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## EXECUTIVE SUMMARY

The Ghana Manganese Company Ltd. (GMC) owns and operates the Nsuta Manganese Mine, located in the Tarkwa-Nsuaem Municipal Assembly of the Western Regional Administrative Area in the South West of Ghana. The mine has been in operation for ninety-eight (98) years and has a total concession area of 175km<sup>2</sup>. Its current mining activities fall within an area of 5.27km<sup>2</sup> while historical working areas and various infrastructures such as the Nsuta Village, Mine Offices, and Workshops add-up to form a total land take of 13.51km<sup>2</sup> utilized by the project site at Nsuta in the Dadwen Extension of the concession.

This Annual Environmental Report has been prepared in respect of the year under review (i.e. 2013). It projects the environmental improvements in and around the mine including assistance to the communities within the Awudua and Esuoso Divisional Stool Councils.

During the year under review, the following technical and engineering updates were carried out by TACMIN, South Africa, during 2013, as per the scope of work of the technical services model:

- Updating of X-sections,
- Updating of the block volume,
- Geological and Resource modeling,
- Geotechnical advice,
- Exploration review, planning and summary of results,
- Quarterly reconciliation and updating of the mine plan for re-sequencing.

GMC Corporate Social Responsibility (CSR) program consists of four components namely: Sustainable Alternative Livelihood Programs, Educational Bursary Scheme, Infrastructural Projects and General Support. In 2013, these programs continued with a total expenditure of US\$ 632,363.

The following sponsorship was made during the year under review:

- To the Medeama Soccer Club, a Tarkwa based Premier League soccer club, an amount of \$80,000.00 was sponsored to support and encourage the team to attain higher laurels as well as promote soccer.
- One hundred and twenty (120) and six (6) packs of roofing sheets were donated to the Roman Catholic School of Nsuta and the Ministry of Food and Agriculture of TNMA respectively. This is to support the two institutions in re-roofing their buildings.

- A donation of Two Thousand Five Hundred Cedis (GH¢2,500.00) was made to the Ghana Association of the Disabled to assist them to participate in a National Conference of the Association in Takoradi.

In addition to the above, the following environmental activities were also carried out:

- A workshop was successfully held at the Senior Staff Club house on the 28<sup>th</sup> of February. It was attended by forty staffs from 9 mining companies including GMC. Presentations made included Environmental Impacts of Blasting, Blasting Standards and Blast Monitoring Procedures; subsequently followed by practical demonstration in the field of work.
- Twenty seven (27) Acacia and five (5) royal palm seedlings were transplanted onto the golf course. This is to provide shade as well as improve the aesthetic value of the course. There was careful pruning of trees and bushes both on the mine and the residential areas. This was done to improve their aesthetic value, clear visibility for drivers, as well as avoid breakage of overgrown branches onto electrical wires in particular.
- Induction for third party contractors, newly employed personnel and employees resuming from annual leave was carried out on a regular basis. The Environmental Policy and Standard Operating Procedures for management of environmental issues such as hydrocarbon management, noise and dust were presented.
- Three thousand, five hundred (3,500) bunches of palm fruits were harvested from the Hill B Reclamation Site within the year and are supplied to traders in the host community.
- Tarkwa Nsuaem Municipal EPA office visited the mine on 28th-30th April 2013 to inspect the oil spillage scenes and the Kawere River/Stream.
- The Monitoring and Evaluation Manager and an officer of the Minerals Commission paid a day's monitoring visit to the mine in particular the site for the new office complex. The visit was in fulfillment of the functions of the commission which enjoins it to monitor the operation of mining companies and report to the government.

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**Managing Director**  
 Ghana Manganese Co. Ltd

## **1.0 INTRODUCTION**

Ghana Manganese Company (GMC) is located at Nsuta near Tarkwa in the Tarkwa-Nsuaem Municipal Assembly. It is the only manganese producing mine in Ghana. Nsuta town is 4km from Tarkwa, the seat of the Tarkwa-Nsuaem Municipal Assembly (TNMA).

In 2013, GMC actively mined Pit C and started a development and dewatering project at Pit B. According to the pit and waste dump designs of the Life of Mine plan (LOM), GMC will move into the other pits in the near future.

The mining method employed is exclusively open-cast; comprising drilling, blasting, loading and hauling. Thereafter, the ore is processed (crushed and screened with no chemical addition) and stockpiled for transportation by rail and road to Takoradi Port for shipment.

The management of Ghana Manganese Company Limited, conscious that mining and its associated activities affect the environment in which it operates, therefore ensures that within its economic limits and the need to be internationally competitive, the Company's activities are carried out with due cognizance of the Environment.

## **2.0 BRIEF DESCRIPTION OF COMPANY'S ACTIVITIES**

### **2.1 Mining**

During the year under review, mining operations were in Pit C and a development and dewatering exercise started at Pit B. GMC's attention focused on cutback at central and the southern eastern sectors of Pit C.

Manganese Carbonate ore was the main ore body exploited during the year under review with the budgeted stripping ratio of 1: 14.9 (ton: ton).

### **2.2 Mining Operations**

Total ore mined during the year under review was 1,824,337 tonnes. This represents 104.9 % of the total budgeted figure of 1,739,680 tonnes.

With the increased mining production, the company purchased additional fleet (mining equipment) to achieve higher equipment availabilities. The following new equipment were obtained in the first quarter of the year:

- 4 x Komatsu 785HD-7 off highway dump trucks,
- 1 x CAT D9R track type bulldozer,
- 1 x Komatsu PC2000-8 hydraulic backhoe,

See Picture 1, 2, and 3.

Other equipment purchased is as follows:

- 1 x Komatsu WA500-3A Front End Loader
- 1 x ATLASCOPCO ROC L8 Drill Rig





*Plate 1: Shows Komatsu 785HD-7 off highway dump trucks*



*Plate 2: Shows CAT D9R track type bulldozer.*



*Plate 3: Komatsu PC2000-8 hydraulic backhoe excavator*

### **2.3 Mine Geotechnical Assessment**

In 2013, the mine's geotechnical assessment of slope design parameters for Pit C was reviewed. The revised analysis is based on previous logging data and on new information collected by the Geotechnical Engineer for Consolidated Minerals Limited Australia (CMLA).

The review mainly focused on a revised assessment of the batter stability, recognizing the presence of a number of different structural domains with the pit. The relationship defining the overall slope angle to overall wall height for the fresh meta-sediments; and the slope design parameters for the oxide and transitional zones are still considered appropriate for the purposes of design.

### **2.4 Topsoil and Subsoil Management**

During the year under review, sub-soils totaling 11,234,018 metric tons were generated from development of Pit C Central West (69,450), Central East (9,150,803), South East (1,245,898), South West (141,465) and Pit B footwall (626,402) were stockpiled at the Hill B soft dump for future closure reclamation/ rehabilitation works. To control erosion of the stockpile, pueraria seeds (leguminous cover crop) were broadcasted on its slopes. Regular inspections at the mine



face to ensure that buffer zone, bench and berm parameters are in compliance with Akoben Criteria was carried out during the year under review. Plates 4 and 5 below show topsoil and subsoil management on the mine.



*Plates 4 and 5: Show topsoil and subsoil management on the mine*

## **2.5 Exploration Activities on the Mine**

Ghana Manganese Company Limited (GMC) takes responsibility for the planning and execution of infill and exploration bore hole drilling programme on the mine.

### **2.5.1 Exploration Sites**

For the year 2013, exploration and infill borehole drilling were executed in the following mine pits,

- Pit C Central West
- Pit C Central East
- Pit C South West
- Pit C South East
- Pit B North end

### **2.5.2 Drilling Information**

With exception of Pit B where Reflex drilling company drilled some pre collar boreholes prior to continuation with diamond drilling rigs, all the other exploration and infill boreholes were drilled with GMC owned wire lines diamond drilling rigs.

#### **2.5.2.1 Reverse Circulation drilling**

This drilling exercise was implemented as pre collar work to penetrate the overburden (severely weathered zones) before core drilling in the un-weathered waste rock and ore body. Depth drilled

depends on the thickness of the weathered zone (i.e. overburden). The drilling pattern follows the main drilling exercise of the infill and exploration holes (i.e. grid pattern of 30\*30 meters).

#### **2.5.2.2 Diamond Drilling**

Diamond core drilling rigs are used for infill and exploration drilling on the mine. Its purpose is to investigate the possible extension of the manganese carbonate ore zones and also bridging in the gaps between ore bodies in the mine pits which previous drilling activities could not cover.

Depth to be drilled varies depending on the extent to which the ore body begins and terminates within the earth crust. For the year under review, three (3) wire line core drilling rigs were in use. (i.e. Atlas Copco wire line core drilling rigs, model CS14; Christensen)

#### **2.5.3 Breakdown of Activities**

##### **2.5.3.1 Pit C Central West**

Re-drilling of infill boreholes in known mineralized ore zones was conducted. Purpose for this drilling exercise was to upgrade the existing Manganese Carbonate ore distribution knowledge and increase further awareness of the grade distribution in gaps left undrilled in the entire mine pit.

##### **2.5.3.2 Pit C Central East**

Re-drilling of infill and some exploration boreholes to upgrade the ore distribution information in the mine pit, (i.e. especially converting the inferred ore zone to indicated resource).

##### **2.5.3.3. Pit C South West**

Drilling of infill boreholes in the mine pit to bridge in the gaps between ore bodies that could not be drilled during the initial drilling programme was carried out. This exercise has brought about increase in ore reserve previously reported for the mine pit.

##### **2.5.3.4 Pit C South East**

Exploration drilling to investigate the possible extension of the manganese carbonate ore body from the mine pit towards further east under the historical soft waste dump was carried out. Table 5 shows Diamond/reverse circulation bore holes drilled from Jan-Dec. 2013

## 2.6 Development of PIT C

The LOM of the pit shell has been extended to enable maximum extraction of the ore body. The areas which fall within the pit shell needs to be developed to open-up so as to achieve the aims of the extended life of the mine. The pit has been re-designed as per standard bench heights and slope and to reach the ultimate pit bottom. See plates 6 and 7 for the initial and progress stages of Pit C.



*Plate 6: Shows Pit C Development in 2013*



*Plate 7: Shows Pit C Progress development in 2013*



## 2.8 Development of Pit B Western side

Continuous exploration activities at Pit B has revealed that there is additional ore (manganese) dipping to the western limb (foot wall) of the pit. Upon optimization and design, a cut-back is being undertaken at the western side to open up access for the mining operations. This activity will affect the reclaimed Pit B North rehab site as mentioned in previous environmental documents. See Plate 8a: showing affected Pit B North rehab site in red arrow.



*Plate 8a: Shows Pit B Development in 2013*



*Plate 8b: Shows Pit B Development in 2013*

## 2.9 CARBONATE PROCESSING PLANT

During the year under review, no major structural changes were undertaken in the plant, except modification and installation of new safety guards and installation of new dust suppression system (5 points). See plate 9a& 9b show painting of structures and side wall for primary section.



*Plate 9a: Shows painting of structures*



*Plate 9b: Shows new side wall for primary crushing section*



### **3.0 ENVIRONMENTAL PROJECTS FOR 2013**

#### **3.1 Fencing of the Volatilization Pad (VP)**

The company does not directly utilize or discharge hazardous chemicals into the environment due to the nature of its beneficiation process. However, hydrocarbons are used in machinery and equipment and therefore generate hazardous waste such as waste oil and hydrocarbon related waste i.e. oil filters, rags, and contaminated soils/sawdust. These were properly segregated and disposed-off at the volatilization pad. All used oil filters were drained and crushed before disposal.

The pad is sited at Pit A close to the domestic waste dump. Looking at the destruction due to theft of HDPE liner at the volatilization pad, effective metal fencing around the facility was undertaken in 2013.

Since the erection of the fencing, no theft case has been recorded and the pad is functioning effectively. Oil Contaminated soil measuring about 345m<sup>3</sup> has so far been deposited in the pad and regular turning of the soil had effectively been done. This is to facilitate the decomposition or breakdown of the hydrocarbon compounds so that the soil could be used for agricultural purposes.

First batch of decomposed HC soil free from any oil has been removed and stockpiled for future use. Sample of such soil is yet to be sent to the Soil Research Institute for chemical analysis. Plate 10 and 11 show Volatilization pad fenced.



*Plate 10: Shows Volatilization pad fenced*



*Plate 11: Shows the entrance of the pad*

#### **3.2 Construction of Storm Water Containment and Pen Stock Valve**

Four (4) other siltation ponds/traps were constructed to improve reduction of siltation of the Kawere stream. A Pen stock valve was installed on 5m<sup>3</sup> storm water settlement pond during the year under review to prevent unauthorized effluent discharges into the Kawere stream. The



number of spill kits on site is regularly reviewed along with relevant training in terms of spill drills to make sure there are always enough kits in stock and employees are capable of dealing with any major accidental release – safety first. Plates 12 and 13 show ingress and egress sections of the storm water drainage with pen stock valve attached to it.



*Plates 12 and 13: ingress and egress sections of the storm water drainage with pen stock valve*

### **3.3 Dust Suppression System (Water Sprinkler)**

As part of our continuous efforts to reduce dust concentrations within our operational area, Water Sprinkling Systems have been installed for dust suppression at the port. See plates 14 and 15 showing sprinkler systems in operation. The Sprinkler Device is operated by a Water Pumping Machine with a capacity of 4BAR/56PSI and a Rubber Hose.

The system rotates at an angle of 360 Degree when limit level is disengaged, with an adjustable mechanism. The maximum sprinkling distance is 25meters and a minimum of about 10meters. See plates 14 and 15 showing water sprinkling systems for dust suppression at the Takoradi Port.



*Plates 14 and 15: Show water sprinkling systems suppression dust at Takoradi Port.*

### 3.4 Reclamation of Waste Dump

The concurrent reclamation/rehabilitation of the Hill B waste dump was continued steadily for the year under review. In 2013, daily agronomic practices mostly slashing in the plantation, weeding around the palm trees and application of NPK (15:15:15) fertilizer were done, pruning dead branches to improve aeration were carried out in the plantation to promote healthy growth and high yield. See plates 16 and 17 showing current state of the palm trees and first fruits harvested.



*Plate 16: Shows current state of the palm trees*



*Plate 17: Shows first fruits harvested*

First batch of the oil palm fruit has been harvested and sample of the fruit was sent to the Crop Research Institute for needed test and analysis to be carried. Harvesting of palm fruit started on large scale at the latter part of the year. Pruning of lower palm branches at the Hill B plantation continued; this is to improve aeration and bigger fruit bunch formation.

#### 3.4.1 Sale of Palm Fruits from Reclaimed Sites

Palm fruits harvested weekly from Hill B and Taysec oil palm plantations by farm- hands drawn from nearby communities were conveyed to a buyer at Nsuta. Bunches were counted and price haggled based on prevailing market price to a suitable conclusion for both parties. The agreed amount is communicated to the commercial department and an invoice is issued to that effect. Payment is then made at the pay office by the buyer. So far, an amount of GH¢ 2,076 has been realized in 2013.

#### 3.4.2 Weed Control

During the month under review, agronomic practices such as slashing and weeding were carried out in the Hill B oil palm plantation and Carbox Stockpile Reclamation Site oil palm plantations. Ring weeding around individual palms and removal of climbing plants entangling palm branches was carried out to improve aeration.

#### 4.1 Tree Seedling Nursery

Various trees species were nursed within the year under review. At the nursery tree species such as, *Polyalthal longifolia* (Weeping willow), *Acacia alata*, and *Roystonea regia* (Royal palm) seedlings were raised in poly pots and transplanted in various locations in the mine village. See table 7 showing types of trees species at the GMC Nursery.

Item no.	Plant Name	Quantity
1	Royal palm	60
2	Weeping willow	70
3	Acassia	124
4	Pink tabebuia	13
5	Azura	65
<b>Total</b>		<b>332</b>

Table 7: Types of trees species at the GMC Nursery

Twenty seven (27) Acacia and five (5) royal palm seedlings were transplanted onto the golf course. This is to provide shade as well as improve the aesthetic of the course. There was careful pruning of tree branches both on the mine and the residential areas. This was done to improve their aesthetic value, clear visibility for drivers, as well as avoid breakage of overgrown branches onto electrical wires in particular.

##### 4.1.1 Major Activities at the Nursery for the Year 2013

The main activities carried out in the nursery within the year under review were generally, maintenance of the nursery such as weeding of surroundings, uprooting of weeds around seedlings and tree planting. Trees in residential areas were also pruned to improve their aesthetic value. The nursery was mainly occupied with the nursing of bimbo bamboo seedlings. The project is on trial for future generation of biogas to be used to supplement the consumption of electricity on the mine. So far, three hundred and thirty two (332) of the seedlings raised have been transplanted onto the trial plot.

##### 4.1.2 Bamboo Energy Project

As energy demand continues to increase in Ghana, GMC started to investigate options for alternative power source (i.e. biomass energy) onsite in order to gain energy security and control of energy costs in support of the Ghana Energy Commission's ambitious target of sourcing 10% of its energy requirements from renewable resources by the year 2020.

Following several researches in Ghana and India, in order to achieve successful cultivation of bamboo energy crops in Ghana, Darlow Ghana Limited signed a memorandum of understanding to partner with Ghana Manganese Company (GMC) in 2013 for a trial bamboo plantation. GMC's existing nursery was upgraded and significantly expanded to the standards required for the project to include infrastructure for vermiculture, manure, sand, soil mix, storage, propagules, potting areas and constructed nursery beds to manage 20,000 imported bamboo saplings from



India and Ethiopia. A mechanized borehole was also constructed to supply water at the nursery. See plates 18 and 19 showing workers grading saplings and view of the nursery.



*Plate 18: Workers grading saplings*



*Plate 19: shows View of the Nursery*

In order to commence the trial plantation, an area of 10 hectares was designated by GMC to Darlow Gh Ltd. The trial site is accessible by mine haul road and has direct access to water. Since the trial site was occupied by local farmers, compensation of 45,000 Ghana Cedi was paid to the farmers for crops affected by the project. Hired dozer and tractor were used in preparing the land and creating ridges in rows 2.5m apart for transplanting of the bamboo seedlings.

Drainage channels were created on the field to divert runoff so as to prevent any incident of water logging. See plates 20 and 21 showing trial plot cleared and tractor ploughing.



*Plate 20: shows showing trial plot cleared*



*Plate 21: show hired tractor ploughing*

#### **4.1.3 Transplanting**

The beema bamboo seedlings were transported from the nursery to the trial site for planting. Holes diameter and depth were 28cm, 24cm respectively. 150bags of compost fertilizer were applied to trial site. See plate 22 and 23 showing planting pegs and rainfall at the trial site.





*Plate 22 show planting pegs*



*Plate 23 show rainfall at the demo site*



*Plate 24: shows the current status of the trial bamboo project*

#### 4.1.4 Re-afforestation Program

Reclamation programs in the teak and ofram afforested areas were vigorously pursued during the year under review to promote ecological integrity of the site and surrounding landscapes. Various places including along the road from the main security gate to the hospital, Ofram and teak plantations and surroundings of the nursery were weeded. Tamso and Nsuta roundabouts were regularly cleaned of litter, grass mowed and hedges trimmed to improve the aesthetic value.

### 5.1 New Oil Management Systems

During the year under review, New Oil Pumping Systems with engine, gear-hydraulic and grease suspenders were installed to help dispense accurate Levels of lubricants into equipment and trucks and also to help in the effective management and minimization of spillages. The system is also an improvement on the dispensing of the correct lubricants into equipment for the avoidance of possible contamination of the various lubricants.

In the year under review, a new 70m<sup>2</sup> washing bay and a 3m<sup>3</sup> oil separator was constructed to help improve on the general cleanliness and a more effective mechanism for Oil Management at the port. Plates 31 and 32 below show new oil pumping systems with engine, gear- hydraulic and grease suspenders.



*Plates 31 and 32: Show New Oil Pumping Systems with engine, gear- hydraulic and grease suspenders*

### 5.2 Waste Segregation and Disposal

Education on the importance of waste segregation and colour codes has been intensified at the various departments. Dust bins depicting the appropriate colours have been placed at vantage points. The environmental department intends to paste pictures of various wastes on the bins.

### **5.3 ENVIRONMENTAL IMPROVEMENT PROGRAMMES DURING YEAR 2013**

- The various workshops were regularly inspected and closely monitored to ensure good housekeeping.
- Various drains on the mine including “Essuabena”, Kawere and Tarkwa Banso were regularly de-silted to improve drainage and surroundings regularly weeded to maintain a clean environment.
- Tamso and Nsuta roundabouts were regularly cleaned of litter, grass mowed and hedges trimmed to improve the aesthetic value.
- Various places like “ofram” and teak plantations, berms along the road between Pit C Central and the mine office, the palm plantation at the carbox stockpile reclaimed site were weeded.
- Twenty seven (27) Acacia and five (5) royal palm seedlings were transplanted onto the golf course. This is to provide shade as well as improve the aesthetic of the course.

There was careful pruning of trees and bushes both on the mine and the residential areas. This was done to improve their aesthetic value, clear visibility for drivers, as well as avoid breakage of overgrown branches onto electrical wires in particular.

### **5.4 Environmental Programs and Workshops**

The environmental policy statement was discussed with workers in the various departments during the HSE morning meetings on a rotational basis. This is to make them aware of the company’s commitment to environmental issues and the role of employees in achieving the company’s goal.

The following were also undertaken during the year:

- Induction for newly employed personnel, employees resuming from annual leave including top and middle level management and third party contractors was carried out on a regular basis. The Environmental Policy and Standard Operating Procedures for management of environmental issues such as hydrocarbon management, noise and dust were presented. This is to involve all stakeholders in pertinent environmental issues so as to achieve the company’s environmental goals. The usual daily HSE morning meetings continued during the year to ensure consciousness of workers on safety and health issues while on the job. This is to help reduce/prevent accidents.
- A workshop was successfully held at the Senior Staff Club house on the 28<sup>th</sup> of February. It was attended by forty staffs from 9 mining companies including GMC. Presentations made included Environmental Impacts of Blasting, Blasting Standards and Blast



Monitoring Procedures; subsequently followed by practical blasting monitoring on the field of work.

- The Environmental Coordinator made a presentation on effective dust suppression on mines at the University of Mines and Technology (UMAT) on 18th of October with support from the Chamber of Mines.
- Four (4) delegates made up of two (2) Environmental Officers, the Environmental Co-coordinator and one (1) Community Affairs officer represented GMC at the third quarter ENSOC meeting organized by the Chamber of Mines at Adamus Resources Limited.

## **5.5 Mining Summit 2013**

Ghana Chamber of Mines Mining Summit 2013 organized from the June 12 – June 14, is the leading mining industry event dedicated to promoting new investment and exploration opportunities for investors, miners and financiers. This event is the biennial mining conference and exhibition that serves as a platform for exhibitors to network with stakeholders in the extractive industry space in Ghana. See plates 43 and 44 show cross-sections of participants in the Mining Summit



*Plates 43 and 44: Show cross-sections of participants in the Mining Summit*

The two-day conference and three-day exhibition which were held concurrently was on the theme: “Making mining the true catalyst for development – Thinking outside the box.” It came on the back of the increased activity in the mining scene, renewed interest of the investor community in Ghana and helped stakeholders and industry players to learn about the changing mining environment in Africa and the opportunities they offer, how governments are reforming mining codes, understand how to build relationships with regional government institutions, master mining risks and regulations and showcase their products and services to the extractive companies in West Africa.



## **5.6 Summary of Environmental Activities during Year 2013**

- The oil/water separator was thoroughly cleaned; the four (4) siltation chambers connected to the oil/ water separator were de-silted and regularly checked to ensure only water free of oil was discharged into surrounding streams.
- Various drains on the mine were regularly de-silted to improve drainage and surroundings regularly weeded to maintain a clean environment.
- Expired drugs at the pharmacy of the Nsuta hospital were properly disposed of by burying.
- Various drains on the mine including “Essuabena”, Kawere and Tarkwa Banso were de-silted to improve drainage and to maintain a clean environment.
- The contaminated soil containers at the workshops were repainted black in accordance with GMC color code.
- Various measures such as cutting of trench, planting of more trees and filling of gulleys with waste rocks were carried out on benches to ensure stability.
- Overgrown branches of trees in the residential areas, hospital and on the mine were pruned to improve their aesthetic value.
- The water storage chambers of the oil/water separator used for washing dump trucks were de-silted and thoroughly cleaned. The regular de- silting and cleaning of the separating chambers also continued within the year to ensure that only oil-free water is released into the external environment
- Four (4) other siltation ponds/traps are being constructed to improve the efficiency of preventing/reducing siltation of the Kawere stream

## **5.7 Visiting Groups**

- Officers from the Tarkwa Nsuaem Municipal EPA office visited the mine on the following dates 3rd April 2013 – Visited where the proposed Pit B de-watering would be carried out and inspected the site for the proposed new offices complex.
- As part of the quarterly inspection by the Minerals Commission, officials of the Inspectorate Division of the commission visited the mine within the year.
- As part of the Mine Safety Day Celebration, the Inspectorate Division of Minerals Commission visited the mine to conduct Mine Safety audit.
- The Ankobra Basin Officer of the Water Resources Commission visited the mine for inspection of water bodies and their management.

As part of mine familiarization, the Chamber of mines each year organizes mine tours within the mining companies in the country. This year’s mine tour for members of the Journalists for

Business Advocacy (JBA) was organized on 30th July, 2013. See plates 45 and 46 show the media personnel in mine tour organized by the Ghana Chamber of Mines



*Plates 45 and 46: Show the media personnel in mine tour organized by the Ghana Chamber of Mines*

## **5.8 ENVIRONMENTAL MONITORING PROGRAMMES**

The environmental monitoring program at G.M.C Limited is designed to evaluate the potential impacts of the operation on the surrounding environment and, to validate predictions made in the Environmental Impact Assessment and the Environmental Management Plan. Monitoring results are compared to the Environmental Protection Agency's (EPA) guidelines and standards. In the absence of the applicable guidelines and standards, the results are compared to the World Health Organization's (WHO) international standard.

## **5.9 Environmental Quality Monitoring**

Environmental quality monitoring is one of the key tasks carried out by the environmental department throughout the year. For this purpose, the Electrical department designed a fully networked system, coupled over encrypted radio connections from the most required locations to the corporate network. Local meteorological conditions were monitored throughout the year. Places monitored include tailings dam, Pit C, and Tarkwa Banso. The meteorological conditions monitored included rainfall, temperature, wind speed, wind direction and rate of evaporation.

At the tailings dam, the ground water level measurement took place at six different points. The values obtained from the water level measurement were recorded and analyzed. This was done by the use of a piezometer gauge.

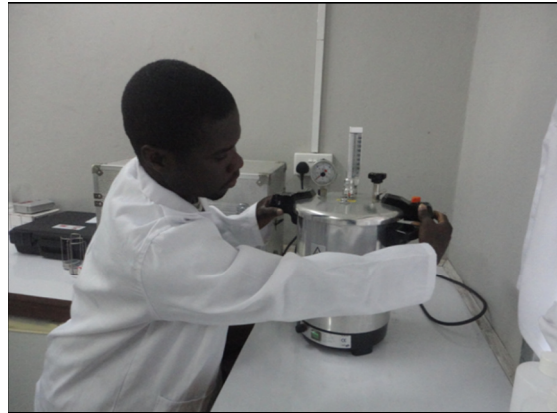
## **6.0 Daily Drinking Water Analysis**

Drinking water is also analyzed for microbiological parameters such as total coli-form, faecal coliform, E-coli, Yeast and Mold. Four samples of water were taken daily to determine quality of

the presence of some water constituent. The parameters analyzed under investigation were mainly physiochemical parameters. See plates 47 and 48 showing Laboratory technician analyzing water quality.



*Plate 47: Laboratory technician*



*Plate 48: Technician analyzing water quality*

A conductivity meter was used to measure the specific conductance, and total dissolved solid (TDS). Chlorine and pH were analyzed qualitatively using Brometymol and O-T iodine as reagents respectively. Lovibond 1000 comparator was used to carry out the qualitative analysis. The water samples were taken from two different places namely Gallaway and Golf course. The Gallaway pump station supplies portable water to the Nsuta community and the company's operational areas whiles the Golf course pump station supplies water to the bungalows.