tower 1)	Borehole B11
Temperature		°C	-	31.0	32.0
pH	Electrometric	-	6.5-8.5	7.0	6.6
Dissolved Oxygen	Electrometric	mg/l	-	3.0	2.1
Colour	Platinum-cobalt	Pt.Co	0-15	6.0	7.0
Turbidity	Nephelometric	NTU	5	1.95	1.46
Conductivity	Electrometric	µs/cm	-	474.0	356.0
Total Dissolved Solids	Electrometric	mg/l	1000	240.0	175.0
Total Hardness	Titrimetric	mg/l	500	143.0	154.0
Calcium Hardness	Titrimetric	mg/l	-	82.0	84.0
Magnesium Hardness	Titrimetric	mg/l	-	61.0	70.0
Alkalinity	Titrimetric	mg/l	-	220.0	40.0
Chloride	Argentometric titration	mg/l	250	30.0	48.0
Nitrite	Diazotization	mg/l	3.0	0.022	2.0
Nitrate	Cadmium reduction	mg/l	50	0.7	4.0
Ammonia(Nitrogen)	Nessler	mg/l	1.5	0.26	0.01

Fluoride	Spands	mg/l	1.5	0.86	0.15
Iron	FerroVer	mg/l	0.3	0.25	0.24
Sulphate	Sulfaver 4	mg/l	250	4.0	3.0
Manganese	Periodate oxidation	mg/l	0.5	0.230	0.15
Phosphate	PhosVer 3	mg/l	0.3	0.035	0.07
Aluminium	Aluminon method	mg/l	0.2	0.075	0.02
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.0	0.0
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.0	0.01

MICROBIOLOGICAL ANALYSIS:			DATE OF ANALYSIS: 01/03/2019		
PARAMETER	TEST METHOD	UNIT	SPECIFICAT ION/ METHOD DETECTION LIMIT	RESULTS	
				Borehole (Tower 1)	Borehole B11
E.Coli	Multiple tube	MPN Index/ 100mL	<2.2	<2.2	<2.2
Faecal coliform	Multiple tube	MPN Index/ 100mL	<2.2	10.0	9.0
Total Viable Count	Total plate count	CFU	0-3	50.0	40.0
Pseudomonas	Membrane filter technique	P/A	0.0	0.0	0.0
Clostridium	Membrane filter technique	P/A	0.0	0.0	0.0
Streptococcus	Membrane filter technique	P/A	0.0	0.0	0.0

P/A: PRESENT/ABSENCE

REMARKS: The borehole water samples, as submitted to the laboratory, do satisfy the required standards for their chemical parameters except that of the Microbiological parameters.

Note: These results are only applicable to the samples submitted to the laboratory.

  
 REGIONAL W. Q. A. MANAGER  
 GHANA WATER CO. LTD.  
 SUNYANI BRONG AHAFO

Ag. Water Quality Assurance Manager

{Hadisu Alhassan}

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman) , Ing. Dr.Clifford Brainmah (. Managing Director) , Mr.Joseph Obeng-Poku ,Mr.Michael Ayesu , Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Abu Lovelace-Johnson,Mr.AlexanderK.B. Bonney, Mrs.Serena Kwakye-Mintah

Registered Office: 28<sup>th</sup> February Road, (Near Independence Square)  
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 Website: [www.gwcl.com.gh](http://www.gwcl.com.gh) E-mail: [info@gwcl.com.gh](mailto:info@gwcl.com.gh)

# GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank  
Ghana Commercial Bank



Brong Ahafo Region  
Post Office Box 88  
Sunyani - B/A

My Ref. No.:.....

28<sup>th</sup> June, 2019

Your Ref. No.:.....

Attn. FORM GHANA P.O. BOX 211, SUNYANI- B/A

## CERTIFICATE OF ANALYSIS

Sample Description: Boreholes water samples	Product Date
Brand Name : Form Ghana Berekum Boreholes Water	Expiry date ; 28/06/2020
Country of Origin: Ghana	Batch No.
Net wt/ volume: 500ml	
District: Berekum	

## TEST RESULTS

PHYSICO-CHEMICAL ANALYSIS:				DATE OF ANALYSIS: 18/06/2019	
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	STANDARD SPECIFICATION	RESULTS	
				Borehole (B11)	Borehole (Site)
Temperature		°C	-	29.3	29.4
pH	Electrometric	-	6.5-8.5	6.8	6.7
Dissolved Oxygen	Electrometric	mg/l	-	1.9	1.9
Colour	Platinum-cobalt	Pt.Co	0-15	7.0	4.0
Turbidity	Nephelometric	NTU	5	1.20	0.48
Conductivity	Electrometric	µs/cm	-	260.0	208.0
Total Dissolved Solids	Electrometric	mg/l	1000	140.0	106.0
Total Hardness	Titrimetric	mg/l	500	142.0	86.0
Calcium Hardness	Titrimetric	mg/l	-	80.0	60.0
Magnesium Hardness	Titrimetric	mg/l	-	62.0	26.0
Alkalinity	Titrimetric	mg/l	-	80.0	80.0
Chloride	Argentometric titration	mg/l	250	50.0	33.0
Nitrite	Diazotization	mg/l	3.0	1.0	1.0
Nitrate	Cadmium reduction	mg/l	50	3.1	2.0
Ammonia(Nitrogen)	Nessler	mg/l	1.5	0.08	0.1

Fluoride	Spands	mg/l	1.5	0.55	0.89
Iron	FerroVer	mg/l	0.3	0.12	0.09
Sulphate	Sulfaver 4	mg/l	250	5.0	5.0
Manganese	Periodate oxidation	mg/l	0.5	0.11	0.2
Phosphate	PhosVer 3	mg/l	0.3	0.055	0.065
Aluminium	Aluminon method	mg/l	0.2	0.0	0.04
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.0	0.0
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.0	0.0

MICROBIOLOGICAL ANALYSIS:			DATE OF ANALYSIS: 18/06/2019		
PARAMETER	TEST METHOD	UNIT	SPECIFICAT ION/ METHOD DETECTION LIMIT	RESULTS	
				Borehole (B11)	Borehole (Site)
E.Coli	Multiple tube	MPN Index/ 100mL	<2.2	<2.2	<2.2
Faecal coliform	Multiple tube	MPN Index/ 100mL	<2.2	16.0	18.0
Total Viable Count	Total plate count	CFU	0-3	50.0	70.0
Pseudomonas	Membrane filter technique	P/A	0.0	0.0	0.0
Clostridium	Membrane filter technique	P/A	0.0	0.0	0.0
Streptococcus	Membrane filter technique	P/A	0.0	0.0	0.0

P/A: PRESENT/ABSENCE

REMARKS: The boreholes water samples, as submitted to the laboratory, do satisfy the required standards for their chemical parameters except that of the Microbiological parameters. A planned disinfection schedule in three months interval is necessary to ensure microbial safety.

Note: These results are only applicable to the samples submitted to the laboratory.

02/07/19  
 REGIONAL W. Q. A. MANAGER  
 WATER CO. LTD.  
 SUNYANI BRONG AHAFO  
 Regional WQA Manager  
 {Janet Atebiya}

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman) , Ing. Dr.Clifford Braimah (. Managing Director) , Mr.Joseph Obeng-Poku ,Mr.Michael Ayesu , Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson,Mr.AlexanderK.B. Bonney, Mrs.Serena Kwakye-Mintah  
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 Website: [www.gwcl.com.gh](http://www.gwcl.com.gh) E-mail: [info@gwcl.com.gh](mailto:info@gwcl.com.gh)

# GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank  
Ghana Commercial Bank



Brong Ahafo Region  
Post Office Box 88  
Sunyani – B/A

My Ref. No.:.....

28<sup>th</sup> June, 2019

Your Ref. No.:.....

Attn. FORM GHANA P.O. BOX 211, SUNYANI- B/A

## CERTIFICATE OF ANALYSIS

Sample Description: Boreholes water samples	
Brand Name : Form Ghana Berekum Boreholes Water	Product Date
Country of Origin: Ghana	Expiry date ; 28/06/2020
Net wt/ volume: 500ml	Batch No.
District: Berekum	

## TEST RESULTS

PHYSICO-CHEMICAL ANALYSIS:				DATE OF ANALYSIS: 18/06/2019	
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	STANDARD SPECIFICATION	RESULTS	
				Borehole (B46)	Borehole (A24)
Temperature		°C	-	29.4	29.5
pH	Electrometric	-	6.5-8.5	7.11	6.5
Dissolved Oxygen	Electrometric	mg/l	-	2.0	1.7
Colour	Platinum-cobalt	Pt.Co	0-15	4.0	5.0
Turbidity	Nephelometric	NTU	5	0.78	0.80
Conductivity	Electrometric	µs/cm	-	484.0	125.0
Total Dissolved Solids	Electrometric	mg/l	1000	246.0	64.0
Total Hardness	Titrimetric	mg/l	500	184.0	54.0
Calcium Hardness	Titrimetric	mg/l	-	158.0	39.0
Magnesium Hardness	Titrimetric	mg/l	-	26.0	15.0
Alkalinity	Titrimetric	mg/l	-	226.0	50.0
Chloride	Argentometric titration	mg/l	250	37.0	27.0
Nitrite	Diazotization	mg/l	3.0	0.76	1.0
Nitrate	Cadmium reduction	mg/l	50	1.3	2.9
Ammonia(Nitrogen)	Nessler	mg/l	1.5	0.08	0.08

Fluoride	Spands	mg/l	1.5	0.72	0.74
Iron	FerroVer	mg/l	0.3	0.04	0.07
Sulphate	Sulfaver 4	mg/l	250	4.0	2.0
Manganese	Periodate oxidation	mg/l	0.5	0.22	0.034
Phosphate	PhosVer 3	mg/l	0.3	0.050	0.3
Aluminium	Aluminon method	mg/l	0.2	0.0	0.02
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.0	0.0
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.0	0.0

MICROBIOLOGICAL ANALYSIS:			DATE OF ANALYSIS: 18/06/2019		
PARAMETER	TEST METHOD	UNIT	SPECIFICAT ION/ METHOD DETECTION LIMIT	RESULTS	
				Borehole (B46)	Borehole (A24)
E.Coli	Multiple tube	MPN Index/ 100mL	<2.2	<2.2	<2.2
Faecal coliform	Multiple tube	MPN Index/ 100mL	<2.2	<2.2	<2.2
Total Viable Count	Total plate count	CFU	0-3	0.0	0.0
Pseudomonas	Membrane filter technique	P/A	0.0	0.0	0.0
Clostridium	Membrane filter technique	P/A	0.0	0.0	0.0
Streptococcus	Membrane filter technique	P/A	0.0	0.0	0.0

P/A: PRESENT/ABSENCE

REMARKS: The boreholes water samples, as submitted to the laboratory, do satisfy the required standards for their parameters and are recommended for domestic use. A planned disinfection schedule in three months interval is necessary to ensure microbial safety.

Note: These results are only applicable to the samples submitted to the laboratory.

Regional WQA Manager  
 {Janet Atebiya}

2002/07/19  
 REGIONAL W. Q. A. MANAGER  
 GHANA WATER CO. LTD.  
 SUNYANI BRONG AHAFU

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman) , Ing. Dr.Clifford Braimah (. Managing Director) , Mr.Joseph Obeng-Poku ,Mr.Michael Ayesu , Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson,Mr.AlexanderK.B. Bonney, Mrs.Serena Kwakye-Mintah  
 Registered Office: 28<sup>th</sup> February Road, (Near Independence Square)  
 Telephone: 233-0302-666781-7 Fax: 233-0302-663552 Telegrams: DIRWAT  
 Website: [www.gwcl.com.gh](http://www.gwcl.com.gh) E-mail: [info@gwcl.com.gh](mailto:info@gwcl.com.gh)

# GHANA WATER COMPANY LIMITED

**Main Bankers:** Social Security Bank  
Ghana Commercial Bank



**Brong Ahafo Region**  
**Post Office Box 88**  
**Sunyani - B/A**

**My Ref. No.:**.....

4<sup>th</sup> September, 2019

**Your Ref. No.:**.....

Attn. FORM GHANA P.O. BOX 211, SUNYANI- B/A

## CERTIFICATE OF ANALYSIS

<b>Sample Description:</b> Boreholes water samples	
<b>Brand Name :</b> Form Ghana Berekum Boreholes Water	<b>Product Date</b>
<b>Country of Origin:</b> Ghana	<b>Expiry date ; 4/09/2020</b>
<b>Net wt/ volume:</b> 500ml	<b>Batch No.</b>
<b>District:</b> Berekum	

## TEST RESULTS

PHYSICO-CHEMICAL ANALYSIS:				DATE OF ANALYSIS: 20/08/2019	
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	STANDARD SPECIFICATION	RESULTS	
				Borehole (B46)	Borehole (A24)
Temperature		°C	-	27.9	27.7
pH	Electrometric	-	6.5-8.5	7.08	6.5
Dissolved Oxygen	Electrometric	mg/l	-	2.2	1.8
Colour	Platinum-cobalt	Pt.Co	0-15	5.0	4.0
Turbidity	Nephelometric	NTU	5	0.58	0.14
Conductivity	Electrometric	µs/cm	-	462.0	128.0
Total Dissolved Solids	Electrometric	mg/l	1000	236.0	66.0
Total Hardness	Titrimetric	mg/l	500	193.0	72.0
Calcium Hardness	Titrimetric	mg/l	-	111.0	46.0
Magnesium Hardness	Titrimetric	mg/l	-	82.0	26.0
Alkalinity	Titrimetric	mg/l	-	210.0	50.0
Chloride	Argentometric titration	mg/l	250	37.0	26.0
Nitrite	Diazotization	mg/l	3.0	0.06	1.0
Nitrate	Cadmium reduction	mg/l	50	1.2	2.7
Ammonia(Nitrogen)	Nessler	mg/l	1.5	0.07	0.08

Fluoride	Spands	mg/l	1.5	0.56	0.73
Iron	FerroVer	mg/l	0.3	0.04	0.06
Sulphate	Sulfaver 4	mg/l	250	4.0	2.0
Manganese	Periodate oxidation	mg/l	0.4	0.21	0.032
Phosphate	PhosVer 3	mg/l	0.3	0.050	0.3
Aluminium	Aluminon method	mg/l	0.2	0.0	0.02
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.0	0.0
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.0	0.0

MICROBIOLOGICAL ANALYSIS:			DATE OF ANALYSIS: 20/08/2019		
PARAMETER	TEST METHOD	UNIT	SPECIFICAT ION/ METHOD DETECTION LIMIT	RESULTS	
				Borehole (B46)	Borehole (A24)
E.Coli	Multiple tube	MPN Index/ 100mL	<2.2	<2.2	<2.2
Faecal coliform	Multiple tube	MPN Index/ 100mL	<2.2	<2.2	<2.2
Total Viable Count	Total plate count	CFU	0-3	0.0	0.0

P/A: PRESENT/ABSENCE

REMARKS: The borehole water samples as submitted to the laboratory, do satisfy the required standards for their parameters and hence, the source water is recommended for domestic use. A planned disinfection schedule of three months interval is necessary to ensure microbial safety.

Note: These results are only applicable to the samples submitted to the laboratory.

Regional WQA Manager  
{Janet Atebiya}

REGIONAL W. Q. A. MANAGER  
GHANA WATER CO. LTD.  
SUNYANI BRONG AHAFU

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr.Clifford Braimah (. Managing Director), Mr.Joseph Obeng-Poku, Mr.Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr.Alexander K.B. Bonney, Mrs.Serena Kwakye-Mintah  
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Website: [www.gwcl.com.gh](http://www.gwcl.com.gh) E-mail: [info@gwcl.com.gh](mailto:info@gwcl.com.gh)



# GHANA WATER COMPANY LIMITED

Main Bankers: Social Security Bank  
Ghana Commercial Bank



Brong Ahafo Region  
Post Office Box 88  
Sunyani – B/A

My Ref. No.:.....

4<sup>th</sup> September, 2019

Your Ref. No.:.....

Attn. FORM GHANA P.O. BOX 211, SUNYANI- B/A

## CERTIFICATE OF ANALYSIS

Sample Description: Boreholes water samples	Product Date
Brand Name : Form Ghana Berekum Boreholes Water	Expiry date ; 4/09/2020
Country of Origin: Ghana	Batch No.
Net wt/ volume: 500ml	
District: Berekum	

## TEST RESULTS

PHYSICO-CHEMICAL ANALYSIS:				DATE OF ANALYSIS: 20/08/2019	
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	STANDARD SPECIFICATION	RESULTS	
				Borehole (B11)	Borehole (Site)
Temperature		°C	-	27.8	27.9
pH	Electrometric	-	6.5-8.5	6.7	6.6
Dissolved Oxygen	Electrometric	mg/l	-	1.7	1.9
Colour	Platinum-cobalt	Pt.Co	0-15	5.0	4.0
Turbidity	Nephelometric	NTU	5	0.59	0.51
Conductivity	Electrometric	µs/cm	-	342.0	201.0
Total Dissolved Solids	Electrometric	mg/l	1000	174.0	101.0
Total Hardness	Titrimetric	mg/l	500	145.0	73.0
Calcium Hardness	Titrimetric	mg/l	-	83.0	53.0
Magnesium Hardness	Titrimetric	mg/l	-	62.0	20.0
Alkalinity	Titrimetric	mg/l	-	80.0	74.0
Chloride	Argentometric titration	mg/l	250	48.0	36.0
Nitrite	Diazotization	mg/l	3.0	0.9	1.2
Nitrate	Cadmium reduction	mg/l	50	3.1	2.0
Ammonia(Nitrogen)	Nessler	mg/l	1.5	0.07	0.1


Fluoride	Spands	mg/l	1.5	0.50	0.88
Iron	FerroVer	mg/l	0.3	0.11	0.08
Sulphate	Sulfaver 4	mg/l	250	6.0	5.0
Manganese	Periodate oxidation	mg/l	0.4	0.10	0.2
Phosphate	PhosVer 3	mg/l	0.3	0.054	0.065
Aluminium	Aluminon method	mg/l	0.2	0.0	0.03
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.0	0.0
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.0	0.0

MICROBIOLOGICAL ANALYSIS:			DATE OF ANALYSIS: 20/08/2019		
PARAMETER	TEST METHOD	UNIT	SPECIFICAT ION/ METHOD DETECTION LIMIT	RESULTS	
				Borehole (B11)	Borehole (Site)
E.Coli	Multiple tube	MPN Index/ 100mL	<2.2	<2.2	<2.2
Faecal coliform	Multiple tube	MPN Index/ 100mL	<2.2	<2.2	<2.2
Total Viable Count	Total plate count	CFU	0-3	0.0	0.0

P/A: PRESENT/ABSENCE

REMARKS: The borehole water samples as submitted to the laboratory, do satisfy the required standards for their parameters and hence, the source water is recommended for domestic use. A planned disinfection schedule of three months interval is necessary to ensure microbial safety.

Note: These results are only applicable to the samples submitted to the laboratory.

Regional WQA Manager  **REGIONAL W. Q. A. MANAGER**  
**GHANA WATER CO. LTD.**  
**SUNYANI BRONG AHAFI**

{Janet Atebiya}

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr.Clifford Braimah (. Managing Director), Mr.Joseph Obeng-Poku, Mr.Michael Ayesu, Naaba Sigr Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr.Alexander K.B. Bonney, Mrs.Serena Kwakye-Mintah  
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# GHANA WATER COMPANY LIMITED

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Ghana Commercial Bank



Brong Ahafo Region  
Post Office Box 88  
Sunyani – B/A

My Ref. No.:.....

4<sup>th</sup> September, 2019

Your Ref. No.:.....

Attn. FORM GHANA P. O.BOX 211 SUNYANI- B/A

## CERTIFICATE OF ANALYSIS

Sample Description: Borehole water sample	
Brand Name : Form Ghana Akumadan Borehole Water	Product Date
Country of Origin: Ghana	Expiry date; 4/09/2020
Net wt/ volume: 500ml	Batch No.
District: Akumadan	

### TEST RESULTS

PHYSICO-CHEMICAL ANALYSIS:				DATE OF ANALYSIS: 20/08/2019
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	STANDARD SPECIFICATION	RESULTS Borehole (site)
Temperature		°C	-	27.8
pH	Electrometric	-	6.5-8.5	5.50
Dissolved Oxygen	Electrometric	mg/l	-	2.6
Colour	Platinum-cobalt	Pt.Co	0-15	5.0
Turbidity	Nephelometric	NTU	5	0.44
Conductivity	Electrometric	µs/cm	-	32.0
Total Dissolved Solids	Electrometric	mg/l	1000	17.0
Total Hardness	Titrimetric	mg/l	500	38.0
Calcium Hardness	Titrimetric	mg/l	-	25.0
Magnesium Hardness	Titrimetric	mg/l	-	13.0
Alkalinity	Titrimetric	mg/l	-	20.0
Chloride	Argentometric titration	mg/l	250	19.0
Nitrite	Diazotization	mg/l	3.0	0.01

Nitrate	Cadmium reduction	mg/l	50	1.2
Ammonia(Nitrogen)	Nessler	mg/l	1.5	0.31
Fluoride	Spands	mg/l	1.5	0.70
Iron	FerroVer	mg/l	0.3	0.04
Sulphate	Sulfaver 4	mg/l	250	3.0
Manganese	Periodate oxidation	mg/l	0.4	0.1
Phosphate	PhosVer 3	mg/l	0.3	0.32
Aluminium	Aluminon method	mg/l	0.2	0.09
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.0
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.0

MICROBIOLOGICAL ANALYSIS:			DATE OF ANALYSIS: 20/08/2019	
PARAMETER	TEST METHOD	UNIT	SPECIFICATION/ METHOD DETECTION LIMIT	RESULTS
				Borehole (site)
E.Coli	Multiple tube	MPN Index/ 100mL	<2.2	<2.2
Faecal coliform	Multiple tube	MPN Index/ 100mL	<2.2	<2.2
Total Viable Count	Total plate count	CFU	0-3	0.0

P/A: PRESENT/ABSENCE

REMARKS: The borehole water sample, as submitted to the laboratory, do satisfy the required standards for their parameters and is recommended for domestic use.

Note: These results are only applicable to the samples submitted to the laboratory.

Regional Manager  
**REGIONAL MANAGER**  
**GHANA WATER CO. LTD.**  
 SUNYANI BRONG AHAFU  
 {Janet Asare}

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr.Clifford Bratmah (. Managing Director), Mr.Joseph Obeng-Poku, Mr.Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr.Alexander K.B. Bonney, Mrs.Serena Kwakye-Mintah

Registered Office: 28<sup>th</sup> February Road, (Near Independence Square)  
 Telephone: 233-0302-666781-7 Fax: 233-0302-663552 Telegrams: DIRWAT  
 Website: [www.gwcl.com.gh](http://www.gwcl.com.gh) E-mail: [info@gwcl.com.gh](mailto:info@gwcl.com.gh)

# GHANA WATER COMPANY LIMITED

**Main Bankers:** Social Security Bank  
Ghana Commercial Bank



**Brong Ahafo Region**  
**Post Office Box 88**  
**Sunyani – B/A**

**My Ref. No.:**.....

10<sup>th</sup> March, 2020

**Your Ref. No.:**.....

Attn. FORM GHANA LIMITED, P.O.BOX 211, SUNYANI, BONO-REGION

## CERTIFICATE OF ANALYSIS

<b>Sample Description:</b> Borehole	
<b>Brand Name:</b> Form Ghana Boreholes	
<b>Country of Origin:</b> Ghana	<b>Expiry date:</b> 10/02/2021
<b>Town/Community:</b> Berekum (Site/Plantations)	<b>Batch No.</b>
<b>Packaging Type:</b>	

### TEST RESULTS

PHYSICO-CHEMICAL ANALYSIS:				DATE OF ANALYSIS: 02/03/2020			
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNI-TS	GHANA STANDARD SPECIFICATION	RESULTS			
				Site	A24	B11	B46
Temperature		°C	-	31.60	31.40	31.20	31.20
pH	Electrometric	-	6.5-8.5	5.84	6.30	6.58	6.88
Residual free chlorine	Colorimetric	mg/l	0.0	0.00	0.00	0.00	0.00
Colour	Platinum-cobalt	Pt.Co	0-15	4.00	4.00	5.00	5.00
Turbidity	Nephelometric	NTU	5	0.00	0.00	0.00	0.00
Conductivity	Electrometric	µs/cm	-	207.00	124.00	364.00	418.00
Total Dissolved Solids	Electrometric	mg/l	1000	105.00	63.00	185.00	214.00
Total Hardness	Titrimetric	mg/l	500	43.00	30.00	80.00	264.00
Calcium Hardness	Titrimetric	mg/l	-	28.00	21.00	78.00	151.00
Magnesium Hardness	Titrimetric	mg/l	-	15.00	9.00	2.00	113.00
Alkalinity	Titrimetric	mg/l	-	75.00	48.00	159.00	190.00
Chloride	Argentometric titration	mg/l	250	27.00	17.00	19.00	22.00

Nitrite	Diazotization	mg/l	3.0	1.02	1.13	0.95	1.11
Nitrate	Cadmium reduction	mg/l	50	0.90	0.80	0.80	0.90
Ammonia(Nitrogen)	Nessler	mg/l	1.5	0.00	0.01	0.00	0.00
Fluoride	Spands	mg/l	1.5	0.66	0.42	0.74	0.64
Iron	FerroVer	mg/l	0.3	0.09	0.02	0.10	0.11
Sulphate	Sulfaver 4	mg/l	250	0.23	0.44	0.02	1.48
Manganese	Periodate oxidation	mg/l	0.4	0.50	0.80	0.50	0.60
Phosphate	PhosVer 3	mg/l	0.3	0.75	0.20	0.50	0.25
Aluminium	Aluminon method	mg/l	0.2	0.17	0.20	0.18	0.16
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.00	0.00	0.00	0.00
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.00	0.00	0.00	0.0


MICROBIOLOGICAL ANALYSIS:				DATE OF ANALYSIS: 02/03/2020			
PARAMETER	TEST METHOD	UNIT	SPECIFICATIO-N/ METHOD DETECTION LIMIT	RESULTS			
				Site	A24	B11	B46
Fecal coliform	Multiple tube fermentation	MPN Index/ 100mL	<1.1	>8.0	<1.1	4.6	<1.1
E. Coli	Indole Test	Present (P)/Absent(A)	Absent	Absent	Absent	Absent	Absent
Total Viable Count	Total plate count	CFU	0-3	2	0	1	0

REMARKS: All the water samples did not meet the standards for Manganese. Water samples, Site and B11 failed the tests for Phosphate and Fecal coliform. Also, low pH was recorded for samples, Site and A24. pH correction is recommended for samples, Site and A24 source water, whereas disinfection is recommended for samples, Site and B11. Manganese removal for all the boreholes is also recommended before use.

Note: These results are only applicable to the sample(s) submitted to the laboratory.

Regional WQA Manager

{Janet Atebiya}

  
**REGIONAL W. Q. A. MANAGER**  
 GHANA WATER CO. LTD,  
 SUNYANI BRONG AHAFIO

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr.Clifford Braimah (. Managing Director), Mr.Joseph Obeng-Poku, Mr.Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Abu Lovelace-Johnson, Mr.Alexander K.B. Bonney, Mrs.Serena Kwakye-Mintah

Registered Office: 28<sup>th</sup> February Road, (Near Independence Square)

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Website: [www.gwcl.com.gh](http://www.gwcl.com.gh) E-mail: [info@gwcl.com.gh](mailto:info@gwcl.com.gh)

# GHANA WATER COMPANY LIMITED

**Main Bankers:** Social Security Bank  
Ghana Commercial Bank



**Brong Ahafo Region**  
Post Office Box 88  
Sunyani – B/A

**My Ref. No.:**.....

1<sup>th</sup> July, 2020

**Your Ref. No.:**.....

Attn. FORM GHANA LIMITED, P.O.BOX 211 SUNYANI, BONO-REGION

### CERTIFICATE OF ANALYSIS

Sample Description: Boreholes	Expiry date: 19/05/2021
Country of Origin: Ghana	
Net Volume: 1.5L Each	
Name of Community: Berekum	

### TEST RESULTS

PHYSICO-CHEMICAL ANALYSIS:				DATE OF ANALYSIS: 19/06/2020			
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	GHANA STANDARD SPECIFICATION	RESULTS			
				Site BK	BLK B4-6 BK	BLK B11 BK	A24 BK
Temperature		°C	-	28.10	28.10	28.20	28.30
pH	Electrometric	-	6.5-8.5	6.50	7.00	6.70	6.00
Residual free chlorine	Colorimetric	mg/l	0.0	0.00	0.00	0.00	0.00
Colour	Platinum-cobalt	Pt.Co	0-15	5.00	5.00	5.00	5.00
Turbidity	Nephelometric	NTU	5	0.11	0.01	0.23	0.04
Conductivity	Electrometric	µs/cm	-	228.00	490.00	359.00	42.00
Total Dissolved Solids	Electrometric	mg/l	1000	118.00	250.00	184.00	7.00
Total Hardness	Titrimetric	mg/l	500	64.00	214.00	130.00	39.00
Calcium Hardness	Titrimetric	mg/l	-	40.00	162.00	78.00	33.00
Magnesium Hardness	Titrimetric	mg/l	-	24.00	52.00	52.00	6.00
Alkalinity	Titrimetric	mg/l	-	91.00	262.00	182.00	53.00
Chloride	Argentometric titration	mg/l	250	34.00	23.00	24.00	25.00

Nitrite	Diazotization	mg/l	3.0	1.20	1.00	0.92	0.85
Nitrate	Cadmium reduction	mg/l	50	2.50	2.30	2.00	1.70
Ammonia(Nitrogen)	Nessler	mg/l	1.5	0.00	0.00	0.01	0.00
Fluoride	Spands	mg/l	1.5	0.50	0.52	0.53	0.43
Iron	FerroVer	mg/l	0.3	0.00	0.06	0.00	0.01
Sulphate	Sulfaver 4	mg/l	250	0.00	0.00	0.00	0.00
Manganese	Periodate oxidation	mg/l	0.4	0.01	0.00	0.03	0.01
Phosphate	PhosVer 3	mg/l	0.3	0.75	0.22	0.50	0.24
Aluminium	Aluminon method	mg/l	0.2	0.00	0.01	0.01	0.00
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.00	0.00	0.00	0.00
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.00	0.00	0.00	0.00

MICROBIOLOGICAL ANALYSIS:				DATE OF ANALYSIS: 19/06/2020			
PARAMETER	TEST METHOD	UNIT	SPECIFICATION / METHOD DETECTION LIMIT	RESULTS			
				Site BK	BLK B4-6 BK	BLK B11 BK	A24 BK
Fecal coliform	Multiple tube fermentation	MPN Index/ 100mL	<1.1	<1.1	<1.1	<1.1	<1.1
E. Coli	Indole Test	Present/Absent (P/A)	Absent	Absent	Absent	Absent	Absent

REMARKS: Water sample A24 BK, did not meet the standards for pH, Site BK and BLK B11 BK, did not meet the standards for Phosphate. pH correction is recommended for A24 BK and Phosphate removal is recommended for Site BK and BLK B11 BK

Note: These results are only applicable to the sample(s) submitted to the laboratory.

Regional WQA Manager  
{Janet Atebiya}



**REGIONAL W. Q. A. MANAGER**  
GHANA WATER CO. LTD.  
SUNYANI BRONG AHMAFO

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman) , Ing. Dr.Clifford Braimah ( Managing Director ) , Mr.Joseph Obeng-Poku ,Mr.Michael Ayesu , Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson,Mr.AlexanderK.B. Bonney, Mrs.Serena Kwakye-Mintah  
Registered Office: 28<sup>th</sup> February Road, (Near Independence Square)  
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# GHANA WATER COMPANY LIMITED

**Main Bankers:** Social Security Bank  
Ghana Commercial Bank



**Brong Ahafo Region**  
**Post Office Box 88**  
**Sunyani - B/A**

**My Ref. No.:**.....

30<sup>th</sup> September, 2020

**Your Ref. No.:**.....

Attn. FORM GHANA LIMITED, P.O.BOX 211 SUNYANI, BONO-REGION

### CERTIFICATE OF ANALYSIS

<b>Sample Description:</b> Boreholes	<b>Expiry date:</b> 28/09/2021
<b>Country of Origin:</b> Ghana	
<b>Net Volume:</b> 1.5L Each	
<b>Name of Community:</b> Berekum	

### TEST RESULTS

PHYSICO-CHEMICAL ANALYSIS:				DATE OF ANALYSIS: 28/09/2020			
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	GHANA STANDARD SPECIFICATION	RESULTS			
				Site BK	BLK B46 BK	BLK B11 BK	A24 BK
Temperature		°C	-	29.50	29.40	29.60	29.50
pH	Electrometric	-	6.5-8.5	7.34	7.42	7.73	7.52
Residual free chlorine	Colorimetric	mg/l	0.0	0.00	0.00	0.00	0.00
Colour	Platinum-cobalt	Pt.Co	0-15	4.00	5.00	4.00	6.00
Turbidity	Nephelometric	NTU	5	0.00	0.00	0.00	0.00
Conductivity	Electrometric	µs/cm	-	195.00	447.00	358.00	123.00
Total Dissolved Solids	Electrometric	mg/l	1000	95.00	228.00	182.00	63.00
Total Hardness	Titrimetric	mg/l	500	62.00	191.00	149.00	56.00
Calcium Hardness	Titrimetric	mg/l	-	25.00	85.00	96.00	42.00
Magnesium Hardness	Titrimetric	mg/l	-	37.00	106.00	53.00	14.00
Alkalinity	Titrimetric	mg/l	-	74.00	209.00	188.00	31.00
Chloride	Argentometric titration	mg/l	250	39.00	42.00	34.00	43.00

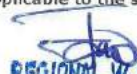
Nitrite	Diazotization	mg/l	3.0	1.24	0.84	0.82	0.65
Nitrate	Cadmium reduction	mg/l	50	0.25	0.00	0.00	0.25
Ammonia (Nitrogen)	Nessler	mg/l	1.5	0.00	0.00	0.00	0.00
Fluoride	Spands	mg/l	1.5	0.34	0.45	0.43	0.37
Iron	FerroVer	mg/l	0.3	0.01	0.03	0.01	0.01
Sulphate	Sulfaver 4	mg/l	250	0.00	0.00	0.00	0.00
Manganese	Periodate oxidation	mg/l	0.4	0.25	0.50	0.25	0.00
Phosphate	PhosVer 3	mg/l	0.3	9.23	6.87	8.44	4.05
Aluminium	Aluminon method	mg/l	0.2	0.05	0.03	0.00	0.04
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.00	0.00	0.00	0.00
Arsenic	2822800 (EZ arsenic)	mg/l	0.01	0.00	0.00	0.00	0.00

MICROBIOLOGICAL ANALYSIS:				DATE OF ANALYSIS: 28/09/2020			
PARAMETER	TEST METHOD	UNIT	SPECIFICATION / METHOD DETECTION LIMIT	RESULTS			
				Site BK	BLK B46 BK	BLK B11 BK	A24 BK
Fecal coliform	Multiple tube fermentation	MPN Index/ 100mL	<1.1	<1.1	<1.1	<1.1	<1.1
E. Coli	Indole Test	Present/Absent (P/A)	Absent	Absent	Absent	Absent	Absent

REMARKS: Sample B4-6 did not meet the standards for Manganese. All four samples exceeded the range for Phosphate. Manganese removal is recommended for B4-6, and Phosphate removal is recommended for all four water systems.

Note: These results are only applicable to the sample(s) submitted to the laboratory.

Regional WQA Manager  
{Janet Atebiya}



**REGIONAL W. Q. A. MANAGER**  
GHANA WATER CO. LTD.  
SUNYANI BRONG AHAFO

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr.Clifford Braimah (. Managing Director), Mr.Joseph Obeng-Poku, Mr.Michael Ayesu, Naaba Sigri Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr.Alexander K. B. Bonney, Mrs.Serena Kwakye-Mintah

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Website: [www.gwcl.com.gh](http://www.gwcl.com.gh) E-mail: [info@gwcl.com.gh](mailto:info@gwcl.com.gh)

# GHANA WATER COMPANY LIMITED

**Main Bankers:** Social Security Bank  
Ghana Commercial Bank



**Brong Ahafo Region**  
**Post Office Box 88**  
**Sunyani – B/A**

**My Ref. No.:**.....

16<sup>th</sup> December, 2020

**Your Ref. No.:**.....

Attn. FORM GHANA LIMITED, P.O.BOX 211 SUNYANI, BONO-REGION

## CERTIFICATE OF ANALYSIS

Sample Description: Boreholes	Expiry date; 16/12/2021
Country of Origin: Ghana	
Net Volume: 1.5L Each	
Name of Community: Berekum	

### TEST RESULTS

PHYSICO-CHEMICAL ANALYSIS:				DATE OF ANALYSIS: 16/12/2020			
PARAMETER	TEST METHOD	METHOD DETECTION LIMIT/UNITS	GHANA STANDARD SPECIFICATION	RESULTS			
				Site BK	BLK B46 BK	BLK B11 BK	A24 BK
Temperature		°C	-	30.20	30.10	30.40	30.20
pH	Electrometric	-	6.5-8.5	6.00	6.33	6.28	6.02
Residual free chlorine	Colorimetric	mg/l	0.0	0.00	0.00	0.00	0.00
Colour	Platinum-cobalt	Pt.Co	0-15	4.00	5.00	4.00	5.00
Turbidity	Nephelometric	NTU	5	0.00	0.00	0.00	0.00
Conductivity	Electrometric	µs/cm	-	195.00	451.00	328.00	118.00
Total Dissolved Solids	Electrometric	mg/l	1000	99.00	229.00	166.00	59.00
Total Hardness	Titrimetric	mg/l	500	100.00	186.00	114.00	168.00
Calcium Hardness	Titrimetric	mg/l	-	57.00	150.00	68.00	85.00
Magnesium Hardness	Titrimetric	mg/l	-	43.00	36.00	46.00	83.00
Alkalinity	Titrimetric	mg/l	-	178.00	236.00	353.00	114.00
Chloride	Argentometric titration	mg/l	250	26.00	52.00	22.00	24.00
Nitrite	Diazotization	mg/l	3.0	0.00	0.00	1.00	1.00

Nitrate	Cadmium reduction	mg/l	50	1.20	1.10	0.30	3.70
Ammonia(Nitrogen)	Nessler	mg/l	1.5	0.05	0.04	0.04	0.05
Fluoride	Spands	mg/l	1.5	0.34	0.68	0.54	0.39
Iron	FerroVer	mg/l	0.3	0.04	0.01	0.00	0.04
Sulphate	Sulfaver 4	mg/l	250	0.00	1.00	0.00	0.00
Manganese	Periodate oxidation	mg/l	0.4	0.00	0.60	0.20	0.00
Phosphate	PhosVer 3	mg/l	0.3	2.58	4.16	4.16	2.58
Aluminium	Aluminon method	mg/l	0.2	0.03	0.02	0.23	0.03
Cyanide	Pyridine-pyrazalone	mg/l	0.07	0.00	0.00	0.00	0.00
Arsenic	2822800(EZ arsenic)	mg/l	0.01	0.00	0.00	0.00	0.00

MICROBIOLOGICAL ANALYSIS:				DATE OF ANALYSIS: 15/12/2020			
PARAMETER	TEST METHOD	UNIT	SPECIFICATION / METHOD DETECTION LIMIT	RESULTS			
				Site BK	BLK B46 BK	BLK B11 BK	A24 BK
Fecal coliform	Multiple tube fermentation	MPN Index/ 100mL	<1.1	4.6	<1.1	<1.1	<1.1
E. Coli	Indole Test	Present/Absent (P/A)	Absent	Present	Absent	Absent	Absent

REMARKS: All the water samples as submitted to the laboratory did not meet the standards for pH and Phosphate. Sample, Blk 46 BK, did not meet the standard for Manganese, sample; Blk 11 BK, did not meet the standards for Aluminium and Sample Site BK, did not meet the standards for Fecal coliform and E-coli.


Note: These results are only applicable to the sample(s) submitted to the laboratory.

  
**REGIONAL WQA MANAGER**  
 REGIONAL WQA Manager  
 GHANA WATER CO. LTD.  
 SUNYANI BRONG AHAFIO  
 {Janet Atebiya}

Board of Directors: Hon Alexander k. Afenyo-Markin (Chairman), Ing. Dr.Clifford Braimah (. Managing Director), Mr.Joseph Obeng-Poku, Mr.Michael Ayesu, Naaba Sigr Gewong, Hon. Kwame Twumasi Amporfo, Mr. Clement Alosebuno Kaba, Dr. Forster Kum-Ankama Sarpong, Madam Maria Aba Lovelace-Johnson, Mr. Alexander K.B. Bonney, Mrs. Serena Kwakye-Mintah  
 Registered Office: 28<sup>th</sup> February Road, (Near Independence Square)  
 Telephone: 233-0302-666781-7 Fax: 233-0302-663552 Telegrams: DIRWAT  
 Website: [www.gwcl.com.gh](http://www.gwcl.com.gh) E-mail: [info@gwcl.com.gh](mailto:info@gwcl.com.gh)

**Appendix 8: MSDS of chemicals**

**MSDS – Sunphosate 757SG**

 <p><b>SUNSHINE</b><sup>®</sup></p>	<p><b>WYNCA SUNSHINE AGRIC PRODUCTS &amp; TRADING CO. LTD</b></p>	<p>ADD: BLOCK 2A, PLOT NO.10, DADEBAN ROAD, NORTH INDUSTRIAL AREA, ACCRA, GHANA. P.O.BOX: CT1883 ACCRA FAX: 0302-221132 TEL: 0302-221132</p>
<p><b><u>SUNPHOSATE GRANULAR 757SG</u></b></p>		
<p><b><u>PRODUCT USAGE AND SAFETY PRECAUTIONARY MEASURES</u></b></p>		
<p><b>WARNING</b></p>		
<ul style="list-style-type: none"><li>• Read label first before using product</li></ul>		
<p><b>PRECAUTION</b></p>		
<ul style="list-style-type: none"><li>• Do not eat, drink or smoke when handling the product.</li><li>• Avoid contact with eyes or skin</li><li>• Wear suitable protective clothing keep product away from food, feed and drinks.</li><li>• Do not contaminate any water body with left over spray solution</li><li>• Do no use empty containers, punch and destroy them.</li><li>• Wash hands, face and change clothes after use.</li></ul>		
<p><b>FIRST AID</b></p>		
<ul style="list-style-type: none"><li>• Get medical aid immediately</li><li>• If in EYES, flush eyes with plenty of water for 15 minutes.</li><li>• If on SKIN, wash skin thoroughly with soap and plenty of water for 15 minutes.</li><li>• If SWALLOWED, immediately dilute by drinking milk or water.</li></ul>		
<p><b>ANTIDOTE</b></p>		
<ul style="list-style-type: none"><li>• No special antidote.</li></ul>		
<p><b>CAUTION</b></p>		
<ul style="list-style-type: none"><li>• Safely keep out of reach of children.</li></ul>		
<p><b>GENERAL INFORMATION</b></p>		
<ul style="list-style-type: none"><li>• SUNPHOSATE-G is a systemic, non-selective foliar herbicide which when applied is absorbed by the green parts of the plan. It translocates into the plant and kills it entirely.</li><li>• It is used in forestry, tree crops and the control of aquatic weeds.</li><li>• SUNPHOSATE-G has no residual soil activity and it is used in “zero tillage” in maize production.</li></ul>		
<p><b>DIRECTION FOR USE</b></p>		
<ul style="list-style-type: none"><li>• Apply product on active growing weed.</li><li>• Do not apply product if rain threatens</li></ul>		

Wynca



**WYNCA SUNSHINE AGRIC PRODUCTS & TRADING CO.  
LTD**

ADD: BLOCK 2A, PLOT NO.10, DADEBAN ROAD, NORTH INDUSTRIAL AREA,  
ACCRA, GHANA. P.O.BOX: CT1883 ACCRA

FAX: 0302-221132

TEL: 0302-221132

- Avoid spray drift to nearby crops
- Spray at a low pressure to give uniform average droplets on the target weeds.

**EQUIPMENT**

- Apply with knapsack or mounted boom sprayers.

**RECOMMENDATION**

- Rate of application for annual grasses with the height of 30cm – apply 2.25kg/ha to cover 10000m<sup>2</sup>, For perennial grasses – apply 3kg/ha. For sedges and other difficult weeds e.g. Imperata sp etc. Apply 4kg/ha.
- Do not enter field 7 hours after spray
- Water volume: Apply 450 – 600 litres of water per hectare depending on the weed density.
- With knapsack sprayers. Apply 50g – 80 g in 15 – 16litres of water.

MSDS – Glyphader

<b>GLYPHADER® 75</b>	Date created : 15/05/07	
<b>MATERIAL SAFETY DATA SHEET</b>		
Page 1 / 4		
<b>1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION</b>		
<b>SUPPLIED BY :</b>	SCPA SIVEX INTERNATIONAL 83-85 Boulevard Vincent Auriol 75013 Paris - FRANCE  TEL. +33 1 44 06 53 00 FAX. +33 1 44 06 54 66	
<b>PRODUCT :</b>	Glyphosate	
<b>CHEMICAL NATURE</b>	Water Soluble Granule (SG)	
<b>CHEMICAL FAMILY/USE:</b>	Glyphosate 680 g/Kg a.e. = 757 g/Kg Ammonium salt of Glyphosate Aminophosphonic ; Glycine derivative/ Herbicide	
<b>FORMULA:</b>	C <sub>3</sub> H <sub>8</sub> N O <sub>5</sub> P	
<b>CHEMICAL SYNONYMS:</b>	IUPAC: N-(phosphonomethyl) glycine	
<b>2. COMPOSITION/INFORMATION ON INGREDIENTS</b>		
<b>Ingredients</b>	<b>Content</b>	<b>CAS NO</b>
<b>Active Ingredient:</b> GLYPHOSATE Salt of ammonium :	75.7 % w/w min	1071-83-6
<b>Other ingredients:</b> Surfactant and formulating ingredients. Sodium sulphite	24.3 % w/w 0.5 % w/w max	
<b>3. HAZARDS IDENTIFICATION EMERGENCY OVERVIEW</b>		
<b>EMERGENCY OVERVIEW:</b> WARNING-POISON. Keep out of reach of children. Avoid contact with skin, eyes and clothing. Do not inhale fumes. Severely irritating to eyes. May cause skin irritation. Harmful if absorbed through the skin. Harmful if swallowed or inhaled.		
<b>EFFECTS OF ACUTE EXPOSURE:</b>		
<b>INGESTION:</b>	Harmful if swallowed. May cause nausea, vomiting, abdominal pain, decreased blood pressure, muscle weakness, and muscle spasms.	
<b>SKIN CONTACT:</b>	May cause slight transient irritation. Overexposure by skin absorption may cause nausea, vomiting, abdominal pain, decreased blood pressure, muscle weakness, and muscle spasms.	
<b>INHALATION:</b>	Contains materials that may be moderately toxic. Vapours could cause headache, dizziness, respiratory irritation and symptoms similar to those from ingestion.	
<b>EYE CONTACT:</b>	Causes severe eye irritation including corneal opacity and irreversible eye damage. Causes redness and tearing. Vapours and mist can cause irritation.	
<b>MEDICAL CONDITIONS AGGRAVATED:</b> Skin exposure may aggravate preexisting skin conditions. Inhalation of mist may aggravate preexisting respiratory conditions.		
<b>PRINCIPLE ROUTES OF EXPOSURE:</b> Eye contact. Skin absorption. Inhalation. Oral.		
<b>CHRONIC EFFECTS/CARCINOGENICITY:</b> No effect		
<b>REPRODUCTIVE TOXICITY:</b> No effect		
<b>GENOTOXICITY:</b> No		
<b>TOXICOLOGICALLY SYNERGISTIC MATERIALS:</b> NA.		
<b>OTHER:</b> None known.		
<b>4. FIRST AID MEASURES</b>		
<b>CROP PROTECTION DEPARTMENT</b>		

**GLYPHADER® 75**

Date created : 15/05/07

**MATERIAL SAFETY DATA SHEET**

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**INGESTION:** Never give anything by mouth to an unconscious person. Get medical attention and show the product label.

**SKIN:** In case of contact, remove contaminated clothing and wash skin thoroughly with soap and water.

**INHALATION:** If inhaled, remove to fresh air and get medical attention or contact a Poison Control Centre.

**EYES:** For eye contact, flush with plenty of water for at least 15 minutes. Get immediate medical attention.

**NOTE TO PHYSICIAN:** Symptomatic treatment.

**5. FIRE FIGHTING MEASURES**

<b>FLASH POINT:</b>	No object
<b>CONDITIONS OF FLAMMABILITY:</b>	No Flammable
<b>FLAMMABLE LIMITS IN AIR - Upper (%):</b>	NA.
<b>FLAMMABLE LIMITS IN AIR - Lower (%):</b>	NA.
<b>AUTOIGNITION TEMPERATURE:</b>	NA.
<b>SENSITIVITY TO MECHANICAL IMPACT (Y/N):</b>	NA.
<b>SENSITIVITY TO STATIC DISCHARGE:</b>	NA.
<b>EXTINGUISHING MEDIA:</b>	Dry powder, carbon dioxide, water or foam.
<b>SPECIAL FIREFIGHTING PROCEDURES:</b>	<p>Special fire fighting procedures: Isolate fire area. Evacuate the employees and evacuate downwind.</p> <p>Avoid spreading of contaminated extinguishing agent in the environment. Minimize use of water to prevent environmental contamination. Do not breathe smoke, gases, or vapour generated. Keep fire exposed containers cool by spraying with water. Wear full protective</p> <p>Firefighters should wear self-contained breathing apparatus and full protective clothing when fighting chemical fires. Minimize and contain water runoff. Equipment should be thoroughly decontaminated after use.</p>

**6. ACCIDENTAL RELEASE MEASURES**

**ACTION TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:**  
 Use safety equipment and procedures appropriate to the size of the spill. Keep unnecessary people away. Avoid runoff to natural waters and sewers. Surround and absorb spills with inert material such as perlite, sawdust, clay granules, vermiculite, sand or dirt. Contain all affected material in a closed, labelled container for proper disposal. Isolate from other waste materials. Clean contaminated area such as hard surfaces with detergent and water, collecting cleaning solution for proper disposal. Large spills to soil or similar surfaces may necessitate removal of top soil. Clean contaminated floors and objects thoroughly, observing environmental regulations. Do not discharge into the drains/surface water/groundwater. Keep people and animals away.

**7. HANDLING AND STORAGE**

**HANDLING:** Avoid contact with the eyes, skin and clothing and avoid inhalation of product or spray mist. If in eyes, wash it immediately with water. After handling and before eating, drinking or smoking, wash hands, arms and face thoroughly with soap and water.

**STORAGE:** Store in the closed, original container in a dry, cool, well-ventilated area, out of direct sunlight. Store in locked room or place away from children, animals, food, animal feed, seed and fertilizers. Keep away from all ignition sources and protect from extreme heat and cold.

**8. EXPOSURE CONTROLS/PERSONAL PROTECTION**



**GLYPHADER® 75**

Date created : 15/05/07

**MATERIAL SAFETY DATA SHEET**

Page 3 / 4

<b>ENGINEERING CONTROLS:</b>	Use in a well ventilated area. General ventilation with a good source of make-up air recommended as minimum for indoor situations. Ventilation should be adequate to maintain air concentrations below exposure limits.
<b>RESPIRATORY PROTECTION EQUIPMENT:</b>	Use an approved pesticide respirator if ventilation is not adequate or exposure to sprays, mists or vapours is likely.
<b>PROTECTIVE GLOVES:</b>	All types of chemical-resistant gloves for handling chemicals are acceptable, provided that they can be cleaned. Rinse gloves before removal. Gloves are not required for applicator in enclosed tractor or airplane cockpit.
<b>EYE AND FACE PROTECTION:</b>	Goggles or face shield when handling concentrate.
<b>OTHER PROTECTIVE EQUIPMENT:</b>	Long sleeved shirt, long pants, socks and shoes are minimum work clothing. Coveralls or a chemical-resistant apron should also be worn when open pouring from containers greater than 5L. Use other equipment appropriate to specific situation.
<b>VENTILATION:</b>	Use only in well ventilated area.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

<b>BOILING POINT:</b>	> 190 °C
<b>VAPOR PRESSURE:</b>	9 x 10 <sup>-3</sup> mPa (25°C)
<b>VAPOR DENSITY (air = 1):</b>	NA.
<b>FREEZING POINT:</b>	NA.
<b>MELTING POINT:</b>	> 190°C
<b>PHYSICAL STATE:</b>	Slightly yellow to white granular
<b>ODOUR:</b>	Specific odour
<b>COLOUR:</b>	Slightly yellow to white
<b>ODOR THRESHOLD (ppm):</b>	NA
<b>EVAPORATION RATE (butyl acetate = 1):</b>	NA.
<b>SPECIFIC GRAVITY (water = 1):</b>	NAp
<b>DENSITY (20°C):</b>	550 g/L ± 50 (bulk density)
<b>pH:</b>	4.0 – 6.0
<b>SOLUBILITY IN WATER (25°C):</b>	144 ± 19 g/l (pH 3,2)
<b>COEFFICIENT OF WATER/OIL DISTRIBUTION:</b>	K <sub>ow</sub> logP= < - 3.7

Note: Physical data are typical values, but may vary from sample to sample. A typical value should not be construed as a guaranteed analysis or as a specification.

**10. STABILITY AND REACTIVITY**

<b>STABILITY:</b>	Stable.
<b>HAZARDOUS POLYMERIZATION:</b>	Not known to occur.
<b>HAZARDOUS THERMAL DECOMPOSITION/COMBUSTION PRODUCTS:</b>	None known
<b>INCOMPATIBILITY (MATERIALS TO AVOID):</b>	Can induced a reaction with metal (do not store or use this product in iron, galvanized steel or no varnish)
<b>CONDITIONS TO AVOID:</b>	None known.

**11. TOXICOLOGICAL INFORMATION**

<b>ORAL LD50</b>	Rat	4230	mg/kg
<b>DERMAL LD50:</b>	Rat	> 5000	mg/kg
<b>4 HOURS INHALATION LC50:</b>	Rat	> 5	mg/L
<b>EYE IRRITATION:</b>	Rabbit	Mild eye irritant	
<b>SKIN IRRITATION :</b>	Rabbit	Mild skin irritant	
<b>SKIN SENSITIZATION :</b>	Guinea pig	Not sensitizing	

Note : Data are from laboratory studies conducted on **GLYPHOSATE**.

**12. ECOLOGICAL INFORMATION**

**ECOTOXICOLOGICAL INFORMATION:**

**GLYPHADER® 75**

Date created : 15/05/07

**MATERIAL SAFETY DATA SHEET**

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<b>96-HOUR LC50:</b>	Rainbow trout	86	mg/L
<b>96-HOUR LC50:</b>	Bluegill sunfish	120	mg/L
<b>48-HOUR EC50:</b>	Daphnia magna	780	mg/L
<b>LD50:</b>	Bobwhite quail	>3851	mg/kg
<b>ORAL LD50:</b>	Bees	100	µg/bee
<b>CONTACT LD50:</b>	Bees	100	µg/bee

Note : Data on Active Ingredient.

**ENVIRONMENTAL FATE INFORMATION:**

In mammals, following oral administration, glyphosate is very rapidly excreted unchanged and does not bioaccumulate. In plants, slowly metabolised to aminomethylphosphonic acid, which is the major plant metabolite. In soil (field), DT50 1-30 days, depending on edaphic and climatic conditions. In water, DT50 varies from a few to 91 days. Photodegradation in water occurs under natural conditions, DT50 33-77 days; no substantial photodegradation in soil was recorded over 31 days. In a lab. whole system with water and sediment, DT50 27-146 days (aerobic), 14-22 days (anaerobic). The major metabolite in soil and water is aminomethyl phosphonic acid.

**13. DISPOSAL CONSIDERATIONS**

**DISPOSAL METHOD:**

For information on disposal of unused, unwanted product, contact the manufacturer or the provincial regulatory agency. Disposal should be made in accordance with federal, provincial and local regulations. Contact the manufacturer and the provincial regulatory agency in case of a spill, and for clean up of spills. Emptied container retains vapor and product residue. Observe all labelled safeguards until container is cleaned, reconditioned or destroyed. Do not reuse container for any purpose. If applicable, return container in accordance with return program. If a recyclable container, dispose of at a container collection site. Contact local distributor, dealer or municipality for the location of the nearest collection site. Before taking the container to the collection site, triple or pressure rinse the empty container adding rinsing to spray tank, and make container unsuitable for further use. If there is no container collection site in your area, dispose of the container in accordance with provincial requirements.

**14. TRANSPORT INFORMATION**

<b>RAIL/ROAD (RID/ADR):</b>	9
<b>SEA (IMDG):</b>	9
<b>AIR (ICAO/IATA):</b>	9
<b>U.N. NUMBER:</b>	3077
<b>DG CLASS:</b>	NA.
<b>HAZCHEM CODE:</b>	9
<b>PACKING GROUP:</b>	III

**15. REGULATORY INFORMATION**

**NOTICE:** The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is give. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations.

**16. OTHER INFORMATION**

**ADDITIONAL INFORMATION:**


Abbreviations used throughout the MSDS are: NA = Not available  
 NAp = Not applicable  
 N/E = None Established.

This MSDS summarises our best knowledge of the health and safety hazard information of the product and how to safely handle and use the product in the workplace. Each user should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace including in conjunction with other products. If clarification or further information is needed to ensure that an appropriate risk assessment can be made, the user should contact this company. Our responsibility for products sold is subject to our standard terms and conditions, a copy of which is sent to our customers and is also available on request.

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**END OF MSDS**

MSDS – Kalach 700 WSG

 <p><b>Arysta LifeScience</b></p>	Product Name: Kalach 700 WSG Page 1 of 5																								
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<b>SECTION 3 - HAZARD IDENTIFICATION</b>																									
<p><b>Toxicity class:</b> WHO Table 5;EPA III A low toxicity herbicide.</p> <p><b>Likely routes of exposure:</b> Skin contact, ingestion and inhalation.</p> <p><b>Skin:</b> Non-irritating to skin.</p> <p><b>Eye contact:</b> May cause mild eye irritation. Cause temporary mild discomfort such as watering and redness of the eyes.</p> <p><b>Ingestion:</b> Minimally toxic.</p> <p><b>Inhalation:</b> Minimally toxic by inhalation.</p>																									
<b>SECTION 4 - FIRST AID MEASURES AND PRECAUTIONS</b>																									
<p>Symptoms of glyphosate poisoning include: headache, vomiting and diarrhoea.</p> <p><b>Inhalation:</b> Remove source of contamination, or move victim to fresh air. Keep affected person warm and at rest. Treat symptomatically and supportively. Administration of oxygen should be performed by qualified personnel. Get medical attention if effects persist.</p>																									
<b>MATERIAL SAFETY DATA SHEET</b>																									
Issued by: Arysta Lifescience South Africa <span style="float: right;">Phone: 031 514 5600</span> <b>Poison Information Centre: 082 446 8946; Tygerberg: (021) 931 6129; Poison Emergency Enquiry: (021) 689 5227</b>																									



Product Name: Kalach 700 WSG

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**Skin contact:**

Move the victim to fresh air and remove all contaminated clothing, shoes and leather goods. Gently wipe off excess chemical. Wash affected skin areas gently and thoroughly with water and non-abrasive soap. Do not rub the skin. If irritation persists, seek medical advice.

**Eye contact :**

Immediately flush the eyes with clean, gently flowing lukewarm water or saline solution for 20 minutes, holding the eyelid(s) open. If irritation persists, seek medical advice.

**Ingestion:**

Have victim rinse mouth thoroughly with water. Do not induce vomiting. Seek medical advice immediately showing container and label.

**Advice to physician:**

There is no specific antidote. Treat symptomatically and supportively as and when required. Remove by gastric lavage and catharsis, but not if victim is unconscious. Give oxygen if respiration is depressed.

**SECTION 5 - FIRE-FIGHTING MEASURES**

Keep fire exposed containers cool by spraying with water.

**Fire and explosion hazard:**

**Flash point: None. This material is not flammable.**

**Extinguishing agents:**

Extinguish fires with carbon dioxide, dry powder, or alcohol-resistant foam. Water spray can be used for cooling of unaffected stock, but avoid water coming in contact with the product. Use as little water as possible. Use spray or fog. Solid stream may cause spreading. Contain water used for fire fighting for later disposal.

**Fire fighting:**

Remove spectators from surrounding area. Remove container from fire area if possible. Contain fire control agents for later disposal. Use a recommended extinguishing agent for the type of surrounding fire. Avoid inhaling hazardous vapours and fumes from burning materials. Keep upwind.

**Personal protective equipment:**

Fire may produce irritating or poisonous vapours (toxic fumes of carbon monoxide, phosphorous oxides and nitrogen oxides), mists or other products of combustion. Fire fighters and others that may be exposed should wear full protective clothing and self-contained breathing apparatus.

**SECTION 6 - ACCIDENTAL RELEASE MEASURES (SPILLAGE)**

**Personal precautions:**

Do not breathe in mist or fumes. Avoid contact with skin and eyes. For personal protection see Section 8.

**Environmental precautions:**

Do not allow entering drains or watercourses. Spillage or uncontrolled discharges into water courses (or public waters) to be reported immediately to the Police and to the Department of Water/Environmental Affairs.

**Occupational spill:**

Remove all sources of flames and sparks. Adsorb spillage onto sand, earth or any suitable adsorbent material. Transfer to a container for disposal. Wash the spillage area with water. Washings must be prevented from entering surface water drains. Do not flush spilled material into drains. Keep spectators away.

**Containers:**

Emptied containers retain material residue. Observe all labeled safeguards until container is cleaned, reconditioned or destroyed.

**SECTION 7 - HANDLING AND STORAGE REQUIREMENTS**

**Handling:**

Avoid contact with eyes, prolonged contact with skin, and inhalation of spray and fumes. Handle product with caution. Use with adequate ventilation. Wash hands before eating, drinking, chewing gum, smoking or using the toilet. Remove clothing immediately if the herbicide gets inside. Then wash skin thoroughly using a non-abrasive soap and put on clean clothing. Operators should change and wash clothing after use. Do not apply directly to areas where surface water is present, or to intertidal areas below the mean high water mark. Water used to clean equipment must be disposed of correctly to avoid contamination.

**Storage:**

Store in its original, labelled and closed container in dry, cool, shaded, well-ventilated area, away from heat, sparks and other sources of ignition. Do not store with other pesticides, fertilizer, seeds, foodstuffs and water supplies. Store away from incompatible substances. Product is incompatible with galvanized steel or unlined mild steel. Keep out of reach of unauthorized persons, children and animals. Local regulations should be complied with.

**MATERIAL SAFETY DATA SHEET**

Issued by: Arysta Lifescience South Africa

Phone: 031 514 5600

**Poison Information Centre: 082 446 8946; Tygerberg: (021) 931 6129; Poison Emergency Enquiry: (021) 689 5227**



Arysta LifeScience

Product Name: Kalach 700 WSG

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**SECTION 8 - EXPOSURE CONTROL/PERSONAL PROTECTION**

It is essential to provide adequate ventilation. The measures appropriate for a particular work site depend on how this material is used and on the extent of exposure. Ensure that control systems are properly designed and maintained. Comply with occupational safety, environmental, fire and other applicable regulations.

**Exposure standards:**

The ADI for Glyphosate is set a 0.3 mg/kg/day. The corresponding NOEL is set at 30 mg/kg/day.

**PERSONAL PROTECTIVE EQUIPMENT:**

In industrial situations, concentration values below the TWA value should be maintained. Values may be reduced by process modification, use of local exhaust ventilation, capturing substances at the source, or other methods. If you believe air borne concentrations of mists, dusts or vapours are high, you are advised to modify the process or environment to reduce the problem.

**Respirator:**

It is usually safe to use the product without a mask or respirator. If the product is used in dusty or confined conditions, a mask or respirator suitable for protection from dusts and mists of pesticides is adequate. Limitations of respirator use specified by the approving agency and the manufacturer must be observed.

**Clothing:**

Employee must wear appropriate protective (impervious) clothing and equipment to prevent repeated or prolonged skin contact with this substance.

**Gloves:**

Employee must wear appropriate synthetic protective gloves to prevent contact with this substance.

**Eye protection:**

Wear safety goggles or face shield.

**Emergency eye wash:** Where there is any possibility that an employee’s eyes may be exposed to this substance, the employer should provide an eye wash fountain or appropriate alternative within the immediate work area for emergency use.

**SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES**

<b>Appearance:</b>	Water Soluble Granules.
<b>Odour:</b>	White
<b>Bulk density:</b>	0.65 ± 0.01 g/cm <sup>3</sup>
<b>Solubility in water:</b>	Miscible
<b>Flash point:</b>	None. Does not flash.
<b>pH:</b>	3.0→5.0
<b>Oxidizing properties:</b>	Not oxidizing
<b>Corrosiveness:</b>	Corrosive to galvanized steel and mild steel.

**SECTION 10 - STABILITY AND REACTIVITY**

**Stability:**

Stable under normal temperatures and pressures. Glyphosate reacts strongly (possibly violent exothermic reaction) with strong alkalis. Photodecomposition is negligible. Is stable to light and also stable up to 60 °C. Product is unlikely to spontaneously polymerise or decompose. Decompose only after heating to dryness followed by further heating.

Glyphosate may be photolabile in natural waters, with calcium or other metal ions acting as catalysts for the process.

**Dilution stability:**

Stable in aqueous solutions at 20 °C.

**Storage stability:**

Stable for 2 years under normal warehouse conditions. Store at temperatures below 50 °C and above -15 °C. Stable to light. Partial crystallization may occur on prolonged storage below -15 °C.

**Incompatibility:**

Product is relatively stable in neutral, weakly acidic and weakly alkaline media, but reacts strongly (and possibly violently) with strong alkalis. Mixing with other products may reduce the activity of glyphosate. Incompatible with galvanized steel and unlined mild steel materials for storage.

**Thermal decomposition:**

Toxic oxides of carbon, nitrogen and phosphorus are released when the product decomposes on heating.

**SECTION 11 - TOXICOLOGICAL INFORMATION**

<b>Acute oral LD<sub>50</sub>:</b>	10740mg/kg in rats.
<b>Acute dermal LD<sub>50</sub>:</b>	> 4000 mg/kg in rats.
<b>Inhalation:</b>	Technical: LC <sub>50</sub> (4 hours): > 12,2 mg/ℓ.

**MATERIAL SAFETY DATA SHEET**

Issued by: Arysta Lifescience South Africa

Phone: 031 514 5600

**Poison Information Centre: 082 446 8946; Tygerberg: (021) 931 6129; Poison Emergency Enquiry: (021) 689 5227**



Product Name: Kalach 700 WSG

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**Acute skin irritation:**

Not irritating to skin (rabbit). Not skin sensitizer.

**Acute eye irritation:**

Slightly irritating to eyes (rabbit).

**Carcinogenicity:**

Animal studies did not detect any carcinogenic effects.

**Teratogenicity:**

Animal studies did not detect any teratogenic effects.

**Mutagenicity:**

Animal studies did not detect any mutagenic effects.

**Reproductivity:**

Reproductive changes in test animals only occur at very high doses. It is unlikely that glyphosate would produce effects in humans.

**SECTION 12 - ECOLOGICAL INFORMATION**

**Degradability:**

Glyphosate is moderately persistent in soil, with estimated half-life of 47 days. Microbes are primarily responsible for breakdown.

Glyphosate is strongly adsorbed to suspended organic and mineral matter in water, and broken down primarily by microbes. Half-life ranges from 12 days to 10 weeks.

**Mobility:**

The product is practically immobile. It is strongly absorbed to most soils. It does not leach appreciably, and has low potential for runoff.

**Accumulation:**

The product shows little or no tendency to bioaccumulate and poses no long term threat to wildlife.

**ECOTOXICOLOGY:**

**Birds: Slightly toxic.**

LC <sub>50</sub> (5-day diet):	Mallard duck:	> 4500 mg/kg diet
	Bobwhite quail:	> 4500 mg/kg diet

**Fish: Not toxic.**

LC <sub>50</sub> (96 hours):	Bluegill sunfish:	> 1000 mg/ℓ
	Trout:	> 1000 mg/ℓ
	Fathead minnows	97 mg/ℓ

Due to surfactant, GLYPHOSATE 360 is moderately toxic to fish.

**Bees: Not toxic.**

LD <sub>50</sub> oral & dermal:	> 0.1 mg/bee
---------------------------------	--------------

**Daphnia:**

LC <sub>50</sub> (48 hours):	930 mg/ℓ
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**Earthworms:**

LC <sub>50</sub> (14 days):	<i>Eisenia foetida</i> :	> 5000 mg/kg soil
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**Other Beneficial organisms:**

No effect on carabid beetles. Harmless to slightly harmful to green lacewing, parasite species, mites/spiders and insects. Moderately harmful to *Bembidion lampros*.

**SECTION 13 - DISPOSAL CONSIDERATION**

**Pesticide disposal:**

Open dumping or burning of this pesticide is prohibited. Waste resulting from the use of this product that cannot be reused or reprocessed. Never pour untreated waste or surplus products into public sewers or where there is any danger of run-off or seepage into water systems. Do not contaminate rivers, dams or any other water sources with the product or used containers. If wastes cannot be used according to label instructions or chemically reprocessed, dispose of in a landfill approved for pesticide disposal or bury under at least 500 mm of soil in a non-crop, non-pasture area away from water sources of homes. Dispose of in accordance with all applicable local and state laws.

**Container disposal:**

Emptied containers retain vapour and product residues. Observe all labelled safeguards until container is destroyed. manner. Do not re-use the empty container for any other purpose but destroy it by perforation and flattening and bury in an approved dump site. Prevent contamination of food, feedstuffs, drinking water and eating utensils. Comply with local legislation applying to waste disposal.

**SECTION 14 - TRANSPORT INFORMATION**

UN NUMBER: 3077  
 Road Transport ADR/IRD:  
 Class: 9

**MATERIAL SAFETY DATA SHEET**

Issued by: Arysta Lifescience South Africa

Phone: 031 514 5600

Poison Information Centre: 082 446 8946; Tygerberg: (021) 931 6129; Poison Emergency Enquiry: (021) 689 5227



**Arysta LifeScience**

Product Name: Kalach 700 WSG

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Packing group: III  
Shipping name: Environmentally hazardous substance, solid, N.O.S. (herbicide - glyphosate)  
**Maritime Transport IMDG/IMO:**  
Class: 9  
Packing group: III  
Shipping name: Environmentally hazardous substance, solid, N.O.S. (herbicide - glyphosate)  
**Considered a Marine Pollutant.**

#### SECTION 15 - REGULATORY INFORMATION

**Symbol:** N  
**Indication:** Environmentally dangerous substance.  
**Risk phrases:**  
**R20/22** Harmful by inhalation or if swallowed  
**R 36** Irritating to eyes.  
**R 52** Harmful to aquatic organisms.  
**R 54** Toxic to flora.  
**Safety phrases:**  
**S 2** Keep out of reach children.  
**S 2425** Avoid contact with skin and eyes.  
**S 36/37/39** Wear suitable protective clothing, gloves and eye/face protection.  
**S 45** In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).  
**S 61** Avoid release to the environment

#### SECTION 16 - OTHER INFORMATION

**Packaging and Labelling:**

Packed in 10, 15, 50, 100, 430, 500g sachets & 1 kg carton & 5, 10, 15, 20 and 25 kg paper bags or Carton with inner plastic sachet with outer plastic lining and labelled according to South African regulations and guidelines.

**Disclaimer:**

The information on this sheet is not a specification; it does not guarantee specific properties. The information is intended to provide general guidance as to health and safety based upon our knowledge of the handling, storage use of the product. It is not applicable to unusual or non-standard uses of the product nor where instructions or recommendations are not followed. All information is given in good faith but without guarantee in respect of accuracy, and no responsibility is accepted for errors and omissions or the consequence thereof.

MSDS – Clethodim



MSDS OHYEW 55 EC  
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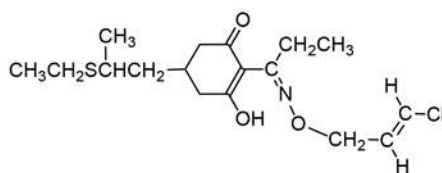
Material Safety Data Sheet

SECTION 1: PRODUCT IDENTIFICATION

**Product name:** Clethodim 55 g/L EC

**Chemical name:** (E, E) - (±)-2-[1-[[[(3-chloro-2-propenyl) oxy] imino] propyl]-5-[2-(ethylthio) propyl]-3-hydroxy-2-cyclohexen-1-one

**Structural formula:**



**CAS No.:** 99129-21-2

**Chemical class:** Herbicide

SECTION 2: COMPOSITION AND INGREDIENT INFORMATION

Clethodim 55 g/L

SECTION 3: HEALTH HAZARD INFORMATION

**Emergency overview:** Harmful by inhalation. May cause lung damage if swallowed.

**Routes of entry:** Inhalation, ingestion, eye and skin contact.

Room 3505, Tower 2, Grand Gateway Building, No.3 Honggiao Road, Xuhui District, Shanghai, PR China.





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#### SECTION 4: FIRST AID MEASURES

**Ingestion:** Rinse mouth. Give water to drink if patient is conscious. Do not induce vomiting. If vomiting occurs ensure patient can breathe, then give water to drink. Get medical attention.

**Eyes:** In case of eye contact, check for and remove any contact lenses. Immediately irrigate eyes with plenty of running water for at least 20 minutes, keeping eyelids open. Seek immediate medical attention.

**Skin:** If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes.

**Inhalation:** Immediately remove source of contamination or move victim to fresh air. If breathing has stopped, perform artificial respiration and administer oxygen. Keep person warm and at rest. Treat symptomatically and supportively as and when required. Seek medical advice immediately.

#### SECTION 5: FIRE AND EXPLOSION INFORMATION

**Extinguishing media:**

Suitable: Carbon dioxide, dry chemical, foam, water fog.

Unsuitable: Water stream.

**Special hazards in fire:** Product is flammable. Combustion may release carbon dioxide, nitrogen oxides, and/or chlorine compounds.

**Required special protective equipment for fire-fighters:** Wear self contained breathing apparatus if in enclosed space.

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**SECTION 6: ACCIDENTAL RELEASE MEASURES**

**Emergency procedures:** Wear protective equipment to prevent skin and eyes being affected. Evacuate unprotected and unnecessary personnel from area of spill. If material is leaking from a container, stop the leak only if this can be done safely. Prevent spillage entering drains or watercourse.

**Methods for containment & cleanup:** Vermiculite, Sand, Soil is a suitable absorbent, especially soils high in clay. Soil can be used to form bunds to contain spillage. Contaminated soil should be collected for disposal at a suitable landfill. Contaminated area and tools should be washed down with hypochlorite bleach. Personal protective equipment and clothing should be washed with soapy water.

**SECTION 7: HANDLING AND STORAGE**

**Handling:** Keep away from food, drink, and animal feedstuff. Keep out of reach of children. Wear suitable personal protective equipment when handling and spraying.

**Storage:** Store in the original container in a dry, cool, ventilated, locked area. Do not store in prolonged sunlight. Do not store with food, seed, or animal feedstuff.

**SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION**

**Engineering controls:** In the Workplace: Ensure ventilation is adequate. Keep containers closed when not in use. No special engineering controls are requirements. Product is used outdoors.

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**Personal protective equipment:** When opening the container, preparing spray and using the prepared spray wear safety goggles, impervious gloves, cotton overalls buttoned to the neck and wrist, and boots.

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**SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES**

**Appearance:** Light yellow liquid

**Odor:** Characteristic

**pH:** 4.0 – 7.0

**SECTION 10: STABILITY AND REACTIVITY INFORMATION**

**Stability:** Stable under normal conditions of handling and storage.

**Conditions to avoid:** Very high or low temperatures.

**Materials to avoid:** Strong oxidising agents.

**Hazardous decomposition products:** Oxides of nitrogen and chlorine. Burning with limited oxygen may produce carbon monoxide.

**SECTION 11: TOXICOLOGICAL INFORMATION**

**Oral:** Acute oral LD<sub>50</sub> for rat >2000mg/kg

**Dermal:** Acute dermal LD<sub>50</sub> for rat >2000mg/kg

**Inhalation:** LC<sub>50</sub> (4h) for rat >4.0mg/l

**Skin irritation:** Moderate irritating (rabbit)

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**Eye irritation:** Slightly irritating (rabbit)

**Skin sensitization:** Not a skin sensitizer

#### SECTION 12: ECOLOGICAL INFORMATION

**For active ingredient**

**Birds:** Oral LD<sub>50</sub> for bobwhite quail >2000 mg/kg. Dietary LC<sub>50</sub> for mallard ducks >6000 mg/kg.

**Fish:** LC<sub>50</sub> (96 h) for rainbow trout 67, bluegill sunfish >120 mg/l.

**Daphnia:** LC<sub>50</sub> (48 h) >120 mg/l; NOEC 60 mg/l.

**Algae:** EC<sub>50</sub> (5 d) for fresh-water algae 57.8 mg/l.

**Bees:** LD<sub>50</sub> (contact) >100 µg/bee.

**Worms:** LC<sub>50</sub> for worms 454 mg/kg soil; NOEL 316 mg/kg soil.

#### SECTION 13: DISPOSAL CONSIDERATIONS

Do not reuse product containers. Dispose of product containers, waste containers, and residues according to local, state, and federal health and environmental regulations.

#### SECTION 14: TRANSPORT INFORMATION

**UN No.:** 3082

**Class:** 9

**Packing group:** III

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**SECTION 15: REGULATORY INFORMATION**

**Risk phrases:**

R20: Harmful by inhalation.

R22: Harmful if swallowed.

R65: Harmful-may cause lung damage if swallowed.

**Safety phrases:**

S20/21: When using do not eat or drink/smoke.

S24/25: Avoid contact with skin/eyes.

S29/35: Do not empty into drains/Dispose of material and container in a safe way.

**SECTION 16: OTHER INFORMATION**

The information contained in the Safety Data sheet is correct to the best of our knowledge at the date of issue. It is intended as a guide for the safe use, handling, disposal, storage and transportation and is not intended as a warranty or as a specification. The information relates only to the product specified and may not be suitable for combinations with other materials or in processes other than those specifically described herein. Buyer assumes all responsibility for safety and use not in accordance with the product label instructions.

CORTA® 480

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**MATERIAL SAFETY DATA SHEET**

**1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**

**SUPPLIED BY :** SCPA SIVEX INTERNATIONAL  
 83-85 Boulevard Vincent Aurioi  
 75013 Paris - FRANCE

TEL. +33 1 44 06 53 00  
 FAX. +33 1 44 06 54 66

**ACTIVE INGREDIENT** Triclopyr

**FORMULATION** 480 g/L  
 Emulsifiable Concentrate (EC)

**CHEMICAL FAMILY/USE** Pyridine carboxylic acid / Herbicide selective, systemic, absorbed through roots and foliage

**FORMULA** C<sub>13</sub>H<sub>18</sub>Cl<sub>3</sub>NO<sub>4</sub>

**CHEMICAL SYNONYMS** 3,5,6-trichloro-2-pyridyloxyacetic acid

**2. COMPOSITION/INFORMATION ON INGREDIENTS**

Ingredients	Content (W/V)	CAS NO
<b>Active Ingredient:</b>		
TRICLOPYR sous forme acide (480 g/l) Eq. Triclopyr-2-butoxyethyl ester ( 600 g/l)	48 % min	64700-56-7
<b>Other ingredients:</b>		
Emulsion agent	10 % max	
Solvent (Xylene)	42 % max	

**3. HAZARDS IDENTIFICATION EMERGENCY OVERVIEW**

**EMERGENCY OVERVIEW:**  
**WARNING-POISON.** Keep out of reach of children. Avoid contact with skin, eyes and clothing. Do not inhale fumes. Severely irritating to eyes. May cause skin irritation. Harmful if absorbed through the skin. Harmful if swallowed or inhaled.

**EFFECTS OF ACUTE EXPOSURE:**

**INGESTION:** Harmful if swallowed. May cause nausea, vomiting, lung damage and abdominal pain.

**SKIN CONTACT:** Causes redness.

**INHALATION:** Cough. A nuisance-causing concentration of airborne particles can be reached quickly when dispersed.

**EYE CONTACT:** Causes redness and irritation.

**MEDICAL CONDITIONS AGGRAVATED:**  
 Skin exposure may aggravate preexisting skin conditions.  
 Inhalation of mist may aggravate preexisting respiratory conditions.

**PRINCIPLE ROUTES OF EXPOSURE:**  
 Skin absorption. Inhalation. Oral.  
 The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion. Occupational exposure to Triclopyr may occur through dermal contact with this compound at workplaces where Triclopyr is produced or used.

**CHRONIC EFFECTS/CARCINOGENICITY:**  
 There is no evidence that Triclopyr causes unscheduled DNA synthesis or acts as a mutagen. The carcinogenicity Peer Review Committee at the US EPA classified Triclopyr as a group D carcinogen, that is, not classifiable as to human carcinogenicity. Testing for cancer is not done on human subjects.

**REPRODUCTIVE TOXICITY:**  
 No data was found on the effects of Triclopyr on human reproduction or development. Regarding tests executed on animals, some changes occurred during pregnancy at 100 mg/kg/day in rabbits, and 300 mg/kg/day in rats. Triclopyr esters produced minor skeletal malformations in the offspring of rats.

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**MATERIAL SAFETY DATA SHEET**

**GENOTOXICITY:**

No

**TOXICOLOGICALLY SYNERGISTIC MATERIALS:**

NA.

**OTHER:**

Toxic levels for humans have not been established. No human exposure cases have been reported.

**4. FIRST AID MEASURES**

<b>INGESTION:</b>	Do not induce vomiting. Keep at rest. Obtain medical attention and if possible show the label. Do not induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person.
<b>SKIN:</b>	In case of contact, remove contaminated clothing and wash skin thoroughly with soap and plenty of water. If symptoms persist, call a physician. Wash clothes before re-use.
<b>INHALATION:</b>	If inhaled, remove to fresh air and keep at rest. Get medical attention or contact a Poison Control Centre.
<b>EYES:</b>	For eye contact, flush with large amount of water for at least 15 minutes. Get immediate medical attention. If easy to do, remove contact lenses. If there are persistent symptoms, medical attention should be obtained without delay.
<b>NOTE TO PHYSICIAN:</b>	Treatment based on sound judgment of physician and individual reactions of patient. Overexposure to materials other than this product may have occurred. Activated charcoal is probably effective in limiting irritant effects and reducing absorption of most or all of these herbicides. Aluminium hydroxide antacids may be useful in neutralizing the irritant actions of more acidic agents. Sorbitol should be given to induce catharsis if bowel sounds are present and if spontaneous diarrhea has not already commenced. Dehydration and electrolyte disturbances may be severe enough to require oral or intravenous fluids. If large amount of ingested herbicides have been ingested and the patient is seen within an hour of the ingestion, gastrointestinal decontamination should be considered. If the amount of ingested herbicides was small, if effective emesis has already occurred, or if treatment is delayed, administer activated charcoal and Sorbitol by mouth.

**5. FIRE FIGHTING MEASURES**

<b>FLASH POINT:</b>	- Close cup: 65.5°C - Open cup: 96.5°C
<b>CONDITIONS OF FLAMMABILITY:</b>	Fire point: 103°C Not Flammable
<b>FLAMMABLE LIMITS IN AIR - Upper (%):</b>	NA.
<b>FLAMMABLE LIMITS IN AIR - Lower (%):</b>	NA.
<b>AUTOIGNITION TEMPERATURE:</b>	NA.
<b>SENSITIVITY TO MECHANICAL IMPACT (Y/N):</b>	NA.
<b>SENSITIVITY TO STATIC DISCHARGE:</b>	NA.
<b>EXTINGUISHING MEDIA:</b>	Dry chemical, carbon dioxide, water fog or foam.
<b>SPECIAL FIREFIGHTING PROCEDURES:</b>	Special fire fighting procedures: Isolate fire area. Evacuate the employees and evacuate downwind. Avoid spreading of contaminated extinguishing agent in the environment. Minimize use of water to prevent environmental contamination. Do not breathe smoke, gases, or vapour generated. Keep fire exposed containers cool by spraying with water. Wear full protective  Fire fighters should wear self-contained breathing apparatus and full protective clothing when fighting chemical fires. Minimize and contain water runoff. Equipment should be thoroughly decontaminated after use.

**CROP PROTECTION DEPARTMENT**



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**MATERIAL SAFETY DATA SHEET**

**6. ACCIDENTAL RELEASE MEASURES**

**ACTION TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:**

Use safety equipment and procedures appropriate to the size of the spill. Keep unnecessary people away. Avoid runoff to natural waters and sewers. Surround and absorb spills with inert material such as perlite, sawdust, clay granules, vermiculite, sand or dirt. Contain all affected material in a closed, labelled container for proper disposal. Isolate from other waste materials. Clean contaminated area such as hard surfaces with detergent and water, collecting cleaning solution for proper disposal. Large spills to soil or similar surfaces may necessitate removal of top soil. Clean contaminated floors and objects thoroughly, observing environmental regulations. Do not discharge into the drains/surface water/groundwater. Keep people and animals away.

**7. HANDLING AND STORAGE**

**HANDLING:** Avoid contact with the eyes, skin and clothing and avoid inhalation of product or spray mist. If in eyes, wash it immediately with water. After handling and before eating, drinking or smoking, wash hands, arms and face thoroughly with soap and water.

**STORAGE:** Store in the closed, original container in a dry, cool, well-ventilated area, keep away from direct sunlight. Store in locked room or place away from children, animals, food, animal feed, seed and fertilizers. Keep away from all ignition sources and protect from extreme heat and cold. Keep containers tightly closed.

**8. EXPOSURE CONTROLS/PERSONAL PROTECTION**

**ENGINEERING CONTROLS:** Use in a well ventilated area. General ventilation with a good source of make-up air recommended as minimum for indoor situations. Ventilation should be adequate to maintain air concentrations below exposure limits.

**RESPIRATORY PROTECTION EQUIPMENT:** Use an approved pesticide respirator if ventilation is not adequate or exposure to sprays, mists or vapours is likely. Short term : Filter apparatus, Filter A.

**PROTECTIVE GLOVES:** All types of chemical-resistant gloves for handling chemicals are acceptable, provided that they can be cleaned. Rinse gloves before removal. Gloves are not required for applicator in enclosed tractor or airplane cockpit.

**EYE AND FACE PROTECTION:** Goggles or face shield when handling concentrate. Chemical resistant goggles must be worn.

**OTHER PROTECTIVE EQUIPMENT:** Long sleeved shirt, long pants, socks and shoes are minimum work clothing. Coveralls or a chemical-resistant apron should also be worn when open pouring from containers greater than 5L. Use other equipment appropriate to specific situation.

**VENTILATION:** Use only in well ventilated area.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

<b>BOILING POINT:</b>	Decomposes at 208°C
<b>VAPOR PRESSURE:</b>	0.2 mPa
<b>VAPOR DENSITY (air = 1):</b>	NA.
<b>FREEZING POINT:</b>	NA.
<b>MELTING POINT:</b>	150.5°C
<b>PHYSICAL STATE:</b>	Liquid
<b>ODOUR:</b>	Oil base paint
<b>COLOUR:</b>	Amber
<b>ODOR THRESHOLD (ppm):</b>	NA
<b>EVAPORATION RATE (butyl acetate = 1):</b>	NA.
<b>SPECIFIC GRAVITY (water = 1):</b>	1.046
<b>DENSITY (21°C):</b>	1.85
<b>pH</b>	6.2 ± 0.5
<b>SOLUBILITY IN WATER (25°C):</b>	0.408 (purified) / 7.69 (pH 5) / 8.10 (pH 7) / 8.22 (pH 9)
<b>COEFFICIENT OF WATER/OIL DISTRIBUTION:</b>	$K_{ow}$ logP=0.42 (pH 5) ; -0.45 (pH 7) ; -0.96 (pH 9)

Note: Physical data are typical values, but may vary from sample to sample. A typical value should not be construed as a guaranteed analysis or as a specification.

**10. STABILITY AND REACTIVITY**

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**MATERIAL SAFETY DATA SHEET**

**STABILITY:** Stable under normal storage and handling conditions. Product will burn, keep away from heat and open flame.  
**HAZARDOUS POLYMERIZATION:** Not known to occur.  
**HAZARDOUS THERMAL DECOMPOSITION/COMBUSTION PRODUCTS:** Carbon monoxide, nitrogen oxides, hydrogen chloride and phosgene may be formed if product is involved in fire.  
**INCOMPATIBILITY (MATERIALS TO AVOID):** Acids, bases and strong oxidizers.  
**CONDITIONS TO AVOID:** Heat and fire.

**11. TOXICOLOGICAL INFORMATION**

ORAL LD50	Rat	713	mg/kg
DERMAL LD50:	lapin	> 2000	mg/kg
4 HOURS INHALATION LC50:	Rat	>256	ppm
EYE IRRITATION:	Rabbit	Slightly irritant	
SKIN IRRITATION :	Rabbit	Non irritant	
SKIN SENSITIZATION :	Guinea pig	Sensitizer	

Note : Data from Dow Chemical Company

**12. ECOLOGICAL INFORMATION**

**ECOTOXICOLOGICAL INFORMATION:**

96-HOUR LC50:	Rainbow trout	117	mg/L
48-HOUR EC50:	Daphnia magna	133	mg/L
LD50:	Mallard Duck	1698	mg/kg
CONTACT LD50:	Bees	> 100	µg/bee

Note : Data on Active Ingredient.

**CHEMICAL FATE INFORMATION:**

In mammals, following oral administration, excretion is primarily via the urine as the unchanged compound. In plants, DT50 is 3-10 days. The main metabolite is 3,5,6-trichloro-2-methoxyppyridine. In soil, fairly rapid degradation by microbial activity, with an average half-life of 46 days, depending on soil and climatic conditions. The major degradation product is 3,5,6-trichloro-2-pyridinol (which has a half life of 30-90 days), with a smaller amount of 3,5,6-trichloro-2-methoxyppyridine. Koc : 59 ml/g; Kd : 87 (unaged samples), 225 (aged) ml/g.  
 Triclopyr is slowly absorbed through skin and is rapidly eliminated. It has very low potential to accumulate in man or to be absorbed through the skin in acutely toxic amount.

**13. DISPOSAL CONSIDERATIONS**

**DISPOSAL METHOD:**

For information on disposal of unused, unwanted product, contact the manufacturer or the provincial regulatory agency. Disposal should be made in accordance with federal, provincial and local regulations. Contact the manufacturer and the provincial regulatory agency in case of a spill, and for clean up of spills.  
 Emptied container retains vapor and product residue. Observe all labelled safeguards until container is cleaned, reconditioned or destroyed. Do not reuse container for any purpose. If applicable, return container in accordance with return program. If a recyclable container, dispose of at a container collection site. Contact local distributor, dealer or municipality for the location of the nearest collection site. Before taking the container to the collection site, triple or pressure rinse the empty container adding rinsing to spray tank, and make container unsuitable for further use. If there is no container collection site in your area, dispose of the container in accordance with provincial requirements.

**14. TRANSPORT INFORMATION**

RAIL/ROAD (RID/ADR):	9
SEA (IMDG):	9
AIR (ICAO/IATA):	9
U.N. NUMBER:	3082
DG CLASS:	NA.
HAZCHEM CODE:	9
PACKING GROUP:	III

**15. REGULATORY INFORMATION**

**CROP PROTECTION DEPARTMENT**

**CORTA® 480**

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**MATERIAL SAFETY DATA SHEET**

**NOTICE:** The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations.

**16. OTHER INFORMATION**

**REVISIONS:**

The following has been revised since the last issue of this MSDS: New.

**ADDITIONAL INFORMATION:**

Abbreviations used throughout the MSDS are: NA = Not available  
NAp = Not applicable  
N/E = None Established.

This MSDS summarises our best knowledge of the health and safety hazard information of the product and how to safely handle and use the product in the workplace. Each user should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace including in conjunction with other products. If clarification or further information is needed to ensure that an appropriate risk assessment can be made, the user should contact this company. Our responsibility for products sold is subject to our standard terms and conditions, a copy of which is sent to our customers and is also available on request.

CORTA®: Registered Trademark of SSI

**END OF MSDS**

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**CROP PROTECTION DEPARTMENT**

Appendix 9: Fire certificate

0028540

LOW RISK

GHANA NATIONAL FIRE SERVICE

FIRE CERTIFICATE

This is to certify that

house number \_\_\_\_\_ of BEREKUM, BONO REGION has been issued  
with Fire Certificate for use as PLACE OF WORK (OFFICE) FORM GHANA LIMITED

Having upon inspection satisfied the following requirement as Fire Safety:

Means of Escape		
Type	Number	Location
a) MAIN EXIT	A O D	A O D
b) GFN	30	
c) ES/EDS	13	
d)		

Fire Fighting Equipment		
Type	Number	Location
a) CO <sub>2</sub> (3KG)	18	
b) DP <sup>2</sup> (6KG)	19	
c)		
d)		

Fire Hydrant/Source of Water Supply

HYDRANT	-	NIL
ALTERNATIVE SOURCE OF WATER	-	MECH. BORE HOLE

Warning Device(s)		
Type	Number	Location
a)		
b)		
c)		
d)		

BC20002A      THIS CERTIFICATE IS VALID FOR TWELVE MONTHS

Dated this 8TH day of JANUARY, 20 21



DCFO OBENG DANKWA DWAMENA

For: CHIEF FIRE OFFICER



**Appendix 10: Corporate Social Responsibility**



*Plate 1: Ablution facility in Kotaa community*



*Plate 2: Solar powered bore hole constructed in Kotaa*



*Plate 3: Road maintenance/construction in Miremano*

**Appendix 11: OHS Training on HIV/AIDS**



*Plate 4: HIV/AIDS Sensitization*



*Plate 5: HIV/AIDS screening of Form Ghana staff*