MEGAPIPES SOLUTIONS LIMITED

ENVIRONMENT IMPACT ASSESSMENT (EIA) STUDY REPORT FOR HDPE PIPES MANUFACTURING FACTORY

LAND REF. NO. RUIRU / MUGUTHA BLOCK 3/30 & 3/31
RUIRU MUNICIPALITY – KIAMBU COUNTY

HDPE PIPES MANUFACTURING FACTORY EIA STUDY REPORT

GPS COORDINATES: -1° 10’32.08”S, 36034’17.58”E

Proponent:
MEGAPIPES SOLUTIONS LTD.
“The Address” – 8th Floor
Muthangari Drive,
Nairobi, Kenya
Ke-Mobile: +254 768 447 858
info@megapipes.co.ke

Consultant:
MANGAT I.B. PATEL (MIBP) LTD.
Consulting Engineers
P.O. Box 48674 00100 – GPO
Nairobi, Kenya
Tel.: +254-20-2710500
Email: mibp.nairobi@mibp.co.ke

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CONSULTANT
MANGAT I.B. PATEL (MIBP) LTD.

DOCUMENT TITLE:
HDPE PIPES MANUFACTURING FACTORY EIA STUDY REPORT

VERSION 01

<table>
<thead>
<tr>
<th>VER.:</th>
<th>DATE:</th>
<th>DESCRIPTION/PURPOSE OF ISSUE:</th>
<th>PREPARED BY:</th>
<th>CHECKED BY:</th>
<th>APPROVED BY:</th>
</tr>
</thead>
</table>
CERTIFICATION

MANGAT I.B. PATEL (MIBP) LIMITED

Signed Date...24th April 2020......

GODWIN LIDAHULI SAKWA
LEAD EXPERT NEMA REG NO. 2492

PROPONENT

Signed ..................................Date ...................................

Name..............................................Juerg Fluehrmann

MEGAPIPES SOLUTIONS LIMITED
E. EXECUTIVE SUMMARY

E.1 Project Information

Megapipes Solutions Limited proposes to build a Factory for manufacturing of HDPE Plastic pipes, namely double wall structured HDPE pipes (Weholite) and solid wall HDPE pipes for drainage and sanitation Projects in Kenya and neighboring countries. The purpose of this Project is to have a local manufacturing of innovative, state-of-the-art products for the growing requirements of sanitation and drainage projects in Kenya, contributing to the local economy and industrialization process and avoiding importation of such products.

The Factory will be developed on 10 acres piece of land LR NO LR 11294/30&31 located in Mugutha Location, Ruiru Sub County (Oaklands Properties Limited) within Kiambu County. Certificate of title / lease is attached as Appendix 1.

The Factory is designed to have various phases starting with building a 4000m² Factory for the manufacturing of Weholite pipes from 800mm to 3000mm diameter. Weholite is a structured wall pipe or structural panel made from high-density polyethylene (HDPE). HDPE structured wall pipes are manufactured by extrusion of a hollow rectangular box section which is continuously wound onto a mandrel.

The production of the HDPE box section is done through various steps which include Extrusion which converts the polymeric particulates into a homogenous, pressurized melt. The use of the die is to pre-form the molten polymer coming from the extruder to a preliminary shape. Calibration Process follows immediately downstream of the extrusion die, where the profile is cooled and solidified, and where its outer dimensions are fixed. This process is discussed in detail in chapter 3 of this report.

E.2 Justification of the EIA and Approval of ToR

EMCA 1999 Cap 387 revised in 2015 to align to the Kenyan Constitution 2010 provides in the second schedule that a Factory of such magnitude be subjected to an Environmental Impact Assessment (EIA).

Also, the International Finance Corporation (IFC) and World Bank Group Environmental, Health, and Safety General Guidelines of April 30, 2007 provides guidelines related to Environment, Occupational Health and Safety, Community Health and Safety, construction and decommissioning upon which such Project should be analyzed against. To comply with the above referenced statutes, the Proponent (herein) referred to as Megapipes Solutions Limited has commissioned M/S Mangat IB Patel (MIBP) Ltd. to undertake engineering designs for the Project including Environmental Impact Assessment Study Report (EIA).

Legal Notice 101 of the Environment Impact Assessment and Audit regulations (EIA/EA 2003) part III of EMCA cap 384 provides for preparation of Terms of Reference (ToR) to be approved by National Environment Management Authority (NEMA) before undertaking the EIA. Therefore, to comply with the regulation Terms of Reference prepared for the Project (NEMA/TOR/5/2/66) was approved by NEMA on 6th of March 2020. A copy of the approval letter is appended to this report as Appendix 2.
E.3 Objectives and Scope of the EIA Assessment

This Environmental Impact Assessment (EIA) has been conducted in compliance with the Environmental Impact Assessment Regulation as outlined under the Gazette Notice No. 56 of 2003 established under the Environmental Management and Coordination Act (EMCA) 1999 cap 387 amended in 2015 and the International Finance Corporation (IFC) and World Bank Group Environmental, Health, and Safety General Guidelines of April 30, 2007.

The EIA is expected to achieve below listed objectives.

(i) Identify all potential significant environmental impacts of the proposed HDPE pipes Factory project and recommend measures for mitigation.
(ii) Generate baseline data for monitoring and evaluating how well the mitigation measures will be implemented during Factory operation.
(iii) Design an Environmental Health and Safety Management and Monitoring Plan that will ensure that Factory is operated in a sustainable manner.

E.4 Scope of EIA Assessment


As provided by the legal instruments, the EIA focused on analyzing, prediction and provision of mitigation measure for the below listed parameters.

(i) Ambient Air Quality analysis. The EIA focused on assessing the ambient Sulphur Oxides (SOx), Nitrogen Oxides (NOx) Particulate matter (PM) and Volatile Organic Compounds (VOC). The baseline of the parameters listed above will provide a basis for subsequent emissions monitoring during operation period of the Factory
(ii) Noise and Excessive Vibrations. The EIA focused on assessment the baseline noise and excessive vibration levels of the proposed site as required by Legal Notice no. 61 Noise and Excessive Vibration Pollution Control
(iii) Wastewater Analysis. The EIA focused on water quality analysis of existing water points identified at the lower elevation to the Factory. The analysis included a full chemical / physical assessment including; pH, Suspended solids, Nitrate (NO3), Ammonia (NH3), Nitrite (NO2) and Total Dissolved Solids among other parameters.
(iv) Occupational Health and Safety Provision. As provided in OSHA 2007 and Public Health Act of 2017, the scope of the Health and Safety Management for the Factory will address the Project’s commitment to mitigate potential impacts of related to HDPE pipe manufacturing process to the health and safety of workers and communities around the Factory.
(v) Analysis of HDPE Factory impacts on natural environment and related sensitive receptors - The impact analysis was done using the Leopold matrix which is a grid that is used to identify the interaction between project activities, which are displayed along one axis, and environmental characteristics, which are displayed along the other axis.
(vi) Stakeholder Interviews – The process involved detailed stakeholder identification and engagement as part of the EIA study. Stakeholders that were interviewed are; Tatu City, Kofinaf Coffee Estates, Sasini Coffee Estates, Oaklands Coffee Estates, Mugutha Location Chief, Kenya Manufacturers Association (KMA). At EIA sectorial review by NEMA, more stakeholders are expected to be involved through Kenya Gazette and daily newspaper EMP advertisements and institutional circulation of the EIA report.

E.5 Legal and Policy Regulatory Instruments

The assessment involved review of national legal statutes and international policies relevant to HDPE pipes manufacturing Factory as summarized below.

(i) Environmental Management and Coordination Act 1999 Cap 387 and subsequent regulation not limited to
   ✓ Legal Notice no 121 Waste Management Regulation 2006
   ✓ Legal Notice no 120 Water Quality Regulations, 2006
   ✓ Legal Notice no. 61 Noise And Excessive Vibration Pollution Control Regulations, 2009
   ✓ Legal Notice no 34 Air Quality Regulations, 2014
(ii) Physical and Land Use Planning Act of 2019 – 202
(iii) The Public Health Act (Cap.242)
(iv) Occupational Health and Safety Act (OSHA 2007),
(v) The Urban Areas and Cities Act 2011
(vi) Water Act 2016
(vii) Land Act 2012
(viii) Energy Act 2019

The EIA also reviewed provision of International Finance Corporation (IFC) and World Bank Group Environmental, Health, and Safety (EHS) General Guidelines of April 30, 2007 as best practice.

E.6 Highlights of Stakeholder Consultations

Kenya’s Environmental Impact Assessment / Audit Regulations of 2003 require that in the process of Environmental Impact Assessment (EIA) the proponent shall in consultation with the National Environment Management Authority (NEMA); seek the views of persons who may be affected by the Project.

Therefore, stakeholder interviews were done to the below listed stakeholders; Tatu City, Kofinaf Coffee Estates, Sasini Coffee Estates, Oaklands Coffee Estates, Mugutha Location Chief, Kenya Manufacturers Association (KMA).

A summary of stakeholder concerns is summarized in Table E.1 on page v.
<table>
<thead>
<tr>
<th>Parameter Discussed</th>
<th>Issues Discussed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air pollution</strong></td>
<td><strong>Concerns</strong></td>
</tr>
<tr>
<td></td>
<td>- The main issue was how the manufacturing process of the pipes would ensure that there would be no air pollution associated with the production process.</td>
</tr>
<tr>
<td></td>
<td>- In addition, during construction, the dust emitting from machines and Lorries going to the site might affect the quality of coffee harvested around the area.</td>
</tr>
<tr>
<td></td>
<td><strong>Response</strong></td>
</tr>
<tr>
<td></td>
<td>- He informed that Factory will comply with the air quality regulation of 2014 with regards to air quality emission standards.</td>
</tr>
<tr>
<td></td>
<td>- In addition, during the EIA, baselines air quality measurements have been collected, this data will be used during annul audit of the Factory</td>
</tr>
<tr>
<td></td>
<td>- The path to the Factory will be constantly sprayed with water during construction period, this provision will form part of EIA conditions</td>
</tr>
<tr>
<td><strong>Water pollution</strong></td>
<td><strong>Concerns</strong></td>
</tr>
<tr>
<td></td>
<td>- He had a concern that during the rains, the surface runoff from the Factory might include heavy metals and chemicals which might end up in the streams around and eventually the coffee farms.</td>
</tr>
<tr>
<td></td>
<td><strong>Response</strong></td>
</tr>
<tr>
<td></td>
<td>- He was informed that the Factory process involve extrusion which converts the polymeric particulates and later molded, this process is dry and no liquid wastes will be released to the environment.</td>
</tr>
<tr>
<td><strong>Noise and Excessive Concern</strong></td>
<td><strong>Concern</strong></td>
</tr>
<tr>
<td></td>
<td>- Stakeholders were concerned that such factories are associated with noise and excessive vibration which interrupt the ambient serenity of the environment</td>
</tr>
<tr>
<td></td>
<td><strong>Response</strong></td>
</tr>
<tr>
<td></td>
<td>- The response was that the Factory will perform with allowable noise and vibration levels as provided in the noise and excessive vibration of 2010. Also, at the EIA stage ambient noise and excessive vibrations levels of the site have been recorded to be used to monitor compliance of the Factory during operation</td>
</tr>
<tr>
<td><strong>Disposal of waste materials and are they hazardous</strong></td>
<td><strong>Concern</strong></td>
</tr>
<tr>
<td></td>
<td>- The aesthetic beauty of the area will be destroyed due to all the activities going on especially tree cutting and bush clearing.</td>
</tr>
<tr>
<td></td>
<td><strong>Response</strong></td>
</tr>
<tr>
<td></td>
<td>- He was assured the EIA will provide provisions for proper disposal of solid wastes as provided in the waste management regulation of 2006. Also, the Factory process do not use any hazardous material and that the Polyethylene has been assessed and found to be no hazardous.</td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td><strong>Concern</strong></td>
</tr>
<tr>
<td></td>
<td>- Finally, he stated the people of Murera village should be given employment opportunities in the Factory as they mostly depend on the coffee farms for salaries.</td>
</tr>
<tr>
<td></td>
<td><strong>Response</strong></td>
</tr>
<tr>
<td></td>
<td>- The response was that the Factory will provide direct jobs to 100 peoples and indirect jobs to 1000 people thereby contributing to achievement of Kenya’s Vision 2030</td>
</tr>
</tbody>
</table>

Detailed filled questionnaires are provided as Appendix 3 of this report
E.7  Product Safety Information Sheet

Product Safety Information Sheet prepared by Borealis¹ AG (12.03.2019), attached to this EIA as Appendix 4, provides the below listed safety advantage of HDPE pipes made from Polyethylene which is a raw material for plastics industry.

(i) Hazards identification - The product is not classified as hazardous according to Regulation (EC) No 1272/2008 and its amendments
(ii) Composition/information on ingredients - The product is a polyethylene polymer, it contains no substance classified as hazardous in concentrations, which should be taken into account according to EU regulations.
(iii) First aid measures- if inhaled: Move to fresh air in case of accidental inhalation of vapours or decomposition products. In case of skin contact: If molten material comes in contact with the skin, cool with plenty of water. DO NOT remove solidified product, as removal could result in severe tissue damage. Obtain medical attention.
(iv) Ecological information - The product is not considered hazardous for the environment.
Not readily biodegradable. Does not accumulate in organisms. Avoid release to the environment.
(v) Firefighting measures -Suitable extinguishing media: Water in spread jet, dry chemicals, foam or carbon dioxide. Specific hazards during firefighting: Principal toxicant in the smoke is carbon monoxide
(vi) Accidental release measures -Vacuum or sweep up spill. All spill of material must be removed immediately to prevent slipping accidents. Prevent product from entering environment and drains.
(vii) Handling and storage - Advice on safe handling: During processing and thermal treatment of the product, small amounts of volatile hydrocarbons may be released. Avoid inhalation of dust and decomposition fumes. Provide adequate ventilation. Local exhaust ventilation or additional personal protective equipment (PPE) may be necessary.
(viii) Exposure controls/personal protection - Do not eat, drink or smoke when using this product. Wash hands before breaks and at the end of workday. Appropriate personal protective equipment (PPE) shall be worn in accordance with Regulation (EU) 2016/425

E.8  Project Impacts

The HDPE pipes manufacturing Factory will provide 100 direct employees and generate indirect employment for about 1000 people during construction and operation stage. This will ultimately translate into economic growth as provided in the Kenya’s Vision 2030 economic pillar.

The Factory will manufacture Weholite pipes are made from high density polyethylene – HDPE - and represent a significant contribution in the development of thermplastic structured wall pipe systems. The pipes will have below listed advantages compared to the concrete pipes as summarized in Table E.2 on page vii;

¹ Product safety information sheet: Polyethylene: BorSafe™ HE3490-LS: 12.03.2019 Ed.4
Table E.2: Advantages of HDPE Pipes

<table>
<thead>
<tr>
<th>Advantage</th>
<th>Advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Light weight</td>
<td>✓ Corrosion Resistant</td>
</tr>
<tr>
<td>✓ Flexible</td>
<td>✓ Environmental Deterioration Resistant</td>
</tr>
<tr>
<td>✓ Easy to Handle and Install</td>
<td>✓ Non-Toxic</td>
</tr>
<tr>
<td>✓ Impact Resistant</td>
<td>✓ Much lower carbon footprint</td>
</tr>
<tr>
<td>✓ Durable</td>
<td>✓ Environmental Friendly Production</td>
</tr>
<tr>
<td>✓ Superior Hydraulics Properties</td>
<td>✓ UV-Resistant</td>
</tr>
<tr>
<td>✓ Fusion Welded Joints</td>
<td>✓ Reliability</td>
</tr>
<tr>
<td>✓ Watertight Mechanical joints</td>
<td>✓ 120 year design life (60 years above ground)</td>
</tr>
<tr>
<td>✓ Abrasion Resistant</td>
<td></td>
</tr>
</tbody>
</table>

Activities during the pre-construction, construction phase and operation phases with potential to trigger negative environment impacts are summarized in Tables E.3 to E.5 below.

Table E.3: Pre-Construction Stage - Permits and Approval Compliance Management Monitoring Plan

<table>
<thead>
<tr>
<th>Activity / Impact</th>
<th>Mitigation / Management Actions</th>
</tr>
</thead>
</table>
| Permits and Licenses | • The Contractor shall ensure that all pertinent permits, certificates and licenses have been obtained prior to any activities commencing on site and are strictly enforced/ adhered to;  
• Registration permit of site as place of work from Department of Occupational Health and Safety Registration (DOSH).  
• Environment Licenses for camp sites and cement batching plants from NEMA  
• Water Resources Authority (WRA) approvals water sources if from nearby streams  
• Approval of Plans by Kiambu County Government Physical Planning Department of any structures on site  
• Permits from Public Health Department Kiambu County) of sanitation facilities installed on site  
• The Contractor shall maintain a database of all pertinent permits and licenses required for the contract as a whole and for pertinent activities for the duration of the contract |

Table E.4: Construction Stage - Impacts Management and Monitoring Plan

<table>
<thead>
<tr>
<th>Associated Impacts</th>
<th>Management Actions</th>
</tr>
</thead>
</table>
| Sedimentation Impacts of drainage channels downstream | • Sand/silt traps should be used so as to prevent silt and any other sediments from getting into storm water channels  
• Site stockpiles will be properly covered to avoid exposure to agents of soil erosion such as wind and rain  
• The drainage system will be developed in a manner that prevents silt-laden runoff from entering surface water drains. |
| Water Quality Impacts within water resources downstream | • Water containing such pollutants as cements, concrete, lime, chemicals and fuels shall be discharged into a conservancy tank for removal from site where applicable  
• All vegetation materials either live or dead on site shall be cleared and removed before the area is excavated  
• Regular monitoring of water quality standards of downstream water resources against the baseline undertaken during the EIA stage |
| Risk of Accidents at Work Sites during Factory construction | • Provide Personal Protective Equipment (PPE) including gloves, gum boots, overalls and helmets to workers. Use of PPE to be enforced by the Supervising Engineer.  
• Fully stocked First Aid Kits to be provided within the Sites, and in all Project Vehicles |
<table>
<thead>
<tr>
<th>Associated Impacts</th>
<th>Management Actions</th>
</tr>
</thead>
</table>
| Solid Wastes impacts during construction of the Factory| - Strict use of warning signage and tapes where the trenches are open and at other active construction sites  
- Contractor to Employ and train Road Safety Marshalls who will be responsible for management of traffic on site                                                                 |
| Liquid Wastes Impacts during construction of the Factory| - Properly labelled and strategically placed waste disposal containers shall be provided at all places of work  
- Litter bins should have secured lids to prevent animals and birds from scavenging  
- All personnel shall be instructed to dispose of all waste in a proper manner  
- Recycling of construction material shall be practiced where feasible e.g. containers and cartons  
- Earth spoils shall be disposed of in pre identified sites |
| Sanitation issues resulting from both solid and liquid wastes on site during Factory construction | - Water containing pollutants such as concrete or chemicals should be directed to a conservancy tank for removal from the site where applicable  
- Potential pollutants of any kind and form shall be kept, stored and used in such a manner that any escape can be contained  
- No grey water runoff or uncontrolled discharges from the site or working areas to any adjacent Storm water channels. |
| Fuels, Oils and other hydro-carbons from plant and equipment | - All temporary/ portable toilets or pit latrines shall be secured to the ground to the satisfaction of the engineer to prevent them from toppling over  
- A wash basin with adequate clean water and soap shall be provided alongside each toilet. Staff shall be encouraged to wash their hands after use of the toilet to minimize the spread of diseases |
| Risk to health and safety of community and workers during Factory construction | - The contractor shall ensure that the machines and equipment are in good condition when on site.  
- Ensure proper handling of lubricants, fuels and solvents while maintaining the plant and equipment.  
- Any chemical or fuel spills shall be cleaned up immediately.  
- The spill liquid and clean-up material shall be removed, treated and transported to an appropriate site licensed for its disposal.  
- Follow specifications of the Occupational Health and Safety Act 2007, EMCA 2015 and others in the development and operation of stores |
| Air pollution from Factory construction activities       | - The Contractor shall keep noise level within acceptable limits and construction activities shall, where possible, be confined to normal working hours in the residential areas  
- The Environmental Management and Coordination (Noise And Excessive Vibration Pollution) (Control) Regulations, 2009 provides 55decibel during the day and 35 decibel during the night |
| Associated risks during contractor decommission of construction works | - Workers shall be trained on management of air pollution from vehicles and machinery.  
- All construction machinery shall be maintained and serviced in accordance with the contractor’s specifications  
- Contractor shall not carry out dust generating activities (excavation, handling and transport of soils) during times of strong winds  
- Vehicles delivering soil materials shall be covered to reduce spills and windblown dust  
- Water sprays shall be used on all earthworks areas within 200metres of human settlement. |
| The site is to be cleared of all construction materials, including litter prior to hand over  
Fences, barriers and demarcations associated with the construction phase must be removed from the site  
Rehabilitation Activities of Environmental Cases identified must continue throughout the defect liability period  
Undertake a completion Environment, Health and Safety Audit |
<table>
<thead>
<tr>
<th>Activity Fields</th>
<th>Requirement</th>
<th>Action required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duties of Occupiers (Legal Requirements)</td>
<td>Risk Assessment</td>
<td>Undertake Risk assessment of the Factory before start of operations</td>
</tr>
<tr>
<td></td>
<td>Safety and Health Audit</td>
<td>Undertake Safety and Health Audit of the Factory before start of operations</td>
</tr>
<tr>
<td></td>
<td>Fire Safety Audit</td>
<td>Undertake Fire Safety Audit of the Factory before start of operations</td>
</tr>
<tr>
<td></td>
<td>Initial Environment Audit</td>
<td>Conduct an Initial Environment Audit at completion of Factory construction.</td>
</tr>
<tr>
<td>Management of Polices required at the Factory</td>
<td>Policies Required:</td>
<td>Display signed copies of the policy statement at the workplace and bring it to the attention of all employees and other stakeholders.</td>
</tr>
<tr>
<td></td>
<td>• Safety &amp; Health Policy</td>
<td>This should be followed by a comprehensive Environment, Safety and Health policy document that spells out an arrangement on how the Policy (ies) is going to be implemented.</td>
</tr>
<tr>
<td></td>
<td>• Fire Safety Policy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Environment Policy</td>
<td></td>
</tr>
<tr>
<td>Factory Personnel Trainings Required</td>
<td>Training required:</td>
<td>Appoint and train members of the fire-fighting team</td>
</tr>
<tr>
<td></td>
<td>• Statutory: Fire marshal training</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Training required:</td>
<td>Conduct first aiders’ training for the first time and a refresher training annually.</td>
</tr>
<tr>
<td></td>
<td>• Statutory: First Aid Training</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Training required:</td>
<td>• Have a safety &amp; health committee with a minimum membership of six employees</td>
</tr>
<tr>
<td></td>
<td>• Statutory: Safety and Health Committee</td>
<td>• Ensure the committee is trained by a DOSHS approved training institution.</td>
</tr>
<tr>
<td>Occupational Health Programmes within the Factory</td>
<td>Statutory Medical Examinations</td>
<td>Ensure the employees under-go medical exams by an approved DHP at prescribed intervals.</td>
</tr>
<tr>
<td></td>
<td>• Pre-employment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Periodical</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Post-employment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provision of First Aid Kit</td>
<td>Provide a readily accessible first aid kit for all workers. Additionally can have emergency contacts in case a first responder is needed.</td>
</tr>
<tr>
<td></td>
<td>Documents required:</td>
<td>Ensure that all accidents / occurrences are investigated to establish root cause. These are then entered in the general register and reported to the County Safety and Health Officer within the prescribed timelines</td>
</tr>
<tr>
<td></td>
<td>• General register</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Accident notification forms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Examinations required:</td>
<td>Any of the equipment listed in Part VII of OSHA 2007 must be inspected by Government approved person in line with the prescribed timelines</td>
</tr>
<tr>
<td></td>
<td>• All plants, lifting equipment and machinery (as per OSHA 2007) that will be used during construction</td>
<td></td>
</tr>
<tr>
<td>Factory Operations Safety</td>
<td>Required:</td>
<td>Factory daily operations will be done using heavy machinery or aided by specialized equipment and processes.</td>
</tr>
<tr>
<td></td>
<td>Risk assessment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inspection of ladders / scaffolding</td>
<td></td>
</tr>
<tr>
<td>Permits To Work (PTW)</td>
<td>Permit to Works are required for non-routine hazardous work.</td>
<td>The Factory manager will design permits to work system for use by employees/ external contractors engaged in hazardous activities e.g. electrical installations, hot works and work at height and entry in confined spaces</td>
</tr>
<tr>
<td>Activity Fields</td>
<td>Requirement</td>
<td>Action required</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Fire Safety</td>
<td>Requirements:</td>
<td>• Ensure fire drills are done annually</td>
</tr>
<tr>
<td></td>
<td>• Fire drill</td>
<td>• sufficient firefighting equipment</td>
</tr>
<tr>
<td></td>
<td>• firefighting equipment</td>
<td>• ensure all fire escapes are not obstructed and open outwards or slide sideways</td>
</tr>
<tr>
<td></td>
<td>• Fire escapes</td>
<td>• Precautions with respect to explosive or inflammmable dust or gas.</td>
</tr>
<tr>
<td>Emergency Response Plan</td>
<td>Required:</td>
<td>The occupier should prepare listed emergency preparedness and response plans for</td>
</tr>
<tr>
<td></td>
<td>• Injury emergency response;</td>
<td>the workplace.</td>
</tr>
<tr>
<td></td>
<td>• Non entry rescue mission to persons in confined space;</td>
<td>Emergency contacts should be posted at this point.</td>
</tr>
<tr>
<td></td>
<td>• Fire emergency response;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Accidental spill management;</td>
<td></td>
</tr>
<tr>
<td>Ergonomics At The Workplace</td>
<td>Requirement: Ergonomic survey</td>
<td>Provide handling aid for lifting and/or transportation of heavy objects.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The workplace facilities and machines should be designed to fit the requirements/</td>
</tr>
<tr>
<td></td>
<td></td>
<td>abilities of the workers using them.</td>
</tr>
<tr>
<td>Contractors And Suppliers</td>
<td>Duties of an occupier of place of work to persons other than his employees.</td>
<td>Develop policy to guide contractors and suppliers regarding their obligations t</td>
</tr>
<tr>
<td></td>
<td></td>
<td>o take care of their employees’ safety and health and complying with statutory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>regulations. This should be imbedded on the contract document and the contractors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>made aware of them before signing the contract.</td>
</tr>
<tr>
<td>Personal Protective Equipment</td>
<td>Requirements:</td>
<td>PPE are used to protect the workers from physical, chemical or biological hazards</td>
</tr>
<tr>
<td></td>
<td>• Head, body eye, ear, respiratory tract, hand and foot protection as needed.</td>
<td>which they are likely to encounter in their working environment.</td>
</tr>
</tbody>
</table>

**E.9 Conclusions**

The Environmental Impact Assessment (EIA) undertaken for the proposed HDPE Pipes Manufacturing Factory provides below listed conclusions:

(i) The Project will be developed on 10 acres piece of land LR NO LR 11294/30&31 located in Mugutha Location, Ruiru Sub County (Oakland Properties Limited) within Kiambu County. Certificate of title / lease attached as Appendix 1. This parcels of land are owned by the Proponent (Megapipes Solutions Limited).

(ii) The Change of User minute CPTC/031/2017/052 approved change of user of the parcel of land from agricultural to mixed development use (attached as Appendix 5). This implies that the Factory will not be out of character from the surrounding area which has existing similar factories milling coffee.

(iii) The production of the HDPE box section is done through various steps which include; Extrusion which converts the polymeric particulates into a homogenous, pressurized melt...
among other steps, the process is a dry process and no liquid wastes is anticipated.

(iv) Despite the process being a dry process, the EIA focused on water quality analysis of existing water points identified at the lower elevation to the Factory as a precautionary measure, the baseline water quality data will be used during route audits of the Factory process.

(v) The product is not classified as hazardous according to Regulation (EC) No 1272/2008 and its amendments. Also, the product is not considered hazardous for the environment. However, it is not readily biodegradable it does not accumulate in organisms.

E.10 Recommendations

This assessment recommends the following provisions:

(i) The Environment Management Plan (EMP) prepared under this EIA provides a budget of Kenya Shilling Three Hundred Thousand (KES 300,000.00) for mitigation of environment impacts identified in this report at Factory Construction stage.

(ii) The budget for implementing health and safety provisions on an annual basis during Factory operations is also provided as KES 300,000.00 However, this budget will be revised appropriately during operation phase of the Factory.

(iii) The Bid documents prepared for the project should incorporate the Environment, Health and Safety Provisions discussed under Chapter 7 (Environment Impact Assessment and Mitigation Measures). This will ensure the contractors who tender for the works include in their bids the KES 300,000.00 budget presented the EMP.

(iv) Contractor will be required to commit to implementing the Environment, Health and Safety (EHS) Provisions by developing site specific (EHS) plans at construction stage of the Factory.

(v) At Project implementation stage, the Contractor will report to the Project management team comprising of the Consultant and the Project proponent on a monthly basis on how EHS provision detailed in this EIA are addressed at each Project Site.

(vi) On completion of the Civil Works, Proponent (Megapipes Solutions Ltd.) will commission an independent Consultant to undertake an initial Environment, Health and Safety Audit as required by Environment Impact Assessment and Audit Regulations of 2003. The audit will identify nonconformities which the Contractor together with Proponent will address through the defects liability period of the Project and use to during annual self-audits.
LIST OF ABBREVIATIONS

BoD - Biological Oxygen Demand
CoD - Chemical Oxygen Demand
DOSH - Department of Occupational Health and Safety
EHS - Environment Health and Safety
EC - European Commission
EA - Environmental Assessment
EIA - Environment Impact Assessment
EMCA - Environment Management & Coordination Act
EHSMP - Environment Health and Safety Management Plan
IFC - International Finance Cooperation
KMA - Kenya Manufacturers Association
HDPE - High Density Polyethylene Pipes
NEMA - National Environmental Management Authority
NOx - Sulphur Oxides
SOx - Nitrogen Oxides
OSHA - Occupational Health & Safety Act
PE - Polyethylene
Pm - Particulate Matter
TOR - Terms of Reference
PPE - Personal Protective Equipment
VOC - Volatile Organic Compounds
WBG - World Bank Group
WRA - Water Resources Authority
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CHAPTER 1: BACKGROUND INFORMATION

1.1 Project Information

Megapipes Solutions Limited proposes to build a Factory for manufacturing of HDPE Plastic pipes, namely double wall structured HDPE pipes (Weholite) and solid wall HDPE pipes for drainage and sanitation Projects in Kenya and neighboring countries. The purpose of this Project is to have a local manufacturing of innovative, state-of-the-art products for the growing requirements of sanitation and drainage projects in Kenya, contributing to the local economy and industrialization process and avoiding importation of such products.

The project will be developed on 10 acres piece of land LR NO LR 11294/30&31 located in Mugutha Location, Ruiru Sub County (Oakland Properties Limited) within Kiambu County. Certificate of title/lease attached as Appendix 1.

The Factory is designed to have various phases starting with building a 4000 m² Factory for the manufacturing of Weholite pipes from 800mm to 3000mm diameter. Weholite is a structured wall pipe or structural panel made from high-density polyethylene (HDPE). HDPE structured wall pipes are manufactured by extrusion of a hollow rectangular box section which is continuously wound onto a mandrel.

The production of the HDPE box section is done through various steps which include Extrusion which converts the polymeric particulates into a homogenous, pressurized melt. The use of the die is to pre-form the molten polymer coming from the extruder to a preliminary shape. Calibration Process follows immediately downstream of the extrusion die, where the profile is cooled and solidified, and where its outer dimensions are fixed. This process is discussed in detail in chapter 3 of this report.

1.2 Location and Administration

The physical location of Parcel Number LR 11294/30 & 31 where the Factory will be located is within Oaklands Estates next to Kofinaf Coffee Factory, Ruiru Municipality of Kiambu County. Figure 1-1 on Page 1-2 presents topographical map for the proposed site.
Figure 1-1: Location Map of the Factory
CHAPTER 2: SITE BASELINE INFORMATION

2.1 Location Information

The project will be developed on 10 acres piece of land LR NO LR 11294/30&31 located in Mugutha Location, Ruiru Sub County (Oakland Properties Limited) within Kiambu County at GPS Coordinates -1° 10’32.08"S, 36°034’17.58”E

The parcel was originally a coffee plantation but later change of user the Change of User minute CPTC/031/2017/052 approved change of user of the parcel of land from agricultural to mixed development use.

The site is accessed from Thika Superhighway after the Ruiru River Bridge using the Murera road past Matundu Estate to a right turn at Kofinaf Coffee Mills. Photograph of the parcel are illustrated below.

![Photographs Showing Factory Site on LR Number 11294/30&31 -](image)

2.2 Climate

Ruiru town and its environs within which the Factory site lies experience a bi-modal type of rainfall. The long rains are experienced between the month of March to May followed by a cold season. The cold season is characterized by drizzles and frost, which occur in the months of June to August. The short rains fall between October to November. The town receives rainfall of a high of 2000mm and a low of 600mm. The town experiences sunshine most of the year with temperature highs of 27.0°C and lows of 12.0 °C

2.3 Soils

Most parts of Ruiru are covered by soils from volcanic footbridges. These are well drained with moderate fertility. They are red to dark brown friable clays. However, some parts of are covered by shallow soils, which are poorly drained, and these areas are characterized by low rainfall, which severely limits agricultural development. The proposed Factory site has well drained, very deep kaolinitic clayey soils, Igneous bed rock, with rolling slope relative factor 8%, CLAY: KA, dominated with ridges.
2.4 **Water Resources**

There are no rivers or streams that traverse the proposed site except for natural storm water drains that flows into the Mugutha Stream. The Mugutha stream is a tributary to Theta River which ultimately drains into Ruiru River.

2.5 **Social Environment**

The social environment in the area consists of several business established enterprises, transportation system (roads), industries and residential area. The interaction of these establishments with people in the area and outside the area is part of the functional Nairobi socioeconomic environment. Currently, the social environment around the area augers well with movement of people, goods and delivery of services due to the existing infrastructure such as roads, railway line, water pipelines, sewerage pipelines, powerlines, commercial and residential buildings.

However, the Factory site is located with coffee plantations approximately 3km from the social networks of Ruiru Town. Existing establishments around the site are predominantly coffee mills, Kofinaf Coffee Estates, Sasini Coffee Estates, Oaklands Coffee Estate and the Tatu City.

2.6 **Baseline Analysis Results**


As provided by the legal instruments, the EIA focused on analyzing, prediction and provision of mitigation measure for the below listed parameters for the proposed site. The baseline data will be used to monitor Factory performance at operation stage.

2.6.1 **Ambient Air Quality Analysis**

At facility level, impacts should be estimated through qualitative or quantitative assessments by the use of baseline air quality assessments and atmospheric dispersion models to assess potential ground level concentrations. Therefore, and with an understanding that the Factory raw material is related to High Density Polyethylene which is a thermos plastic polymer produced from monomer ethylene, the focus of the EIA was on analyzing ambient Sulphur Oxides (SOx), Nitrogen Oxides (NOx)Particulate matter (PM) and Volatile Organic Compounds (VOC). The baseline of the parameters listed above will provide a basis for subsequent emissions monitoring during operation period of the Factory.

provide acceptable emission estimation and dispersion modeling approaches for point and fugitive sources as summarized in Table 2.1 below.

**Table 2.1: Ambient Air Quality Guidelines**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Averaging Period</th>
<th>Guideline Value in mg/m³ for Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur dioxide (SO2)</td>
<td>Annual Average*</td>
<td>80 µg/m³</td>
</tr>
<tr>
<td></td>
<td>24 hours**</td>
<td>125 µg/m³</td>
</tr>
<tr>
<td>Nitrogen dioxide (NO2)</td>
<td>Annual Average*</td>
<td>80 µg/m³</td>
</tr>
<tr>
<td></td>
<td>24 hours**</td>
<td>150 µg/m³</td>
</tr>
<tr>
<td>Particulate Matter PM (&lt;10 m) (RPM)</td>
<td>Annual Average*</td>
<td>70 µg/m³</td>
</tr>
<tr>
<td></td>
<td>24 hours**</td>
<td>150 µg/m³</td>
</tr>
<tr>
<td>Volatile Organic Compounds (VOC)</td>
<td>24 hours**</td>
<td>600 µg/m³</td>
</tr>
</tbody>
</table>

The EIA focused on assessing the ambient Sulphur Oxides (SOx), Nitrogen Oxides (NOx) Particulate matter (PM) and Volatile Organic Compounds (VOC). The baseline of the parameters listed above will provide a basis for subsequent emissions monitoring during operation period of the Factory.

Particulate Matter sampling was also done using a pumped air sampler. The sampler is positioned with the intake upward in an unobstructed area, free from any obstruction to airflow. The Machine/Equipment used for the survey was Model EPAM-5000, HAZ-DUST Particulate Air Monitoring Equipment. The EPAM-5000 is a high sensitivity real-time particulate monitor designed for ambient environmental and indoor air quality applications. This unit combines traditional filter techniques with real-time monitoring methods. These techniques combined overcome limitations of all other aerosol monitoring products. Photographs below illustrate Particulate Meter (PM) on site.

Photograph illustrating Particulate Meter (PM) on site.

---

Results of Particulate Meter (PM) analysis are presented below and Tables 2.2 and 2.3.

**Table 2.2: PM10 Results**

<table>
<thead>
<tr>
<th>Point</th>
<th>Total Weighted Average (TWA) (mg/m³)</th>
<th>Max (mg/m³)</th>
<th>Min (mg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DML1</td>
<td>0.12</td>
<td>1.24</td>
<td>0.03</td>
</tr>
<tr>
<td>1º 10’32.08”S 36034’17.58”E</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 2.3: PM2.5 Results**

<table>
<thead>
<tr>
<th>Point</th>
<th>Total Weighted Average (TWA) (mg/m³)</th>
<th>Max (mg/m³)</th>
<th>Min (mg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DML1</td>
<td>0.12</td>
<td>1.24</td>
<td>0.03</td>
</tr>
<tr>
<td>1º 10’32.08”S 36034’17.58”E</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From the results obtained the point sampled for PM10 and PM2.5 was within the EMC Air Quality Regulations, 2014, and the World Health Organization Air quality guidelines. Mega Pipes will carry out continuous monitoring of the ambient air quality for particulates as well as SOx, NOx and VOCs during factory operations.

Photographs showing mounting of SOX and NOX elements on site

Results of the baseline analysis are presented below.

**2.6.2 Noise and Excessive Vibrations.**

The Environmental Management and Coordination (Noise And Excessive Vibration Pollution) (Control) Regulations, 2009 provides under general provisions that except as otherwise provided in the Regulations, no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

Part III Clause 11 provides that any person wishing to engage in any commercial or industrial activity, which is likely to emit noise or excessive vibrations shall carry out the activity or activities within the relevant levels prescribed in the First Schedule to the Regulation. Table 2.4 below illustrates allowable noise level that will be applicable to the HDPE pipe manufacturing Factory ranked as a commercial facility.
Table 2.4: Permissible Noise Levels³

<table>
<thead>
<tr>
<th>Zone</th>
<th>Sound Level Limits dB(A) (Leq,14 h)</th>
<th>Noise Rating Level (NR) (Leq,14 h)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day</td>
<td>Night</td>
</tr>
<tr>
<td>Mixed residential (with some commercial and places of entertainment)</td>
<td>55</td>
<td>35</td>
</tr>
</tbody>
</table>

The monitoring surveys were conducted to measure ambient noise levels and determine background noise levels within the study area. The baseline environment can be defined as the conditions that would prevail in the absence of the proposed development. This information sets the scene for the assessment of the potential noise impacts at the NSRs created by the proposed Project.

A model 824 Larson and Davis serial number – 0004897 Type 1 precision grade Sound Level Meter (SLM) real time acquisition system was used. The meter logs noise levels and records audible sound over a set monitoring period selected by the user. The effective measurement range of the instrument is 20-140 dBA to ±1 dBA accuracy. The logging rate was set for one minute and the monitoring period was set for 24 hours (sound recordings were saved every 10 minutes). The instrument was duly calibrated before the noise measurement.

The 24-hour measurement data collected for the study are summarized in this section. Noise sources that were not captured during the measurement period due to their impact on representative of expected, typical ambient conditions were excluded from the calculated hourly, daytime, or nighttime results. All “hourly” Leq values were based on at least 30 minutes of data. Measured hourly LAeq, and L90 values for the noise monitoring locations are shown in the following sections.

Tables 2.5 and 2.6 below summarizes the logarithmic average of hourly LAeq and LA90 results for both the daytime and nighttime periods and recorded 24-hour time sound level LAeq and L90 value based on EMCA time period guidelines for the monitoring location.

Table 2.5: Summary of Baseline Daytime and Night time Results

<table>
<thead>
<tr>
<th>Monitoring Location</th>
<th>Logarithmic Average Day time and Night time ¹</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daytime – 6.01 AA – 8.00 PM</td>
</tr>
<tr>
<td>NML 1</td>
<td>49</td>
</tr>
</tbody>
</table>

Table 2.6: Noise Measurement Results – 3rd – 4th March

<table>
<thead>
<tr>
<th>Monitoring Location</th>
<th>24 hr. Baseline Noise Measurement Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LÄeq dBA</td>
</tr>
<tr>
<td>NML 1</td>
<td>49.1</td>
</tr>
</tbody>
</table>

The average noise levels recorded at the monitoring location was low during the nighttime period. Most of the values recorded were below 50dBA the ambient noise level at the monitoring locations was comprised of sounds from birds and the general surrounding. Only noise levels

³ legal Notice no. 61: the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009 – First Schedule
generated by direct interaction between birds and the equipment were filtered from the measurements.

The measured baseline sound levels in Table 2.4 (background noise level) are useful for establishing the ambient noise levels at sensitive receptors prior to project activities. The adapted ambient noise levels for the monitoring location are as shown in Table 2.7 below.

**Table 2.7: Adapted Baseline Noise Levels**

<table>
<thead>
<tr>
<th>Monitoring Location</th>
<th>Baseline Noise Level Measurements (Dba)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LAeq</td>
</tr>
<tr>
<td>NML 1</td>
<td>49</td>
</tr>
</tbody>
</table>

2.6.3 Wastewater Analysis.

As part of baseline water quality assurance at EIA stage, surface water quality analysis was on done within storm drains identified at the lower elevation to the Factory that drain into Mugutha Stream. The analysis will include a full chemical / physical assessment including; pH, Suspended solids, Nitrate (NO3) Ammonia (NH3), Nitrite (NO2) and Total Dissolved Solids among other parameters. Photographs below illustrate the sampling process that was undertaken on site.

**Photographs illustrating Water Sampling Process on Site**

The results of water sampling undertaken on site are summarized in Figure 2.1 below. Detailed laboratory report is provided as Appendix 6.

Environment Impact Assessment (EIA) Study Report

LABORATORY TEST REPORT

Date Received: 06/03/2020
Date Started: 04/03/2020
Date Completed: 18/03/2020
External Sample ID: Stream Water

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>METHOD</th>
<th>RESULTS</th>
<th>Low</th>
<th>Opt.</th>
<th>High</th>
<th>Standard (Max Limits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>ISO 10522</td>
<td>6.37</td>
<td></td>
<td></td>
<td>6.5–8.5</td>
<td></td>
</tr>
<tr>
<td>Total Suspended Solids, TSS mg/L</td>
<td>APHA 2540</td>
<td>4.32</td>
<td></td>
<td></td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Nitrate mg/L</td>
<td>ISO 7890</td>
<td>0.044</td>
<td></td>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Ammonium Nitrogen, mg/L</td>
<td>ISO 11732</td>
<td>&lt;0.01</td>
<td></td>
<td></td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Nitrite NO₂, mg/L</td>
<td>ISO 6777</td>
<td>0.014</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Total Dissolved Solids; TDS mg/L</td>
<td>APHA 2540 C</td>
<td>124.4</td>
<td></td>
<td></td>
<td>1290</td>
<td></td>
</tr>
<tr>
<td>Fluoride mg/L</td>
<td>APHA 4580 F</td>
<td>0.46</td>
<td></td>
<td></td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>E. coli: cfu per 100ml</td>
<td>ISO 9308-1</td>
<td>Nil</td>
<td></td>
<td></td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>Phenols</td>
<td>APHA 5510</td>
<td>Nil</td>
<td></td>
<td></td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>Arsenic mg/L</td>
<td>ISO 8288</td>
<td>&lt;0.01</td>
<td></td>
<td></td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Cadmium mg/L</td>
<td>ISO 8288</td>
<td>&lt;0.01</td>
<td></td>
<td></td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Lead mg/L</td>
<td>ISO 8288</td>
<td>&lt;0.01</td>
<td></td>
<td></td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Zinc mg/L</td>
<td>ISO 8288</td>
<td>&lt;0.01</td>
<td></td>
<td></td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Copper mg/L</td>
<td>ISO 8288</td>
<td>&lt;0.01</td>
<td></td>
<td></td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2.1: Water Quality Results of Mugutha Stream
CHAPTER 3: PROJECT DESCRIPTION

3.1 Introduction
The purpose of this Project is to have a local manufacturing of innovative, state-of-the-art products for the growing requirements of sanitation and drainage projects in Kenya, contributing to the local economy and industrialization process and avoiding importation of such products.

The project will be developed on an area of 10 acres in various phases starting with building a 4000m² Factory for the manufacturing of Weholite pipes from 800mm to 3000mm diameter. The Factory will have up to 100 direct employees and generate indirect employment for about 1000 people.

3.2 The Weholite Pipe Production Process

Weholite pipe is an HDPE structured wall pipe manufactured by extrusion of a hollow rectangular box section which is continuously wound onto a mandrel. The production of the HDPE box section is done with process described below.

Pipes are usually manufactured in a continuous extrusion process in which the molten (PE) from the extruder is forced into the extrusion head and evenly distributed in the die. The function of the extruder is to melt the polymer and build up the necessary pressure for the material to flow through the die. The die provides the polymer with the preliminary shape of the pipe.

The outlet of the die is a circular gap of a size that is close to the final diameter and wall thickness of the pipe to be produced. The shaped melt leaving the die is taken into a vacuum tank where it is pressed against a brass calibrating sleeve by atmospheric pressure and cooled by water sprayed on to its final outside diameter. A haul-off unit is used in order to pull the pipe profile through the calibration section. At the final stage a cutting unit is used to cut the pipes into the necessary lengths, and after that the profile is stored.

The process chain for the pipe extrusion is illustrated Figure 3.1 on page 3.2.

Environment Impact Assessment (EIA) Study Report

3.2.1 Extruder
Extruder - The major use of the extruder is to convert the polymeric particulates into a homogenous, pressurized melt. The extruder has to build up the necessary pressure and temperature behind the die in order for the material to flow through it. An extruder has to deliver a homogenous melt with uniform temperature distribution, before the melt passes through the die.

Weholite is manufactured using the single screw type which consists of a helical flight wound around a metal shaft enclosed within a cylindrical barrel. The material transport in a single screw extruder takes place mainly through the drag flow which means that the friction between the screw and the barrel is used to convey the material forward.

In a single screw extruder, the velocity flow patterns are easy and well defined and can handle material at moderate production rates with good fusion. The parameters that influence the melt
temperature and generally the properties of the extrudate are screw design, screw cooling, degree of fill, screw speed and barrel temperatures.

3.2.2 Die
Die - The use of the die is to pre-form the molten polymer coming from the extruder to a preliminary shape. The die has to distribute the polymer melt to the various parts of the profile to achieve the required mass flow in each of them. The parameters that affect the polymer distribution are the flow properties of the polymer, the flow channel geometry, the flow rate through the die and the temperature of the die and the polymer melt. The die design plays a significant role in the extrusion process. A die must be designed in such a way that it delivers a defined cross-section of the pipe profile, with correct mass flow rate to each part this cross section.

3.2.3 Calibration Process
Calibration Process - The term calibration in pipe production refers to the process immediately downstream of the extrusion die, where the profile is cooled and solidified, and where its outer dimensions are fixed. Calibration is very important, and the processing conditions must be chosen very carefully otherwise the final profile will show big distortions.

The calibrator consists essentially of a metal block with a closely fitting and appropriately shaped prismatic channel through which the profile passes. It has to be designed in such a way that it ensures the best possible uniform cooling of the profile surface. Therefore, cooling channels are used, especially in the first calibrator, in order to strengthen the effect of uniform cooling for the profile. The cooling ability of the first calibrator is significant since it has to provide rapid and efficient cooling to the profile to fix its outer geometry. In every calibrator there are slots that connect the inner channel to vacuum, which is provided to draw the profile outwards and stabilize it against the channel wall.

As for the cooling systems, the position of the vacuum slots is critical in order to make sure that the profile surface is in maximum contact with calibrator walls. In the first calibrator the first vacuum slot should be at the right place to pull the hot and paste-like polymer immediately towards the cool calibrator walls. This is very important in order for the profile to be formed in a successful way. The positioning and the dimensions of the vacuum slots depend mainly on the experience of the tool manufacturer and the processing conditions, e.g. line speed, high or low vacuum etc.
The calibrators are usually manufactured out of steel, brass or aluminum. The wear protection of the calibrator is a necessity in order to ensure high product quality of the final profile. The reason for the wear is usually the abrasive materials which are used for the formulation of the PE, and the friction that appears in the calibration system. In order to avoid wear problems, the calibrators are coated with surface protection systems. The pipes are produced by extrusion of a hollow box section in polyethylene which is continuously wound onto a mandrel; successive turns being welded together by hot polyethylene melt supplied by an auxiliary extruder.

3.2.4 Haul off
Haul Off - At the end of every production line there is the haul-off unit, the task of which is to pull the pipe profile through the calibration table against the frictional forces in the calibrators. The main types of pulling systems that are used today are rollers, belt- or pad-chains.

3.2.5 Profile Winder
Profile Winder - Weholite pipes are manufactured by the winding and continuous welding of the extruded HDPE (High Density Polyethylene) rectangular profile. This device sits downstream of the aforementioned production line, approximately 8-10m from the haul off, and receives the extruded profile. The profile is wound around a revolving mandrill which is a precision engineered drum designed to be the same internal diameter as the pipe being produced. In order for the large diameter pipe to be produced, the box profile section is wound around the rotating mandrel where it is welded together by hot PE melt supplied by an auxiliary extruder.

The Weholite process is shown in the following photographs.
Due to the continuous nature of the manufacturing process, the pipes can be produced to very long lengths (up to 30m) and in a diameter range from 400mm up to 3500mm. The size of the hollow box section depends upon the diameter as well as the required ring stiffness of every pipe. The photograph below shows an overview of different production lines, producing a variety of pipe sizes.

![Overview of Weholite Production](image)

**Figure 3.6: Overview of Weholite Production. Different Box Sections of Mandrel used for every individual Pipe [2]**

### 3.2.6 Other Associated Process

**Cutting Saw** – Pipes are cut to length using a travelling friction saw, which travels with the pipe as it rotates and is triggered by electronic switch to the set length. The saw is fitted with an extractor to remove the swarf. No dust is produced from this process.

**Raw Material** – The pipe grade HDPE is procured from reputable sources and delivered via truck, in loads of approximately 25 tons. The sources are generally Middle Eastern in origin. The extrusion process takes place at temperatures of around 190°C to 220°C which produces no fumes or waste. Any ‘scrap’ can be reintroduced into the process.

**Cooling Water** – Cooling water is supplied from a closed system consisting of pipework, a chilling unit and a sump. There is no discharge to outside and the sump, after evaporation, will be topped up from a rainwater harvesting system situated under the storage area. The cooling system uses approximately 0.1kW/kg, see below.

**Water General** - No industrial process water will be discharged into the sewage system; a packaged Sewage treatment plant will be installed for the treatment of wastewater from the personnel usage of up to 100 employees.

Fresh water for personnel use as well as for feeding the cooling water tank will be coming from a borehole on the Factory property; a potable water treatment unit will ensure water quality for personnel use.

**Power Consumption of the production line** - This was measured at 550kg/h and outside temp 20°C was around 0.5kW/kg and included the cooling system. Without cooling system, the line runs at ~0.38kW/kg and that is quite well corresponding with 0.5KW if the cooling is around 0,1kW/kg.
**Power General** - By the time the plant is at full capacity, it will consume up to 3 MVA electrical power. A Backup Diesel Generator of 1MVA will be installed to allow partial production in case of power interruptions.

**Fabrication Process**

Fittings are manufactured from Weholite pipes. This is generally done via labor intensive techniques, such as hand extrusion welding, and automated machinery. The power consumption of these machines is accounted for above.

**Hand welding process** - The extrudate output, preheat and extrudate temperatures are set on the hand extruder as a function of the weld thickness and the type of welding material employed. Temperatures are the same as for the main extrusion process approximately 200°C. **No hazardous or toxic fumes are given off during the welding process.** All equipment is calibrated and tested to current health and safety regulations.

Automated Machinery – Consists of a milling cutter protected by a perspex guard. The unit produces HDPE swarf which is reused again in the pipe production process.

![Milling Cutter](image3.7)

**Figure 3.7: Milling Cutter**

The photograph below shows a bandsaw for cutting angles. The unit produces HDPE swarf which is reused again in the pipe production process.
The photograph below shows a radius band saw for cutting circles. The unit produces HDPE swarf which is reused again in the pipe production process.

Figure 3.8: Bandsaw for Cutting Angles

Figure 3.9: Radius Bandsaw for Cutting Circles

Figure 3-11 on Page 3.10 presents Site Layout Plan of the Factory.
Figure 3-11: Project Layout Plan
CHAPTER 4: APPROACH AND METHODOLOGY

4.1 Introduction

This section outlines methodology and detailed work plan that was undertaken during preparation of Environmental Impact Assessment Study Report (EIA) for proposed manufacturing of HDPE Plastic pipes. The approach and methodology for preparing is aligned to the International Finance Corporation (IFC) and World Bank Group Environmental, Health, and Safety General Guidelines of April 30, 2007 and Kenya’s Environmental Management and Coordination Act 1999 Cap 387 legal notice 101 for the EIA/EA Regulations of 2003.

The EIA was prepared through the following approach.

- Literature Review
- Specialized Environmental Analysis
- Assessment of impacts and generation of Environmental Management Plan (EMP).
- Stakeholder Engagement

4.2 Literature Review

4.2.1 Documents and Reports

The process involved review of literature documents and studies relevant to the Project, some of the relevant reports reviewed were;

- Literature on Weholite HDPE pipe manufacturing process
- Kiambu County Integrated Spatial Planning Report including Cadastral Maps, RIM Maps and Folio Register (FR) Maps of the Project Area.
- Kiambu Government Changes of User Provision issued to Socfinaf Company Limited for LR No 11294

4.2.2 Legal and Policy Provision

The assessment involved review of national legal statutes and international policies relevant to the Project as summarized below.

- Environmental Management and Coordination Act 1999 Cap 387 and subsequent regulation not limited to
  - Legal Notice no 121 Waste Management Regulation 2006
  - Legal Notice no 120 Water Quality Regulations, 2006
  - Legal Notice no. 61 Noise And Excessive Vibration Pollution Control Regulations, 2009
  - Legal Notice no 34 Air Quality Regulations, 2014
- Physical and Land Use Planning Act of 2019 - 202
- The Public Health Act (Cap.242)
- Occupational Health and Safety Act (OSHA 2007),
- The Urban Areas and Cities Act 2011
- Water Act 2016
- Land Act 2012
4.3 Specialist Environment Analysis for the HDPE Pipes Factory

4.3.1 Ambient Air Quality


The statutes provide that factories dealing in factories of similar nature with potential of emitting gases into the environment should prevent or minimize impacts. This can be achieved by ensuring that Emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines as provided by EHS guidelines and air quality regulations above. Also, Emissions should not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards.

At facility level, impacts should be estimated through qualitative or quantitative assessments by the use of baseline air quality assessments and atmospheric dispersion models to assess potential ground level concentrations. Therefore, and with an understanding that the Factory raw material is related to High Density Polyethylene which is a thermos plastic polymer produced from monomer ethylene, the focus of the EIA was on analyzing ambient Sulphur Oxides (SOx), Nitrogen Oxides (NOx) Particulate matter (PM) and Volatile Organic Compounds (VOC). The baseline of the parameters listed above will provide a basis for subsequent emissions monitoring during operation period of the Factory.

International Finance Corporation (IFC) and World Bank Group Environmental, Health, and Safety (EHS) General Guidelines of April 30, 2007 and Legal Notice no 34 Air Quality Regulations, 2014 of the Environmental Management and Coordination Act 1999 Cap 384 provide acceptable emission estimation and dispersion modeling approaches for point and fugitive sources as summarized in Table 4.1 below.

Table 4.1: Ambient Air Quality Guidelines

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Averaging Period</th>
<th>Guideline Value in mg/m³ for Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur dioxide (SO2)</td>
<td>Annual Average*</td>
<td>80 µg/m³</td>
</tr>
<tr>
<td></td>
<td>24 hours**</td>
<td>125 µg/m³</td>
</tr>
<tr>
<td>Nitrogen dioxide (NO2)</td>
<td>Annual Average*</td>
<td>80 µg/m³</td>
</tr>
<tr>
<td></td>
<td>24 hours**</td>
<td>150 µg/m³</td>
</tr>
<tr>
<td>Particulate Matter PM (&lt;10 m) (RPM)</td>
<td>Annual Average*</td>
<td>70 µg/m³</td>
</tr>
<tr>
<td></td>
<td>24 hours**</td>
<td>150 µg/m³</td>
</tr>
<tr>
<td>Volatile Organic Compounds (VOC)</td>
<td>24 hours**</td>
<td>600 µg/m³</td>
</tr>
</tbody>
</table>

4.3.2 Noise and Excessive Vibrations

The Environmental Management and Coordination (Noise And Excessive Vibration Pollution) (Control) Regulations, 2009 provides under general provisions that except as otherwise provided in the Regulations, no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

Part III Clause 11 provides that any person wishing to engage in any commercial or industrial activity, which is likely to emit noise or excessive vibrations shall carry out the activity or activities within the relevant levels prescribed in the First Schedule to the Regulation. Table 4.2 below illustrates allowable noise level that will be applicable to the HDPE pipe manufacturing Factory ranked as a commercial facility.

Table 4.2: Permissible Noise Levels

<table>
<thead>
<tr>
<th>Zone</th>
<th>Sound Level Limits dB(A) (Leq,14 h)</th>
<th>Noise Rating Level (NR) (Leq,14 h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed residential (with some commercial and places of entertainment)</td>
<td>Day: 55 Night: 35</td>
<td>Day: 50 Night: 25</td>
</tr>
</tbody>
</table>

4.3.3 Wastewater Analysis

Industrial wastewater generated from industrial operations includes process wastewater, wastewater from utility operations, runoff from process and materials staging areas, and miscellaneous activities including wastewater from laboratories, equipment maintenance shops, etc. The pollutants in an industrial wastewater may include acids or bases (exhibited as low or high pH), soluble organic chemicals causing depletion of dissolved oxygen, suspended solids, nutrients (phosphorus, nitrogen).

However, the production of the HDPE box section is done through various steps which include; Extrusion which converts the polymeric particulates into a homogenous, pressurized melt among other steps, the process is a dry process and no liquid wastes is anticipated. The only liquid waste that will be generated from the Factory will be raw sewerage from the toilet facilities. Therefore, the management the sewerage, a Packaged Sewage treatment plant will be installed for the treatment of wastewater from the personnel usage of up to 100 employees.

As part of baseline water quality assurance at EIA stage, surface water quality analysis was on existing water points identified at the lower elevation to the Factory. The analysis will include a full chemical / physical assessment including; pH, Suspended solids, Nitrate (NO₃⁻) Ammonia (NH₃), Nitrite (NO₂⁻) and Total Dissolved Solids among other parameters.
Occupational Health and Safety Provision

Tasks under community health and safety was undertaken in line with the Provisions of Occupational Health and Safety Act of 2007 and Public Health Act of 2017. The scope of the Health and Safety Management for the Factory will addresses the Project’s commitment to mitigate potential impacts of related to HDPE pipe manufacturing process to the health and safety of workers and communities around the Factory.

4.3.4 Stakeholder identification and Mapping

The process involved detailed stakeholder identification and engagement as part of the EIA study using literature review. The aim was to ensure that all the stakeholders likely to be affected or influence the Factory are identified and targeted as part of the EIA study. The following stakeholders were engaged during the EIA study;

- Mugutha Location Chief
- Pillion Coffee Mills
- Tatu City
- Kofinaf Coffee Mills
- Oaklands Coffee Mills
- Kenya Association of Manufactures (KMA)

The outcome of the stakeholder engagement including the recommendations were incorporated into the EIA study report.

4.3.5 EIA and EMP Development

The impact analysis was done using the leopold matrix which is a grid that is used to identify the interaction between project activities, which are displayed along one axis, and environmental characteristics, which are displayed along the other axis. For the identification of impacts a breakdown of the environment into elements or factors that may be affected and a breakdown of the various actions or activities of the project under study were done.

The potential impacts associated with the proposed Factory were assessed as presented in Table 4.3 below. Precautionary principle will be used to establish the significance of impacts and their management and mitigation.
Table 4-3: Impact Rating Criteria for Environment Risks

<table>
<thead>
<tr>
<th>Extent</th>
<th>Duration</th>
<th>Intensity</th>
<th>Probability</th>
<th>Weighting Factor (WF)</th>
<th>Significance Rating (SR)</th>
<th>Mitigation Efficiency</th>
<th>Significance Following Mitigation (SFM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Footprint</td>
<td>Short term</td>
<td>1</td>
<td>Low</td>
<td>Probable</td>
<td>Low</td>
<td>1</td>
<td>Low</td>
</tr>
<tr>
<td>Site (1km radius)</td>
<td>Short to medium</td>
<td>2</td>
<td>Low</td>
<td>Probable</td>
<td>Low to Medium</td>
<td>2</td>
<td>Low to Medium</td>
</tr>
<tr>
<td>Location</td>
<td>Medium term</td>
<td>3</td>
<td>Medium</td>
<td>Likely</td>
<td>medium</td>
<td>3</td>
<td>medium</td>
</tr>
<tr>
<td>Sub County</td>
<td>Long term</td>
<td>4</td>
<td>High</td>
<td>Highly likely</td>
<td>Medium to high</td>
<td>4</td>
<td>Medium to high</td>
</tr>
<tr>
<td>County</td>
<td>Permanent</td>
<td>5</td>
<td>High</td>
<td>Highly likely</td>
<td>Medium to high</td>
<td>4</td>
<td>Medium to high</td>
</tr>
</tbody>
</table>

**Definition of Terms**

**Extent:** An area of influence covered by the impact. In this sense, if the action produces a much-localized effect within the space, it is considered that the impact is low (1). If, however, the effect does not support a precise location within the Factory operating environment, having a pervasive influence beyond the project footprint, the impact will be at location level (3) or could be County (5).

**Timing:** Refers to the moment of occurrence, the time lag between the onset of action and effect on the appearance of the corresponding factor. We consider five categories according to this time period is zero, up to 1 year (short term), or more than two years, which are called respectively medium term (3), long-term (4), and permanent (5).

**Intensity:** Refers to the degree of impact on the factor, in the specific area in which it operates, ranked from low (1) to high (5).

**Probability:** Refers to the likelihood of the impact occurring during the project implementation, this is also ranked as Probable (1) to highly probable.
CHAPTER 5: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

5.1 Introduction

This section provides analysis of relevant Acts of Parliament that are related to the proposed HDPE Pipes manufacturing Factory. The main focus was on provision of EMCA 1999 Cap 387 and subsequent regulations, Occupational Health and Safety Act (OSHA 2007) and Public Health Act 2017. Details analysis of relevant sections of the Acts is presented in Tables 5.1 and 5.2 below.

Table 5.1: Acts of Parliament

<table>
<thead>
<tr>
<th>No</th>
<th>Policy</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EMCA 1999 cap 387</td>
<td>The Act provides for the establishment of a legal and institutional framework for the management of the environment. This is achieved through various regulations. For the proposed HDPE pipes manufacturing Factory, the following regulations are applicable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>✓ Legal Notice No. 101 The Environmental (Impact Assessment and Audit) Regulations, 2003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>✓ Legal Notice no 121 Waste Management Regulation 2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>✓ Legal Notice no 120 Water Quality Regulations, 2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>✓ Legal Notice no. 61 Noise and Excessive Vibration Pollution Control Regulations, 2009</td>
</tr>
<tr>
<td></td>
<td></td>
<td>✓ Legal Notice no 34 Air Quality Regulations, 2014</td>
</tr>
<tr>
<td>2</td>
<td>The Environmental (Impact Assessment and Audit) Regulations, 2003</td>
<td>The regulation provides a framework under which Environment Impact Assessment for the Factory is prepared, Regulation 4(1) further states that:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(a)“…no Proponent shall implement a project: likely to have a negative environmental impact.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) for which an environmental impact assessment is required under the Act or these Regulations, unless an environmental impact assessment has been concluded and approved in accordance with these Regulations…”</td>
</tr>
<tr>
<td>3</td>
<td>Environmental Management and Coordination (Water Quality) Regulations, 2006</td>
<td>Regulation 9 of these regulations provides for water quality monitoring. It states that the “Authority in consultation with the relevant lead agency, shall maintain water quality monitoring for sources of domestic water at least twice every calendar year and such monitoring records shall be in the prescribed form as set out in the second schedule to these regulations”.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>As part of baseline water quality assurance at EIA stage, surface water quality analysis was on done within storm drains identified at the lower elevation to the Factory that drain into Mugutha Stream. The analysis will include a full chemical / physical assessment including; pH, Suspended solids, Nitrate (NO3) Ammonia (NH3), Nitrite (NO2) and Total Dissolved Solids among other parameters.</td>
</tr>
<tr>
<td>4</td>
<td>Waste Management Regulations, 2006</td>
<td>Regulation 4 (1) states that “no person shall dispose of any waste on a public highway, street, road, recreational area or in any place except in a designated receptacle”. Regulation 4 (2) further states that “a waste generator shall collect, segregate and dispose such waste in the manner provided for under these regulations”. The proponent (Mega Pipes Limited) will use provisions of this regulation to ensure that waste is handled, stored, transported and disposed as per this regulation.</td>
</tr>
<tr>
<td>5</td>
<td>Noise and Excessive Vibration Pollution (Control) Regulations, 2009</td>
<td>The Contractor will be required to ensure compliance with the above regulations in order to promote a healthy and safe working environment throughout the Construction Phase. This shall include regular inspection and maintenance of equipment and prohibition of unnecessary hooting by vehicles. The regulations provide for a maximum of 60 dcl during the day and 35 dcl during the night for a construction site.</td>
</tr>
</tbody>
</table>
At EIA stage baseline noise survey was done, the baseline data will be used to monitor on a regular basis the noise and excessive vibration of the Factory during operation.

These regulations provide a framework for management of plant and equipment emissions of hydrocarbons on site. The regulations require that all plant and equipment on site should be well serviced to manufacturers specifications to avoid air pollution, the regulation also require monitoring of baseline air quality within construction site and implementation of correction action where the standards are not complied to. Water spray will be used at all times when working in dry areas to avoid risks associated with dust menace.

The EIA also focused on assessing the ambient Sulphur Oxides (SOx), Nitrogen Oxides (NOx) Particulate matter (PM) and Volatile Organic Compounds (VOC). The baseline of the parameters listed above will provide a basis for subsequent emissions monitoring during operation period of the Factory.

The Act provides Environment Health and Safety (EHS) Guidelines which shall be followed by both the Contractor and Supervising Consultant during implementation of the Project to avoid injuries and even loss of life to workers and neighboring community.

The Act provides Guidelines to the Contractor on how he shall manage all wastes (Liquid and Solid Wastes) emanating from the Project in a way not to cause nuisance to the community. This Act, during construction shall be read alongside the Waste Management Regulations of EMCA 2015 for utmost compliance.

### Table 5.2: Factory Operation Provision and relevant Acts

<table>
<thead>
<tr>
<th>Activity Fields</th>
<th>Requirement</th>
<th>Relevant Act (Clauses)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duties Of Occupiers (Legal Requirements)</strong></td>
<td>Risk Assessment</td>
<td><strong>Section 6 (3) of OSHA 2007</strong>&lt;br&gt;Every occupier shall carry out appropriate risk assessments in relation to the safety and health of persons employed…</td>
</tr>
<tr>
<td></td>
<td>Safety and Health Audit</td>
<td><strong>Section 11 of OSHA 2007</strong>;&lt;br&gt;The occupier of a workplace shall cause thorough safety and health audit of his workplace to be carried out at least once in every period of twelve months by a safety and health advisor</td>
</tr>
<tr>
<td></td>
<td>Fire Safety Audit</td>
<td><strong>Section 36 of Fire risk Reduction Rules; 2007</strong>&lt;br&gt;(1) Every occupier shall cause a fire safety audit of the workplace to be taken at least once every</td>
</tr>
<tr>
<td></td>
<td>Initial Environment Audit</td>
<td><strong>Section 7(1) (b) of OSHA 2007</strong>&lt;br&gt;<em>It is the duty of occupier to bring the statement and any revision of the policy to the notice of all of his employees.</em></td>
</tr>
<tr>
<td><strong>Management of Policies required at the Factory</strong></td>
<td>Policies Required:</td>
<td><strong>Section 7(2) of OSHA 2007</strong>&lt;br&gt;<em>giving implementation obligations</em></td>
</tr>
<tr>
<td></td>
<td>• Safety &amp; Health Policy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fire Safety Policy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Environment Policy</td>
<td></td>
</tr>
<tr>
<td><strong>Factory Personnel Trainings Required</strong></td>
<td>Training required:</td>
<td><strong>Rule 22 of Fire risk reduction rules, 2007</strong>&lt;br&gt;(A firefighting team should be formed and provided fire safety training to enable them effectively to discharge their functions)</td>
</tr>
<tr>
<td></td>
<td>• Statutory: Fire marshal training</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Training required:</td>
<td><strong>Rule 7 of First-Aid Rules, 1977</strong>&lt;br&gt;(No person shall be placed in charge of a first aid unless he has received adequate training and holds a certificate</td>
</tr>
<tr>
<td></td>
<td>• Statutory: First Aid Training</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Training required:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Statutory: Safety and Health Committee</td>
<td></td>
</tr>
<tr>
<td>Activity Fields</td>
<td>Requirement</td>
<td>Relevant Act (Clauses)</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Occupational Health Programmes within the Factory</td>
<td>Statutory Medical Examinations.</td>
<td>Section 21(1) and 21(5), Section 122 of OSHA, 2007 notification of accident and entering the details in the general register</td>
</tr>
<tr>
<td></td>
<td>Provision of First Aid Kit</td>
<td>Section 95 of OSHA 2007 provision of a first aid box or cupboard of a prescribed standard</td>
</tr>
<tr>
<td></td>
<td>Documents required:</td>
<td>Section 21(1) and 21(5), Section 122 of OSHA, 2007 notification of accident and entering the details in the general register</td>
</tr>
<tr>
<td></td>
<td>• General register</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Accident notification forms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Examinations required:</td>
<td>Part VII of OSHA 2007 As the case may apply</td>
</tr>
<tr>
<td></td>
<td>• All plants, lifting equipment and machinery (as per OSHA 2007) that will be used during construction</td>
<td></td>
</tr>
<tr>
<td>Permits To Work (PTW)</td>
<td>Permit to Works are required for non-routine hazardous work.</td>
<td>Section 96(1) &amp; (2) of OSHA, 2007 (Employers to issue permits to work to employees likely to be exposed to hazardous work processes. PTW sets out work to be done, hazards involved &amp; precautions to be taken)</td>
</tr>
<tr>
<td>Fire Safety</td>
<td>Requirements: Fire drill firefighting equipment Fire escapes</td>
<td>Rule 22 of Fire risk reduction rules, 2007 A firefighting team should ensure that fire drills and regular workplace inspections are conducted for purposes of identifying fire risks and recommending remedial measures.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Section 78-82 of OSHA 2007</td>
</tr>
<tr>
<td>Emergency Response Plan</td>
<td>Required: Injury emergency response; Non entry rescue mission to persons in confined space; Fire emergency response; Accidental spill management;</td>
<td>Section 82(1)-(4) of OSHA 2007 Designing of evacuation procedures for emergency, including accident and fire</td>
</tr>
<tr>
<td>Ergonomics At The Workplace</td>
<td>Requirement: Ergonomic survey</td>
<td>Section 76 of OSHA 2007 (4) An employer shall not require or permit any of his employees to engage in the manual handling or</td>
</tr>
<tr>
<td>Activity Fields</td>
<td>Requirement</td>
<td>Relevant Act (Clauses)</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Contractors And Suppliers          | Duties of an occupier of place of work to persons other than his employees. | Section 18(01and (2)
Responsibility of a person by virtue of contract |
| Personal Protective Equipment      | Requirements:                                                               | Section 101 & 102 of OSHA 2007                                  |
|                                   | • Head, body eye, ear, respiratory tract, hand and foot protection as needed. | Every employer shall provide and maintain for the use of employees in any workplace where employees are employed in any process involving exposure to wet or to any injurious or offensive substance, adequate, effective and suitable protective clothing and appliances, including, where necessary, suitable gloves, footwear, goggles and head coverings. |
CHAPTER 6: STAKEHOLDER CONSULTATION

6.1 Stakeholder Consultations

Stakeholder consultation in the Environment Impact Assessment (EIA) process is undertaken during the design, implementation and initial operation stages of the Project. The aim is to disseminate information to interested and affected parties (stakeholders), solicit their views and consult on sensitive issues.

The specific aims of the consultation process during the EIA at the design stage were;

- To inform the local people, leaders and other stakeholders about the proposed Project and its objectives
- Obtain the main concerns and perception of the community and their representatives regarding the project
- To promote project ownership by the beneficiaries and minimize conflicts
- Obtain opinions and suggestions from the directly affected persons on the project impacts and best suited measures to mitigate them.
- Obtain opinions and suggestions on the project designs and therefore minimize conflicts and delays in implementation
- To facilitate the development of appropriate and acceptable entitlements options
- To increase long term project sustainability and ownership
- To reduce problems of institutional coordination, especially at the different government levels.

6.2 Stakeholder Consultation Process

Kenya’s Environmental Impact Assessment / Audit Regulations of 2003 require that in the process of Environmental Impact Assessment (EIA) the proponent shall in consultation with the National Environment Management Authority (NEMA); seek the views of persons who may be affected by the Project.

Therefore stakeholder interview were done to the below listed stakeholders; Tatu City, Kofinaf Coffee Estates, Sasini Coffee Estates, Oaklands Coffee Estates, Mugutha Location Chief, Kenya Manufacturers Association (KMA). The consultations were through a key informant interviews and administration of questionnaires

Table 6.1 below presents the relevant stakeholders who were engaged in the EIA process.

<table>
<thead>
<tr>
<th>Date of Consultation</th>
<th>Institution Consulted</th>
<th>Name and Position of Officer</th>
</tr>
</thead>
<tbody>
<tr>
<td>11th March 2020</td>
<td>Oaklands Estate Coffee Mill</td>
<td>Senior Agronomist – Mr. Mathew</td>
</tr>
<tr>
<td>12th March 2020</td>
<td>Kofinaf Coffee Mill</td>
<td>Manager- Mr. Benson</td>
</tr>
<tr>
<td>12th March 2020</td>
<td>Chief- Mugutha Location</td>
<td>Mr. Joseph Kinuthia</td>
</tr>
<tr>
<td>10th March 2020</td>
<td>Sasini Coffee Mill</td>
<td>Manager- Mrs. Catherine Waiithaka</td>
</tr>
<tr>
<td>10th March 2020</td>
<td>Pillion Coffee Estate</td>
<td>Manager - Mr. Kariuki Kigutha</td>
</tr>
<tr>
<td>12th March 2020</td>
<td>Kenya Association of Manufactures (KAM) Central Rep</td>
<td>Mr. Jackson</td>
</tr>
</tbody>
</table>
The project designs and Environment Impact Assessment (EIA) in-cooperated issues discussed and resolved in the consultative meeting as summarized in Table 6.2 below.

**Table 6.2: Stakeholder Concerns**

<table>
<thead>
<tr>
<th>Parameter Discussed</th>
<th>Issues Discussed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air pollution</td>
<td><strong>Concerns</strong></td>
</tr>
<tr>
<td></td>
<td>• The main issue was how the manufacturing process of the pipes would ensure that there would be no air pollution associated with the production process.</td>
</tr>
<tr>
<td></td>
<td>• In addition, during construction, the dust emitting from machines and Lorries going to the site might affect the quality of coffee harvested around the area.</td>
</tr>
<tr>
<td></td>
<td><strong>Response</strong></td>
</tr>
<tr>
<td></td>
<td>• He informed that Factory will comply to the air quality regulation of 2014 with regards to air quality emission standards.</td>
</tr>
<tr>
<td></td>
<td>• In addition, during the EIA, baselines air quality measurements have been collected, this data will be used during annul audit of the Factory</td>
</tr>
<tr>
<td></td>
<td>• The path to the Factory will be constantly sprayed with water during construction period, this provision will form part of EIA conditions</td>
</tr>
<tr>
<td>Water pollution</td>
<td><strong>Concerns</strong></td>
</tr>
<tr>
<td></td>
<td>He had a concern that during the rains, the surface runoff from the Factory might include heavy metals and chemicals which might end up in the streams around and eventually the coffee farms.</td>
</tr>
<tr>
<td></td>
<td><strong>Response</strong></td>
</tr>
<tr>
<td></td>
<td>He was informed that the Factory process involve extrusion which converts the polymeric particulates and later molded, this process is dry and no liquid wastes will be released to the environment.</td>
</tr>
<tr>
<td>Noise and Excessive</td>
<td><strong>Concern</strong></td>
</tr>
<tr>
<td></td>
<td>Stakeholders were concerned that such factories are associated with noise and excessive vibration which interrupt the ambient serenity of the environment</td>
</tr>
<tr>
<td></td>
<td><strong>Response</strong></td>
</tr>
<tr>
<td></td>
<td>The response was that the Factory will perform with allowable noise and vibration levels as provided in the noise and excessive vibration of 2010. Also, at the EIA stage ambient noise and excessive vibrations levels of the site have been recorded to be used to monitor compliance of the Factory during operation</td>
</tr>
<tr>
<td>Disposal of waste materials and are they hazardous</td>
<td><strong>Concern</strong></td>
</tr>
<tr>
<td></td>
<td>The aesthetic beauty of the area will be destroyed due to all the activities going on especially tree cutting and bush clearing.</td>
</tr>
<tr>
<td></td>
<td><strong>Response</strong></td>
</tr>
<tr>
<td></td>
<td>He was assured the EIA will provide provisions for proper disposal of solid wastes as provided in the waste management regulation of 2006. Also, the Factory process do not use any hazardous material and that the polyethylene has been assessed and found to be no hazardous.</td>
</tr>
<tr>
<td>Employment</td>
<td><strong>Concern</strong></td>
</tr>
<tr>
<td></td>
<td>Finally, he stated the people of Murera village should be given employment opportunities in the Factory as they mostly depend on the coffee farms for salaries.</td>
</tr>
<tr>
<td></td>
<td><strong>Response</strong></td>
</tr>
<tr>
<td></td>
<td>The response was that the Factory will provide direct jobs to 100 peoples and indirect jobs to 1000 people thereby contributing to achievement of Kenya Vision 2030</td>
</tr>
</tbody>
</table>

Detailed filled questionnaires are provided as Appendix 3 of this report.
CHAPTER 7: ENVIRONMENTAL, HEALTH AND SAFETY IMPACTS ASSESSMENT & MITIGATION

7.1 Introduction

This EIA assessment has been systematically conducted to determine whether the HDPE Factory will have a diverse impact on the environment. The Environmental Management and Co-ordination Act (EMCA) 1999 cap 387 No.8 amended in of 2015 provide the legal and statutory guideline for the Environment Impact Assessment process in Kenya.

7.2 Product Safety Information Sheet

Product safety information sheet prepared by Borealis6 AG (12.03.2019) (attached to this EIA as Appendix 4) provide the below listed safety advantage of HDPE pipes made from Polyethylene which is a raw material for plastics industry.

i) Hazards identification - The product is not classified as hazardous according to Regulation (EC) No 1272/2008 and its amendments

ii) Composition/information on ingredients - The product is a polyethylene polymer, it contains no substance classified as hazardous in concentrations, which should be taken into account according to EU regulations.

iii) First aid measures- if inhaled: Move to fresh air in case of accidental inhalation of vapours or decomposition products. In case of skin contact: If molten material comes in contact with the skin, cool with plenty of water. DO NOT remove solidified product, as removal could result in severe tissue damage. Obtain medical attention.

iv) Ecological information - The product is not considered hazardous for the environment. Not readily biodegradable. Does not accumulate in organisms. Avoid release to the environment.

v) Firefighting measures -Suitable extinguishing media: Water in spread jet, dry chemicals, foam or carbon dioxide. Specific hazards during firefighting: Principal toxicant in the smoke is carbon monoxide

vi) Accidental release measures -Vacuum or sweep up spill. All spill of material must be removed immediately to prevent slipping accidents. Prevent product from entering environment and drains.

vii) Handling and storage - Advice on safe handling: During processing and thermal treatment of the product, small amounts of volatile hydrocarbons may be released. Avoid inhalation of dust and decomposition fumes. Provide adequate ventilation. Local exhaust ventilation or additional personal protective equipment (PPE) may be necessary.

viii) Exposure controls/personal protection - Do not eat, drink or smoke when using this product. Wash hands before breaks and at the end of workday. Appropriate personal protective equipment (PPE) shall be worn in accordance with Regulation (EU) 2016/425
7.3 Project Impacts

The HDPE pipes manufacturing Factory will provide 100 direct employees and generate indirect employment for about 1000 people during construction and operation stage. This will ultimately translate into economic growth as provided in the Kenya’s Vision 2030 economic pillar.

The Factory will manufacture Weholite pipes are made from high density polyethylene – HDPE - and represent a significant contribution in the development of thermoplastic structured wall pipe systems. The pipes will have below listed advantages compared to the concrete pipes as summarized below;

Table 7.1: Advantages of HDPE Pipes

| ✓ Light weight | ✓ Corrosion Resistant |
| ✓ Flexible | ✓ Environmental Deterioration Resistant |
| ✓ Easy to Handle and Install | ✓ Non-Toxic |
| ✓ Impact Resistant | ✓ Much lower carbon footprint |
| ✓ Durable | ✓ Environmental Friendly Production |
| ✓ Superior Hydraulics Properties | ✓ UV-Resistant |
| ✓ Fusion Welded Joints | ✓ Reliability |
| ✓ Watertight Mechanical joints | ✓ Abrasion Resistant |
| ✓ Abrasion Resistant | ✓ 120 year design life (60 years above ground) |

7.4 Negative Impacts during Factory Construction Phase

Activities during the construction phase with potential to trigger negative environment impacts are summarized in Tables 7.2 to 7.4 on pages 7.5 to 7.8 below.

7.4.1 Sedimentation Impacts within Storm Water Drains

This impact is caused by clearing of vegetation cover during setting up of the site and movement of contractor’s equipment on site during excavation activities. This ultimately destabilize soil structure ultimately exposing soils to agent of erosion.

The lose soils eventually are washed down into the lower elevation areas of the Factory site. Table 7.2 illustrates assessment Impacts related to sedimentation.
Table 7.1: Sedimentation Impacts within Storm Water Drains

<table>
<thead>
<tr>
<th>Impact Sources</th>
<th>Sedimentation Impacts of storm water drains</th>
<th>Mitigation Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of impact</td>
<td>This impact is caused by clearing of vegetation cover during setting up of the site and movement of plant and equipment on site during excavation activities.</td>
<td>High</td>
</tr>
<tr>
<td>Reversibility of impact</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Affected areas</td>
<td>Excavated sites</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Magnitude</th>
<th>Extent</th>
<th>Site – 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intensity</td>
<td>Medium-3</td>
</tr>
<tr>
<td></td>
<td>Duration</td>
<td>Short term-1</td>
</tr>
<tr>
<td></td>
<td>Probability</td>
<td>Likely-3</td>
</tr>
<tr>
<td>Significance</td>
<td>Weighting</td>
<td>(Extent + Intensity + Duration + Probability) x WF (1+3+1+3) x2 = 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Low-Medium)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
</tr>
</tbody>
</table>

Mitigation Measures

The following measures are proposed to mitigate against soil erosion which leads to sedimentation of drainage channels downstream the Factory.

- Sand/silt traps should be used so as to prevent silt and any other sediments from getting into storm water channels
- Site stockpiles will be properly covered to avoid exposure to agents of soil erosion such as wind and rain
- The drainage system will be developed in a manner that prevents silt-laden runoff from entering surface water drains.

7.4.2 Water Pollution Impacts on (Mugutha Stream)

The assessment identified that that there are no rivers or streams that traverse the proposed site except for natural storm water drains that flows into the Mugutha Stream. Contractor’s machineries on site pose potential risks associated with oil and fuels leaks and accumulation of solid wastes on site that could be washed down the drain during rain seasons. This risk is presented in Table 7.3 on page 7-4.

Table 7.2: Water Pollution Impacts on (Mugutha Stream) Rating

<table>
<thead>
<tr>
<th>Impact Sources</th>
<th>Contractor’s machineries on site pose potential risks associated with oil and fuels leaks and accumulation of solid wastes on site</th>
<th>Mitigation Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of impact</td>
<td>Could lead to contamination of water flowing through Mugutha stream and consequently impacting natural and human ecosystem that depend on the stream.</td>
<td>Medium</td>
</tr>
<tr>
<td>Reversibility of impact</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Affected areas</td>
<td>Mugutha stream</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Magnitude</th>
<th>Extent</th>
<th>location– 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intensity</td>
<td>Medium-3</td>
</tr>
<tr>
<td></td>
<td>Duration</td>
<td>Short term -2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mitigation Measures

- Water containing such pollutants as cements, concrete, lime, chemicals and fuels shall be discharged into a conservancy tank for removal from site where applicable
- All vegetation materials either live or dead on site shall be cleared and removed before the area is excavated
- Regular monitoring of water quality standards of Mugutha stream against the baseline undertaken during the EIA stage

7.4.3 Workers, Community Health and Safety Risks

Workers, Community Health and Safety risks are often triggered by Project activities during Project Construction Phase. These risks often affect both workers on site as well as general community in close proximity to the work site. Management of these risks is required to be as provided for by the Occupational Health and Safety Act (OSHA 2007), Waste Management Regulation 2006, noise and excessive vibration regulations of 2009 and air quality regulations of 2014.

This assessment identified potential Environment, Health and Safety in the following context and analysis in Table 7.4 on page 7-5

(i) Wastes Management (Liquid and Solids)
(ii) Excessive noise and vibrations
(iii) Air Pollution and Dust Generation.
(iv) Risk of Accidents at Work Sites

Table 7.3: Impacts on Workers, Community Health and Safety

<table>
<thead>
<tr>
<th>Impact Sources</th>
<th>Adverse Impact associated with Health and Safety</th>
<th>Mitigation Efficiency</th>
<th>Low to Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of impact</td>
<td>Solid and liquid Wastes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact involves pollution of the environment caused by construction activities generated solid and liquid waste which include waste water, fuels, oils, hazardous substances and other liquid pollutants.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise and excessive vibrations</td>
<td>Noise and excessive vibrations due to un-serviced plant and equipment could result hearing impairment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health and Safety risks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Open trenches on site which pose health hazards to workers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Failure to use required correct signage and safety marshal on site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Un-serviced plant and equipment which emit hydro carbons through equipment exhaust system.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Poor workmanship &amp; failure to use water sprays during dry season could also result to air pollution.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Failure to observe safe work environment requirements like use of PPEs, Warning Taps, site labelling.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Air pollution**
- Anticipated impact may originate from vehicle and machinery fumes and dust

<table>
<thead>
<tr>
<th>Reversibility of impact</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affected stakeholders /areas</td>
<td>Workers and Community</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Magnitude</th>
<th>Extent</th>
<th>Site – 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity</td>
<td>Medium-5</td>
<td></td>
</tr>
<tr>
<td>Duration</td>
<td>Medium term-4</td>
<td></td>
</tr>
<tr>
<td>Probability</td>
<td>Likely – 4</td>
<td></td>
</tr>
</tbody>
</table>

**Significance**

<table>
<thead>
<tr>
<th>Weighting</th>
<th>(Extent+ Intensity +Duration + Probability) x WF(2+5+4+4) x4=60 (Medium to High)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium to high</td>
<td></td>
</tr>
</tbody>
</table>

## 7.4.3.1 Solid Wastes

During construction of the Factory, solid waste will be generated from a wide range of project activities. Some of the waste includes; wrapping materials discarded by the workers on site, food waste from kitchens, waste from the workESops and offices consisting of waste papers, toners and cartridges, broken equipment and containers, steel, timber, etc.

To minimize pollution and visual intrusion, waste will to be managed appropriately as provided in this sub section. Solid and liquid wastes often increase organic load of the streams (in this case Mugutha Stream) eventually rising the Biological Oxygen Demand (BoD). Food waste may also attract primates and birds to the construction camps with the potential of being a nuisance to the construction workers.

**Mitigation Measures**

- The contractor develops a comprehensive Waste Management Plan (WMP) prior to commencement of works to be approved by the engineer
- Properly labelled and strategically placed waste disposal containers shall be provided at all places of work
- Litter bins should have secured lids to prevent animals and birds from scavenging
- All personnel shall be instructed to dispose of all waste in a proper manner
- Recycling of construction material shall be practiced where feasible e.g. containers and cartons

## 7.4.3.2 Liquid Wastes

During construction various types of liquid waste will be produced such as concrete washings, runoff from workESops and grey water from contractor’s camp. Just as with solid waste, liquid waste can pollute water resources downstream and also attract rodents and birds especially for meeting their drinking water needs. This can affect pose health hazards to both workers and community.

**Mitigation Measures**
- Water containing pollutants such as concrete or chemicals should be directed to a conservancy tank for removal from the site where applicable
- Wash areas shall be placed and constructed in such a manner so as to ensure that there are no leakages to the environment.

### 7.4.3.3 Fuels, Oils, Hazardous Substances

The construction phase will involve use of stationary and mobile plant and equipment which will require fueling and lubrication. There are chances of accidental spillage of used engine oils, grease and diesel which may lead to soil contamination. Should this spillage occur during the rainy season, the contaminants may be washed off by surface runoff and find their way into the nearby (Mugutha Stream).

**Mitigation Measures**

(i) Ensure proper handling of lubricants, fuels and solvents while maintaining the plant and equipment.

(ii) Any chemical or fuel spills shall be cleaned up immediately. The spilt liquid and clean-up material shall be removed, treated and transported to an appropriate site licensed for its disposal.

(iii) Storm water shall be diverted away from the fuel handling and storage areas. An oil water interceptor shall be provided to treat any rainwater from fuel storage and handling areas;

(iv) Measures should be taken to ensure proper storage of fuel, oil and other lubricants. Oil-water interceptors or sumps should be constructed to capture discharge of oils and other polluting liquids from maintenance work, vehicle and equipment washing bays.

### 7.4.3.4 Excessive Noise and Vibrations

Noise generating activities from machinery on site could pose health risks to workers and community members. As required, legal Notice no. 61 Noise and Excessive Vibration Pollution Control Regulations. The Contractor will keep noise level within acceptable limits (60 Decibels during the day and 35 Decibels during the night) and construction activities shall, where possible, be confined to normal working hours in the residential areas.

### 7.4.3.5 Air Pollution and Dust Generation

Air pollution will most likely be attributable to particulate matter (PM), especially dust. As required by Legal Notice no 34 Air Quality Regulations, 2014, below listed mitigation will be adhered to.

**Mitigation Measure**

(i) Water sprays shall be used to suppress dust at construction sites.

(ii) Vehicles delivering soil materials shall be covered to reduce spills and windblown dust;

(iii) Vehicle speeds shall be limited to minimise the generation of dust on site.
7.5 Factory Operation and Management of the Factory with Regards to Environment Health and Safety.

The Factory at operation stage will be required to comply with the provisions Occupational Health and Safety Act of 2007 and Public Health Act of 2017. The Factory demonstrates commitment to such provisions as detailed in sub-sections below.

7.5.1 Duties of Occupiers (Legal Requirements)

The Factory management shall before commencing operation undertake below listed audits. The audits, are required before registering the Factory as a workplace with Directorate of Occupational Health and Safety (DOSH).

(i) Risk Assessment  
(ii) Safety and Health Audit  
(iii) Fire Safety Audit  
(iv) Initial Environment Audit

7.5.2 Management of Polices required at the Factory

The Factory management shall ensure that before commencing operation prepare the below listed policies are prepared. The policies will guide operation of the Factory with regards to Environment Health and Safety.

(i) Safety & Health Policy  
(ii) Fire Safety Policy  
(iii) Environment Policy

7.5.3 Factory Personnel Trainings Required

The Factory management shall before commencing operation under that below listed trainings to staff including the Health and Safety Committee.

(i) Statutory Fire marshal training  
(ii) Statutory First Aid Training  
(iii) Statutory Safety and Health Committee

7.5.4 Occupational Health Programs within the Factory

The Factory management shall ensure that the below listed Occupational Health and Safety Provisions are adhered to with the first six months of the operation.

(i) Statutory Medical Examinations at Pre-employment, Periodical and Post-employment  
(ii) Provide a readily accessible first aid kit for all workers, additionally can have emergency
contacts in case a first responder is needed

(iii) Documents required: General register and Accident notification forms
(iv) Examinations required: All plants, lifting equipment and machinery (as per OSHA 2007) that will be used during construction.
(v) Required: Risk assessment Inspection of ladders / scaffoldings

7.5.5 Permits to Work (PTW)

The Factory management will ensure that permit to works and available as required for non-routine hazardous work. The Factory manager will design permits to work system for use by employees/ external contractors engaged in hazardous activities e.g. electrical installations, hot works and work at height and entry in confined spaces.

7.5.6 Fire Safety

The following measures will be undertaken by the Factory management with regards to fire safety.

(i) Ensure fire drills are done annually
(ii) Sufficient firefighting equipment
(iii) Ensure all fire escapes are not obstructed and open outwards or slide sideways

7.5.7 Personal Protective Equipment (PPE)

The Factory management will ensure that all workers and visitors are regularly provided with appropriate PPE whilst with the Factory premise on a 24 hour basis. The PPE are used to protect the workers from physical, chemical or biological hazards which they are likely to encounter in their working environment as listed below.

(i) PPE will protect Head, body eye, ear, respiratory tract, hand and foot protection as needed.
(ii) Protection from fall from height

7.5.8 Emergency Response Plan

The following measures will be undertaken by the Factory management with regards to Emergency Response Plan.

(i) Develop and Injury Emergency Response;
(ii) Non entry rescue mission to persons in confined space;
(iii) Fire emergency response;
(iv) Accidental spill management;
CHAPTER 8: ENVIRONMENTAL, HEALTH & SAFETY MANAGEMENT AND MONITORING PLAN (EHSMP)

8.1 Purpose and Objectives of EHSMP

The specific objectives of the EHSMP are to:

- Serve as a commitment and reference for the contractor to implement the EHSMP including conditions of approval from NEMA.
- Serve as a guiding document for the environmental, health and safety monitoring activities during construction and operation of the Factory.
- Provide detailed specifications for the management and mitigation of activities that have the potential to impact negatively on the environment, health and safety of Factory workers and community.
- Provide instructions to relevant Factory personnel regarding procedures for protecting the environment and minimizing environmental effects, thereby supporting the Factories goal of minimal or zero incidents.

The Environmental, Health & Safety Management and Monitoring Plan (EHSMP) prepared for the HDPE Pipes Manufacturing Factory was separated into three phased as listed below

- Factory Pre-Construction Stage - Permits and Approval Compliance Management Monitoring Plan
- Factory Construction Stage - Impacts Management and Monitoring Plan
- Factory Operation Stage - Occupational Health and Safety Management and Monitoring Plan (HSMP)

Tables 8.1 to 8.3 on pages 8-2 to 8-7 present the Environmental, Health & Safety Management and Monitoring Plan (EHSMP).
Table 8.1: Factory Pre-Construction Stage - Permits and Approval Compliance Management Monitoring Plan

<table>
<thead>
<tr>
<th>Activity</th>
<th>Associated Impacts</th>
<th>Impact Levels</th>
<th>Management Actions</th>
<th>Target Areas &amp; Responsibilities</th>
<th>Monitoring Indicator</th>
<th>Budget (KES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permits and Licenses</td>
<td>Delay in implementation of the Project due to objections and stop orders</td>
<td>Low</td>
<td>§ The Contractor shall ensure that all pertinent permits, certificates and licenses have been obtained prior to any activities commencing on site and are strictly enforced/adhered to; § Registration permit of site as place of work from Department of Occupational Health and Safety Registration (DOSH). § Environment Licenses for camp sites, burrow pits, cement batching plants from NEMA § Water Resources Authority (WRA) approvals water sources if from nearby streams § Approval of Plans by Kiambu County Government Physical Planning Department of any structures on site § Permits from Public Health Department Kiambu County of sanitation facilities installed on site § The Contractor shall maintain a database of all pertinent permits and licenses required for the contract as a whole and for pertinent activities for the duration of the contract</td>
<td>Entire Factory components Responsibility Mega Pipes Solutions Limited</td>
<td>Approvals permits issued</td>
<td>KES 100,000.00</td>
</tr>
</tbody>
</table>

Sub Total 1                                                         KES 100,000.00
Table 8.2: Factory Construction Stage - Impacts Management and Monitoring Plan

<table>
<thead>
<tr>
<th>Activity</th>
<th>Associated Impacts</th>
<th>Impact Levels</th>
<th>Management Actions</th>
<th>Target Areas &amp; Responsibilities</th>
<th>Monitoring Indicator</th>
<th>Budget (KES)</th>
</tr>
</thead>
</table>
| Sedimentation Impacts            | Medium to High     | ▪ Sand/silt traps should be used so as to prevent silt and any other sediments from getting into storm water channels  
▪ Site stockpiles will be properly covered to avoid exposure to agents of soil erosion such as wind and rain  
▪ The drainage system will be developed in a manner that prevents silt-laden runoff from entering surface water drains. | All works areas with the Factory premise  
**Responsibility** Contractor | Sediment load in storm water channels downstream | No associated direct cost, contractors best practice |
| Water Quality Impacts            | Medium to high     | ▪ Water containing such pollutants as cements, concrete, lime, chemicals and fuels shall be discharged into a conservancy tank for removal from site where applicable  
▪ All vegetation materials either live or dead on site shall be cleared and removed before the area is excavated | All works areas with the Factory premise  
**Responsibility** Contractor | Water quality of within water channels downstream | No associated direct cost, contractors best practice |
| Risk of Accidents at Work Sites  | High               | ▪ Provide Personal Protective Equipment (PPE) including gloves, gum boots, overalls and helmets to workers. Use of PPE to be enforced by the Supervising Engineer.  
▪ Fully stocked First Aid Kits to be provided within the Sites, and in all Project Vehicles  
▪ Strict use of warning signage and tapes where the trenches are open and at other active construction sites  
▪ Contractor to Employ and train Road Safety Marshalls who will be responsible for management of traffic on site | All works areas with the Factory premise  
**Responsibility**  
▪ Contractor  
▪ Supervising Engineer | Number of fatalities and accidents recorded in the incidence book | KES 100,000.00 |
| Solid Wastes impacts             | Low to Medium      | ▪ Properly labelled and strategically placed waste disposal containers shall be provided at all places of work  
▪ Litter bins should have secured lids to prevent animals and birds from scavenging  
▪ All personnel shall be instructed to dispose of all waste in a proper manner  
▪ Recycling of construction material shall be practiced where feasible e.g. containers and cartons  
▪ Earth spoils shall be disposed of in pre identified sites | All works areas with the Factory premise  
**Responsibility**  
▪ Contractor  
▪ Supervising Engineer | Quantity of solid Wastes Generated and appropriately disposed | No associated direct cost, contractors best practice |
<p>| Liquid Wastes                    | Low to Medium      | ▪ Water containing pollutants such as concrete or | All works areas with | Quantity of | No associated |</p>
<table>
<thead>
<tr>
<th>Activity</th>
<th>Associated Impacts</th>
<th>Impact Levels</th>
<th>Management Actions</th>
<th>Target Areas &amp; Responsibilities</th>
<th>Monitoring Indicator</th>
<th>Budget (KES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impacts</td>
<td></td>
<td>Medium</td>
<td>chemicals should be directed to a conservancy tank for removal from the site where applicable</td>
<td>the Factory premise</td>
<td>liquid Wastes Generated and appropriately disposed</td>
<td>direct cost, contractors best practice</td>
</tr>
</tbody>
</table>
| Sanitation issues resulting from both solid and liquid wastes on site |                                                                                    | Low to Medium    | • All temporary/ portable toilets or pit latrines shall be secured to the ground to the satisfaction of the engineer to prevent them from toppling over  
  • A wash basin with adequate clean water and soap shall be provided alongside each toilet. Staff shall be encouraged to wash their hands after use of the toilet, in order to minimise the spread of possible disease | All works areas with the Factory premise | Incidence of reported cases of water related diseases among the workforce                                                                  | No associated direct cost, contractors best practice |
| Storage of fuel oils, lubricants, chemicals and flammable materials | Fuels, Oils and other hydrocarbons                                                  | high             | • The contractor shall ensure that the machines and equipment are in good condition when on site.  
  • Ensure proper handling of lubricants, fuels and solvents while maintaining the plant and equipment.  
  • Any chemical or fuel spills shall be cleaned up immediately.  
  • The split liquid and clean-up material shall be removed, treated and transported to an appropriate site licensed for its disposal.  
  • Follow specifications of the Occupational Health and Safety Act 2007, EMCA 2015 and others in the development and operation of stores  | All works areas with the Factory premise | Quantity of waste fuels and oils appropriately disposed                                                                                       | KES 100,000.00                         |
| Noise and Vibration control from plant and equipment | Risk to health and safety of community and workers                                 | Low to Medium    | • The Contractor shall keep noise level within acceptable limits and construction activities shall, where possible, be confined to normal working hours in the residential areas  
  • The Environmental Management and Coordination (Noise And Excessive Vibration Pollution) (Control) Regulations, 2009 provides 55 decibel during the day and 35 decibel during the night | All works areas with the Factory premise | Reported complaints from neighbor community and institutions                                                                                 | No associated direct cost, contractors best practice |
<table>
<thead>
<tr>
<th>Activity</th>
<th>Associated Impacts</th>
<th>Impact Levels</th>
<th>Management Actions</th>
<th>Target Areas &amp; Responsibilities</th>
<th>Monitoring Indicator</th>
<th>Budget (KES)</th>
</tr>
</thead>
</table>
| **Air Quality Control**        | Air pollution causing respiratory disorders to human    | Low to Medium | ▪ Workers shall be trained on management of air pollution from vehicles and machinery.  
▪ All construction machinery shall be maintained and serviced in accordance with the contractor’s specifications.  
▪ The contractor shall not carry out dust generating activities (excavation, handling and transport of soils) during times of strong winds.  
▪ Vehicles delivering soil materials shall be covered to reduce spills and windblown dust.  
▪ Water sprays shall be used on all earthworks areas within 200 metres of human settlement.                                                                                                                                   | All works areas with the Factory premise  
**Responsibility** Contractor  
Cases of respiratory complication at nearby health center                                                                                                                  | KES 100,000.00                                                                                                                                            |
| **Contractor de-mobilization and site reinstatement** | Associated risks of environmental degradation | Low           | ▪ The site is to be cleared of all construction materials, including litter prior to hand over.  
▪ Fences, barriers and demarcations associated with the construction phase must be removed from the site.  
▪ Rehabilitation Activities of Environmental Cases identified must continue throughout the defect liability period.  
▪ Undertake a completion Environment, Health and Safety Audit.                                                                                                                                                                       | All works areas with the Factory premise  
**Responsibility** Contractor  
**Closeout audit report findings**  
No associated direct cost, contractors best practice                                                                                                                                  |                                                                                                       |                                                                                           |
| **Sub Total 2**                |                                                         |               |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                   |                                                                                                       | EMP 2 EMP Khs 300,000.00          |
### Table 8.2: Factory Operation Stage - Occupational Health and Safety Management and Monitoring Plan (HSMP)

<table>
<thead>
<tr>
<th>Activity Fields</th>
<th>Requirement</th>
<th>Action required</th>
<th>Target Areas &amp; Responsibilities</th>
<th>Monitoring Indicator</th>
<th>Budget (KES)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duties of Occupiers (Legal Requirements)</strong></td>
<td>Risk Assessment</td>
<td>Undertake Risk assessment of the Factory before start of operations</td>
<td>Entire Factory</td>
<td>• Risk Assessment Report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Safety and Health Audit</td>
<td>Undertake Safety and Health Audit of the Factory before start of operations</td>
<td>Responsibility</td>
<td>Occupational Health and Safety Report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fire Safety Audit</td>
<td>Undertake Fire Safety Audit of the Factory before start of operations</td>
<td>Meaupipes Solutions Limited</td>
<td>Fire Assessment Report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Initial Environment Audit</td>
<td>Conduct an Initial Environment Audit at completion of Factory construction.</td>
<td></td>
<td>Initial Environment Audit Report</td>
<td></td>
</tr>
</tbody>
</table>
| **Management of Policies required at the Factory** | Policies Required:  
• Safety & Health Policy  
• Fire Safety Policy  
• Environment Policy | Display signed copies of the policy statement at the workplace and bring it to the attention of all employees and other stakeholders.  
This should be followed by a comprehensive Environment, Safety and Health policy document that spells out an arrangement on how the Policy (ies) is going to be implemented. | Entire Factory | Responsibility | 150,000 |
| | | | Meaupipes Solutions Limited | Policies with the Factory premise |  |
| | | |  | • Safety & Health Policy |  |
| | | |  | • Fire Safety Policy |  |
| | | |  | • Environment Policy |  |
| **Factory Personnel Trainings Required** | Training required:  
• Statutory: Fire marshaling training | Appoint and train members of the fire-fighting team | All personnel | Responsibility | 150,000 |
| | | | Meaupipes Solutions Limited | Fire Marshalls appointed and trained in fire management |  |
| | | |  | First Aid Trainings undertaken |  |
| | | |  | Health and Safety Committee appointed and trained on Occupational Health and Safety |  |
| | Training required:  
• Statutory: First Aid Training | Conduct first aiders’ training for the first time and a refresher training annually. |  |  |  |
| | Training required:  
• Statutory: Safety and Health Committee | • Have a safety & health committee with a minimum membership of six employees  
• Ensure the committee is trained by a DOSHS approved training institution. |  |  |  |
| **Occupational Health Programmes within the Factory** | Statutory Medical Examinations.  
• Pre-employment  
• Periodical  
• Post-employment | Ensure the employees under-go medical exams by an approved DHP at prescribed intervals. | All personnel | Responsibility |  |
<p>| | | | Meaupipes Solutions Limited | Number of personnel who undergo medical examination |  |
| | | |  | Factory operation budgets |  |</p>
<table>
<thead>
<tr>
<th>Activity Fields</th>
<th>Requirement</th>
<th>Action required</th>
<th>Target Areas &amp; Responsibilities</th>
<th>Monitoring Indicator</th>
<th>Budget (KES)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Provision of First Aid Kit</td>
<td>Provide a readily accessible first aid kit for all workers. Additionally can have emergency contacts in case a first responder is needed</td>
<td>All Factory components</td>
<td>Number of functional first aid kits provided on site</td>
<td>Factory operation budgets</td>
</tr>
<tr>
<td></td>
<td>Documents required:</td>
<td>Ensure that all accidents / occurrences are investigated to establish root cause. These are then entered in the general register and reported to the County Safety and Health Officer within the prescribed timelines</td>
<td>All Factory processes</td>
<td>Duly filled Incidence reporting available</td>
<td>Factory operation budgets</td>
</tr>
<tr>
<td></td>
<td>• General register</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Accident notification forms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Examinations required:</td>
<td>Any of the equipment listed in Part VII of OSHA 2007 must be inspected by Government approved person in line with the prescribed timelines</td>
<td>All plant and equipment's on within the Factory</td>
<td>Number of plant and equipment inspected and availability of inspection sheet</td>
<td>Factory operation budgets</td>
</tr>
<tr>
<td></td>
<td>All plants, lifting equipment and machinery (as per OSHA 2007) that will be used during construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factory Operations Safety</td>
<td>Required:</td>
<td>Factory daily operations will be done using heavy machinery or aided by specialized equipment and processes.</td>
<td>All ladders within the Factory</td>
<td>Number of ladders fully inspected and inspection reports</td>
<td>Factory operation budgets</td>
</tr>
<tr>
<td></td>
<td>Risk assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inspection of ladders / scaffoldings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permits To Work (PTW)</td>
<td>Permit to Works are required for non-routine hazardous work.</td>
<td>The Factory manager will design permits to work system for use by employees/ external contractors engaged in hazardous activities e.g. electrical installations, hot works and work at height and entry in confined spaces</td>
<td>All Factory confined sections</td>
<td>Number of permit to work issued</td>
<td>Factory operation budgets</td>
</tr>
<tr>
<td>Fire Safety</td>
<td>Requirements:</td>
<td>• Ensure fire drills are done annually • sufficient firefighting equipment • ensure all fire escapes are not obstructed and open outwards or slide sideways • Precautions with respect to explosive or inflammable dust or gas.</td>
<td>All Factory components</td>
<td>Number of firefighting equipment installed on site</td>
<td>Factory operation budgets</td>
</tr>
<tr>
<td></td>
<td>• Fire drill</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• firefighting equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fire escapes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity Fields</td>
<td>Requirement</td>
<td>Action required</td>
<td>Target Areas &amp; Responsibilities</td>
<td>Monitoring Indicator</td>
<td>Budget (KES)</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Emergency Response Plan</td>
<td>Required:</td>
<td>The occupier should prepare listed emergency preparedness and response plans for the workplace. Emergency contacts should be posted at this point.</td>
<td>All Factory components</td>
<td>Number of Emergency Response Plan prepared</td>
<td>Factory operation budgets</td>
</tr>
<tr>
<td></td>
<td>• Injury emergency response;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Non entry rescue mission to persons in confined space;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fire emergency response;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Accidental spill management;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ergonomics At The Workplace</td>
<td>Requirement: Ergonomic survey</td>
<td>Provide handling aid for lifting and/or transportation of heavy objects. The workplace facilities and machines should be designed to fit the requirements/abilities of the workers using them</td>
<td>All work places within the Factory</td>
<td>Customer satisfaction survey</td>
<td>Factory operation budgets</td>
</tr>
<tr>
<td>Contractors And Suppliers</td>
<td>Duties of an occupier of place of work to persons other than his employees.</td>
<td>Develop policy to guide contractors and suppliers regarding their obligations to take care of their employees' safety and health and complying with statutory regulations. This should be imbedded on the contract document and the contractors made aware of them before signing the contract.</td>
<td>All Contractors And Suppliers of Mega Pipes Solutions Limited</td>
<td>Number of suppliers and contractors aware of Factory provision on Environment Health and Safety</td>
<td>Factory operation budgets</td>
</tr>
<tr>
<td>Personal Protective Equipment</td>
<td>Requirements:</td>
<td>PPE are used to protect the workers from physical, chemical or biological hazards which they are likely to encounter in their working environment.</td>
<td>All Factory employees</td>
<td>Number of Personal Protective Equipment</td>
<td>Factory operation budgets</td>
</tr>
<tr>
<td></td>
<td>• Head, body eye, ear, respiratory tract, hand and foot protection as needed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Protection from fall from height</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub Total 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Khs 300,000.00</td>
</tr>
</tbody>
</table>
CHAPTER 9: CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

The Environmental Impact Assessment (EIA) undertaken for the proposed HDPE Pipes Manufacturing Factory provides below listed conclusions

(i) The project will be developed on 10 acres piece of land LR NO LR 11294/30&31 located in Mugutha Location, Ruiru Sub County (Oakland Properties Limited) within Kiambu County. Certificate of title / lease attached as Appendix 1. This parcel of land is owned by the Proponent (Megapipes Solutions Limited)

(ii) The Change of User minute CPTC/031/2017/052 approved change of user of the parcel of land from agricultural to mixed development use (attached as Appendix 5). This implies that the Factory will not be out of character from the surrounding area which has existing similar factories milling coffee.

(iii) The production of the HDPE box section is done through various steps which include; Extrusion which converts the polymeric particulates into a homogenous, pressurized melt among other steps, the process is a dry process and no liquid wastes is anticipated.

(iv) Despite the process being a dry process, the EIA focused on water quality analysis of existing water points identified at the lower elevation to the Factory as a precautionary measure, the baseline water quality data will be used during route audits of the Factory process.

(v) The product is not classified as hazardous according to Regulation (EC) No 1272/2008 and its amendments. Also, the product is not considered hazardous for the environment. However, it is not readily biodegradable it does not accumulate in organisms.

9.2 Recommendations

This assessment recommends the following provisions:

(i) The Environment Management Plan (EMP) prepared under this EIA provides a budget of Kenya Shilling Three Hundred Thousand (KES 300,000.00) for mitigation of environment impacts identified in this report at Factory Construction stage.

(ii) The budget for implementing health and safety provisions on an annual basis during Factory operations is also provided as KESs 300,000. However, this budget will be revised appropriately during operation phase of the Factory.

(iii) The Bid documents prepared for the project should incorporate the Environment, Health and Safety Provisions discussed under Chapter 7 (Environment Impact Assessment and Mitigation Measures). This will ensure the contractors who tender for the works include in their bids the KES 300,000.00 budget presented the EMP.

(iv) Contractor will be required to commit to implementing the Environment, Health and Safety (EHS) Provisions by developing site specific (EHS) plans at construction stage of the Factory.

(v) At Project implementation stage, the Contractor will report to the Project management team comprising of the Consultant and the Project proponent on a monthly basis on how
EHS provision detailed in this EIA are addressed at each Project Site.

(vi) On completion of the Civil Works, Proponent (Mega Pipes) will commission an independent Consultant to undertake an initial Environment, Health and Safety Audit as required by Environment Impact Assessment and Audit Regulations of 2003. The audit will identify nonconformities which the Contractor together with Proponent will address through the defects liability period of the Project and use to during annual self-audits.
APPENDIXES

Appendix 1: Certificate of Title / Lease of Land Ref. No. Ruiru / Mugutha Block 3/30 & 3/31
Appendix 2: NEMA Terms of Reference (ToR) Approval Letter
Appendix 3: Stakeholder Participation Filled Questionnaires
Appendix 4: Product Safety Information Sheet Prepared by Borealis
Appendix 5: Change of User Approval by Kiambu County Government
Appendix 6: Laboratory Results to Baseline Analysis (Water, Ambient Air & Noise Survey)
Appendix 7: Lead Expert’s Year 2020 Practicing License
Appendix 1

Certificate of Lease for Land Ref. RUIRU / MUGUTHA BLOCK 3/30 & 3/31

Environment Impact Assessment (EIA) Study Report

REPUBLI OF KENYA

THE LAND REGISTRATION ACT
(No. 3 of 2012, Section 106)

THE REGISTERED LAND ACT
(Chapter 306, Repealed)

Certificate of Lease

Title No. Ruiru/Mugutha Block 3/30

Approximate Area 2,000 ha

Lessor

The Government of Kenya

Rent Kshs. 87,342/= (REV.)

Term 99 years from 1.6.2018

This is to certify that NEGAPIPES SOLUTIONS LIMITED

BOX 764-00506 NAIROBI

is (are) now registered as the proprietor(s) of the leasehold interest above
referred to, subject to the agreements and other matters contained in the
registered lease, to the entries in the register relating to the lease and to such
of the overriding interests set out in section 30 of the Registered Land Act as
may for the time being subsist and affect the land comprised in the lease.

GIVEN under my hand and the seal of the

Ruiru District Land Registry

this 25th day of March, 2020.
At the date stated on the front hereof, the following entries appeared in the register relating to the land:

**PART A—PROPERTY SECTION**

<table>
<thead>
<tr>
<th>EDITION</th>
<th>OPENED:</th>
<th>PARTICULARS OF LEASE</th>
<th>NATURE OF TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9.3.20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REGISTRATION SECTION</th>
<th></th>
<th>PARTICULARS OF LEASE</th>
<th>NATURE OF TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruiru/Mugutha Block 3</td>
<td></td>
<td>Lessor: THE GOVERNMENT OF KENYA</td>
<td>LEASEHOLD</td>
</tr>
<tr>
<td>Parcel Number 30</td>
<td></td>
<td>Lesser: OAKLANDS PROPERTIES KENYA LIMITED</td>
<td></td>
</tr>
<tr>
<td>Approximate Area</td>
<td>2,000</td>
<td>Rent: KES 487,342/= (REV.)</td>
<td></td>
</tr>
<tr>
<td>Registry Map Sheet No.</td>
<td></td>
<td>Term: 99 yrs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>From: 1.6.2018</td>
<td></td>
</tr>
</tbody>
</table>

**PART B—PROPRIETORSHIP SECTION**

<table>
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**Restriction:** No Disposition by the Proprietor shall be registered without the written consent of the Lessor (S. 48)
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</table>
REPUBLIC OF KENYA

THE REGISTERED LAND ACT
(Chapter 300, Repealed)

Certificate of Lease
Republic of Kenya

The Land Registration Act
(No. 3 of 2012, Section 108)
The Registered Land Act
(Chapter 300, Repealed)

Certificate of Lease

Title No. Ruiru/Mugutha Block 3/31
Approximate Area 1.992 HA

Lessor THE GOVERNMENT OF KENYA
Rent KShs. 86,858/- (REV.)
Term 99 YEARS FROM 1-6-2018

This is to certify that MEGAPIES SOLUTIONS LIMITED
BOX 764-00606 NAIROBI

is (are) now registered as the proprietor(s) of the leasehold interest above referred to, subject to the agreements and other matters contained in the registered lease, to the entries in the register relating to the lease and to such of the overriding interests set out in section 30 of the Registered Land Act as may for the time being subsist and affect the land comprised in the lease.

GIVEN under my hand and the seal of the

Ruiru District Land Registry

this 25TH day of MARCH 2020
HDPE Pipes Manufacturing Factory Located on Land Ref. No.
Ruiru / Mugutha Block 3/30 & 3/31 – Kiambu County

Environment Impact Assessment (EIA)
Study Report

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**PART A—PROPERTY SECTION**

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**PART B—PROPRIETORSHIP SECTION**

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[Signature]

[Stamp: Land Registry]

Environment Impact Assessment (EIA) Study Report

REPUBLIC OF KENYA

THE REGISTERED LAND ACT
(Chapter 300, Repealed)

Certificate of Lease
Appendix 2 NEMA Terms of Reference (ToR) Approval Letter
RE: ACKNOWLEDGEMENT AND APPROVAL OF TERMS OF REFERENCE (TOR)
FOR ENVIRONMENTAL IMPACT ASSESSMENT

We acknowledge the receipt of TOR for the above subject.

Pursuant to the Environmental Management and Coordination Act CAP 387, the second schedule and the Environmental (Impact Assessment and Audit) Regulations 31 and 25, your terms of reference for the Environmental Impact Assessment (EIA) for the proposed Pipe manufacturing Factory for Magpipes Solutions Ltd has been approved.

You shall submit ten (10) copies and one electronic copy of your report prepared by a registered expert to the Authority.

MARRIAN KIOKO
EIA SECTION HEAD
Appendix 3 Stakeholder Participation Filled Questionnaires
**FACT SHEET**

<table>
<thead>
<tr>
<th>Report</th>
<th>Environment Impact Assessment (EIA) for HDPE Pipes Manufacturing Factory</th>
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<tbody>
<tr>
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<td>MEGAPIPES SOLUTIONS LIMITED</td>
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<td>Stakeholder engagement through questionnaire administration</td>
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<td>Local Administration, Business Community, institutions and Public.</td>
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<tr>
<td>County</td>
<td>Kiambu</td>
</tr>
<tr>
<td>Lead expert</td>
<td>Godwin Saiwa Lidaah NEMA Lead Expert Reg Nr. 2492</td>
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**INTERVIEW DETAILS**

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<td>0741888738</td>
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1. INTRODUCTION

MEGAPIPES SOLUTIONS LIMITED proposes to build a factory for manufacturing of HDPE Plastic pipes, namely double wall structured HDPE pipes (Webhost) and solid wall HDPE pipes for drainage and sanitation Projects in Kenya and neighboring countries. EMCA 1969 Cap 387 revised in 2015 to align to the Kenyan Constitution 2010 provides for second schedule that Project of such magnitude be subjected to an Environmental Impact Assessment (EIA).

Input from stakeholders during EIA process is important and is required during finalization of Project designs and also help in development of impacts mitigation measures presented in the environment management plan presented as a chapter in the EIA report.

You are among the stakeholders selected to be interviewed with the regards to the above described project. All the information provided in the questionnaire will be kept confidential. Thank you.

2. PROJECT CONSTRUCTION IMPACTS

What are some of the Project impacts anticipated during Project construction to both Natural and Human Environment? (Refer to footer below for an interpretation of Natural and Human Environment. Interviewer to guide the respondent)

(a) General positive impacts during Project Construction Phase:

- Creation of employment opportunities

(b) General negative impacts during Project Construction Phase:

- Manufacturing effects from the proposed
- Loss of aesthetic beauty of the area

1. Example of natural environment could be soils, geology, topography, hydrology, flora and fauna while human environment could refer to peoples wellbeing including sources of livelihood, hygiene and sanitation, health, resettlement issues etc.
3. PROJECT OPERATION IMPACTS

What are some of the Project impacts anticipated during Project operation to both Natural and Human Environment? in your area (refer to footer below for relevant impact categories, interview to guide the respondent).

(c) General positive impacts during Project operation Phase

- Air pollution from

- Employment

(d) General negative impacts during Project operation Phase

- Chemicals from the factory

- Siltation/Run off from the factory

- Disturb village

- Drainage should be considered

4. RESPONDENT INDEPENDENT OPINION AND GENERAL COMMENT

What is your independent opinion and general comment with regards to the above mentioned Project?

"It is a good project that would bring jobs to the Community, significant profit to the people."

5. INTERVIEW AUTHENTICATION

Kindly sign or provide an official rubberstamp to the questionnaire.

[Signature]

[Stamp]

2. Example of operation impacts could be issues related to, economic growth through creation of employment etc
FACT SHEET

<table>
<thead>
<tr>
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<tr>
<td>Lead Expert</td>
<td>Godwin Sakome Lishihu NFMA Lead Expert Reg Nt: 2492</td>
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INTERVIEW DETAILS

| Name / Institution of respondent | Kajima Manufacturing Association |
| Contact of respondent | Contact Dep |
| Responding classification (institution / Individual) | General Dep |
| Interviewer’s Name | Othome 
| ID Number Interviewer’s | 0876861728 |
| Interviewer’s Contact | 0712966645 |
| Date of Interview | 12-03-20 |

1. INTRODUCTION

MEGAPIPIES SOLUTIONS LIMITED proposes to build a factory for manufacturing of HDPE Plastic pipes, namely double wall structured HDPE pipes (Wallstic) and solid wall HDPE pipes for drainage and sanitation Projects in Kenya and neighboring countries. EMCA 1999 Cap 367 revised in 2015 is aligned to the Kenyan Constitution 2010 provides in the second schedule that Project of such magnitude be subjected to an Environmental Impact Assessment (EIA).

Input from stakeholders during EIA process is important and is required during finalization of Project designs and also helps in development of impact mitigation measures presented in the environment management plan as a chapter in the EIA report.

You are among the stakeholders selected to be interviewed with the regards to the above described project. All the information provided in the questionnaire will be kept confidential. Thank you.

2. PROJECT CONSTRUCTION IMPACTS

What are some of the Project impacts anticipated during Project construction to both Natural and Human Environment? Is your area (refer to box below for an interpretation of natural and human environment) interviewer to guide the respondents?

(a) General positive impacts during Project Construction Phase

- Growth of employment opportunities

(b) General negative impacts during Project Construction Phase

- Health and safety of the workers during...
3. PROJECT OPERATION IMPACTS

What are some of the Project impacts anticipated during Project operation to both Natural and Human Environment in your area (refer to footer below for relevant impact categories, interview to guide the respondent)

(c) General positive impacts during Project operation Phase

- Better demand and opening of new businesses

(d) General negative impacts during Project operation Phase

- Decrease in traffic issues, crime and congestion
- Slope of accidents in factory
- Air pollution coming from factory

4. RESPONDENT INDEPENDENT OPINION AND GENERAL COMMENT

What is your independent opinion and general comment with regards to the above mentioned Project?

- I think the project is a good project that would benefit the community. There are jobs created, the roads are improved and accidents are minimized and there’s less waste water

5. INTERVIEW AUTHENTICATION

Kindly sign or provide an official rubber stamp to the questionnaire

---

2 Example of operation impacts could be issues related to, economic growth through creation of employment etc.
FACT SHEET

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INTERVIEW DETAILS

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1. INTRODUCTION

MEGAPIPES SOLUTIONS LIMITED proposes to build a factory for manufacturing of HDPE Plastic pipes, namely double wall structured HDPE pipes (Website) and solid wall HDPE pipes for drainage and sanitation Projects in Kenya and neighboring countries. EMCA 1999 Cap 317 revised in 2015 to align to the Kenyan Constitution 2010 provides in the second schedule that Project of such magnitude be subjected to an Environmental Impact Assessment (EIA).

Input from stakeholders during EIA process is important and is required during finalization of Project designs and also help in development of impacts mitigation measures presented in the environment management plan presented as a chapter in the EIA report.

You are among the stakeholders selected to be interviewed with the regards to the above described project. All the information provided in the questionnaire will be kept confidential. Thank you.

2. PROJECT CONSTRUCTION IMPACTS

What are some of the Project impacts anticipated during Project construction to both Natural and Human Environment in your area (refer to footer below for an interpretation of natural and human environment, interviewer to guide the respondent)

(a) General positive impacts during Project Construction Phase

> JOB CREATION TO THE LOCAL COMMUNITY.

(b) General negative impacts during Project Construction Phase

> EXPECTED DISTURBANCE TO FLORA & FAUNA IN THE CONSTRUCTION SITE.
> INCREASED RISK ON SAFETY OF PEDESTRIANS AND VEHICLES ON A GOOD ROAD - EXPECTED TRANSFORMATION OF DUTCH CARRIAGE NO CONSTRUCTION
> EQUIPMENT THE INVESTOR MUST ENSURE SAFETY OF ALL.

Example of natural environment could be soil, geology, topography, hydrology, flora and fauna while human environment could refer to peoples welfare including sources of livelihoods, access and movement, health, resettlement issues e.t.c adverse

THREAT TO COFFEE SECTOR COMMERCIAL AGRICULTURAL LAND TO

COMMERCIAL

12 MAR 2020

Scanned with CamScanner
3. PROJECT OPERATION IMPACTS

What are some of the Project impacts anticipated during Project operation to both Natural and Human Environment in your area (refer to footer below for relevant impact categories, interviewer to guide the respondent)

(c) General positive impacts during Project operation Phase

- Expected Creation of Employment for Local Community.

(d) General negative impacts during Project operation Phase

- Risk of Chemical Exposure Hazards – Fumes from the process to be controlled but to maintain air quality for the surrounding communities, human and food industry.
- Expected change of drainage patterns – central of steam water closure
- Noise Hazards
- Contaminated water for the process disposal mechanism will be a concern.

4. RESPONDENT INDEPENDENT OPINION AND GENERAL COMMENT

What is your independent opinion and general comment with regards to the above mentioned Project?

The project will bring a positive economic impact to the local community. However, the risk exposure and hazards associated with the operation carries more weight and thus need to be controlled and addressed beyond reasonable doubt.

5. INTERVIEW AUTHENTICATION

Kindly sign or provide an official rubber stamp to the questionnaire

[Signature]

[Stamp]

2 Example of operation Impacts could be issues related to, economic growth through creation of employment etc.
FACT SHEET

Report: Environment Impact Assessment (EIA) for HDPE Pipes Manufacturing Factory

Proponent: MEGAPIES SOLUTIONS LIMITED

Assignment: Stakeholder engagement through questionnaire administration

Stakeholders: Local Administration, Business Community, Institutions and Public.

County: Kiambu

Lead expert: Godwin Salwa Latafuli NEMA Lead Expert Reg.Nr. 2692

INTERVIEW DETAILS

Name / Institution of respondent: OAKLANDS TUFFREE ESTATE

Contacts of respondent: 0723-860-555

Respondent classification (institution / individual): Medium - Senior Agreement

Interviewer’s Name: DELL

ID Number: 28196637

Interviewer’s Contact: 0711-860-555

Date of Interview: 11/03/2020

1. INTRODUCTION

MEGAPIES SOLUTIONS LIMITED proposes to build a factory for manufacturing of HDPE Plastic pipes, namely double wall structured HDPE pipes (Waterline) and solid wall HDPE pipes for drainage and sanitation Projects in Kenya and neighboring countries. ENCA 1999 Cap 387 revised in 2015 to align to the Kenyan Constitution 2010 provides in the second schedule that Project of such magnitude be subjected to an Environmental Impact Assessment (EIA).

Input from stakeholders during EIA process is important and is required during finalisation of Project designs and also help in development of impacts mitigation measures presented in the environment management plan presented as a chapter in the EIA report.

You are among the stakeholders selected to be interviewed with regards to above described project. All the information provided in the questionnaire will be kept confidential. Thank you.

2. PROJECT CONSTRUCTION IMPACTS

What are some of the Project impacts anticipated during Project construction to both Natural and Human Environment in your area? (refer to factors below for an interpretation of natural and human environment, interviewer to guide the respondent)

(a) General positive impacts during Project Construction Phase

Creation of some economic employment

(b) General negative impacts during Project Construction Phase

Rush of metal from the mine site passing through the area leading to vegetation over destruction

1 Example of natural environment could be soils, geology, topography, hydrology, flora and fauna while human environment could refer to peoples' wellbeing including matters of livelihood, hygiene and sanitation, youth, resettlement issues etc.
3. PROJECT OPERATION IMPACTS

What are some of the Project impacts anticipated during Project operation to both Natural and Human Environment in your area (refer to footer below for relevant impact categories, interviewer to guide the respondent)

(c) General positive impacts during Project operation Phase

- employment to the Nyerere village people

(d) General negative impacts during Project operation Phase

- chemicals emission into the air which may effect on people
- vegetables waste into the neighbouring stream and although run off may affect livestock

4. RESPONDENT INDEPENDENT OPINION AND GENERAL COMMENT

What is your independent opinion and general comment with regards to the above mentioned Project?

It would be better if the production unit can be done elsewhere to avoid the negative impacts on humans eg: drinking

5. INTERVIEW AUTHENTICATION

Kindly sign or provide and official rubber stamp to the questionnaire

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2 Example of operation impacts could be issues related to, economic growth through creation of employment etc.
FACT SHEET
Report | Environment Impact Assessment (EIA) for HDPE Pipes Manufacturing Factory
Proponent | MEGAPIPES SOLUTIONS LIMITED
Assignment | Stakeholder engagement through questionnaire administration
Stakeholders | Local Administration, Business Community, Institutions and Public.
County | Kiambu
Lead expert | Godwin Salwa Liddah NEMA Lead Expert Reg Nr 2492

INTERVIEW DETAILS
Name / Institution of respondent |
Contacts of respondent | 0714204873
Respondent classification (Institution / Individual) |
Interviewer’s Name |
ID Number Interviewer’s | 4567890
Interviewer’s Contact | 0714204873
Date of Interview | 10/02/20

1. INTRODUCTION
MEGAPIPES SOLUTIONS LIMITED proposes to build a factory for manufacturing of HDPE Plastic pipes, namely double wall structured HDPE pipes (Wetolite) and solid wall HDPE pipes for drainage and sanitation Projects in Kenya and neighboring countries. EMCA 1999 Cap 387 revised in 2015 to align to the Kenyan Constitution 2010 provides in the second schedule that Project of such magnitude be subjected to an Environmental Impact Assessment (EIA).

Input from stakeholders during EIA process is important and is required during finalization of Project designs and also help in development of impacts mitigation measures presented in the environment management plan presented as a chapter in the EIA report.

You are among the stakeholders selected to be interviewed with the regards to the above described project. All the information provided in the questionnaire will be kept confidential. Thank you.

2. PROJECT CONSTRUCTION IMPACTS
What are some of the Project impacts anticipated during Project construction to both Natural and Human Environment1 in your area (refer to footer below for an interpretation of natural and human environment, interviewee to guide the respondent)

(a) General positive impacts during Project Construction Phase
- Creation of employment
- Opening up the area
(b) General negative impacts during Project Construction Phase
- Air pollution due to burnt materials

---

1 Example of natural environment could be soils, geology, topography, hydrology, flora and fauna while human environment could refer to peoples wellbeing including sources of livelihood, hygiene and sanitation, health, resettlement issues etc.
3. PROJECT OPERATION IMPACTS

What are some of the Project impacts anticipated during Project operation to both Natural and Human Environment in your area (refer to footer below for relevant impact categories, interviewer to guide the respondent)

(c) General positive impacts during Project operation Phase

- Improved Economic conditions

(d) General negative impacts during Project operation Phase

- Poor waste disposal mechanism from the factory

4. RESPONDENT INDEPENDENT OPINION AND GENERAL COMMENT

What is your independent opinion and general comment with regards to the above mentioned Project?

A good project that will improve jobs

5. INTERVIEW AUTHENTICATION

Kindly sign or provide an official rubber stamp to the questionnaire

---

2 Example of operation impacts could be issues related to, economic growth through creation of employment etc.
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### INTERVIEW DETAILS

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MEGAPIES SOLUTIONS LIMITED proposes to build a factory for manufacturing of HDPE Plastic pipes, namely double wall structured HDPE pipes (Website) and solid wall HDPE pipes for drainage and sanitation Projects in Kenya and neighboring countries. EMCA (999 Cap 387 revised in 2015 to align to the Kenyan Constitution 2010 provides in the second schedule that Project of such magnitude be subjected to an Environmental Impact Assessment (EIA).

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You are among the stakeholders selected to be interviewed with the regards to the above described project. All the information provided in the questionnaire will be kept confidential. Thank you.

### 2. PROJECT CONSTRUCTION IMPACTS

What are some of the Project impacts anticipated during Project construction to both Natural and Human Environment in your area (refer to footer below for an interpretation of natural and human environment, interviewer to guide the respondent)

(a) General positive impacts during Project Construction Phase

- Employment opportunities in the people around

(b) General negative impacts during Project Construction Phase

- Water pollution. Most of the blood products and near river and streams

---

1 Example of natural environment could be soils, geology, topography, hydrology, flora and fauna while human environment could refer to peoples wellbeing including sources of livelihood, hygiene and sanitation, health, settlement issues etc.
2. PROJECT OPERATION IMPACTS

What are some of the Project impacts anticipated during Project operation in both Natural and Human Environment? in your area (refer to footer below for relevant impact categories, interviewer to guide the respondent)

(c) General positive impacts during Project operation Phase
- Improved economy of the area

(d) General negative impacts during Project operation Phase
- Noise and excessive vibration from the machinery operating in the factory could lead to accidents

4. RESPONDENT INDEPENDENT OPINION AND GENERAL COMMENT

What is your independent opinion and general comment with regards to the above mentioned Project?
A better location could be found. The factory should be set up a few years away from the farming areas.

5. INTERVIEW AUTHENTICATION

Kindly sign or provide an official rubber stamp to the questionnaire
Appendix 4: Product Safety Information Sheet prepared by Borealis
Product safety information sheet

Polyethylene
BorSafe™ HE3490-LS

1. Identification of the substance/mixture and of the company/undertaking

- **Trade name:** BorSafe HE3490-LS
- **Material use:** raw material for plastics industry
- **Supplier:** Borealis AG
  E-mail address: product.safety@borealisgroup.com

2. Hazards identification

- **Classification of the substance or mixture:**
  The product is not classified as hazardous according to Regulation (EC) No 1272/2008 and its amendments.
- **Label elements:** Not a hazardous substance or mixture.
- **Other hazards:** The product burns, but is not classified as flammable. Dust from the product gives a potential risk for dust explosion. This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

3. Composition/information on ingredients

The product is a polyethylene polymer containing no substance classified as hazardous in concentrations, which should be taken into account according to EU regulations.

4. First aid measures

- **If inhaled:** Move to fresh air in case of accidental inhalation of vapours or decomposition products.
- **In case of skin contact:** If molten material comes in contact with the skin, cool with plenty of water. DO NOT remove solidified product, as removal could result in severe tissue damage. Obtain medical attention.
- **Most important symptoms and effects, both acute and delayed:** Inhalation of dust may irritate the respiratory tract. Prolonged inhalation of high doses of decomposition products may give headache or irritation of the respiratory tract.

5. Firefighting measures

- **Suitable extinguishing media:** Water in spread jet, dry chemicals, foam or carbon dioxide.
- **Specific hazards during firefighting:** Principal hazard in the smoke is carbon monoxide.

6. Accidental release measures

Vacuum or sweep up spill. All spill of material must be removed immediately to prevent slipping accidents. Prevent product from entering environment and drains.

BorSafe is a trademark of the Borealis group.

Borealis AG | Wagnerstraβe 17-18 | 1220 Vienna | Austria
Telephone +43 1 224 00 0 | Fax +43 1 224 333
FIN 599599 | Commercial Registry Vienna | Website www.borealisgroup.com
Product safety information sheet

Polyethylene

BorSafe HE3490-LS

7. Handling and storage

Advice on safe handling: During processing and thermal treatment of the product, small amounts of volatile hydrocarbons may be released. Avoid inhalation of dust and decomposition fumes. Provide adequate ventilation. Local exhaust ventilation or additional personal protective equipment (PPE) may be necessary.

Advice on protection against fire and explosion: Dust from the product represents a risk for dust explosions when dispersed with air in a sufficient concentration and with the presence of an ignition source. All equipment shall be grounded. Routine housekeeping will also contribute in preventing risks of dust explosions.

Storage: Safety aspects do not require any special precautions in terms of storage.

8. Exposure controls/personal protection

Do not eat, drink or smoke when using this product. Wash hands before breaks and at the end of workday. Appropriate personal protective equipment (PPE) shall be worn in accordance with Regulation (EU) 2016/425.

Provide adequate ventilation. Local exhaust ventilation may be necessary.

9. Physical and chemical properties

Appearance: pellets, black
Odour: odourless

Melting point/range: 110 – 140 °C
Density: 0.9 – 1.0 g/cm³
Ignition temperature: > 320 °C
Water solubility: insoluble in water

10. Stability and reactivity

The product is a stable thermoplastic, with no chemical reactivity.

11. Toxicological information

The product is not classified as hazardous to human health.

12. Ecological information

The product is not considered hazardous for the environment. Not readily biodegradable. Does not accumulate in organisms. Avoid release to the environment.
13. Disposal considerations
Reuse or recycle if not contaminated. The product may be safely used as fuel. Proper combustion does not require any special flue gas control. Check with local regulations.

14. Transport information
The product is not regulated by ADR/RID, IMDG or IATA.

15. Regulatory information
None known to apply.

16. Other information
Product does not require Safety Data Sheet in accordance with Article 31 of Regulation (EC) No 1907/2006, and its amendments.

Issuer: Borasal, Grup Product Stewardship / Sofia Notarić

Disclaimer
To the best of our knowledge, the information contained herein is accurate and reliable as of the date of publication; however we do not assume any liability whatsoever for the accuracy and completeness of such information.

Borasis makes no warranties which extend beyond the description contained herein. Nothing herein shall constitute any warranty of merchantability or fitness for a particular purpose.

It is the customer's responsibility to inspect and test our products in order to satisfy itself as to the suitability of the products for the customer's particular purpose. The customer is responsible for the appropriate, safe and legal use, processing and handling of our products.

No liability can be accepted in respect of the use of Borasis' products in conjunction with other materials. The information contained herein relates exclusively to our products when not used in conjunction with any third party materials.
Appendix 5: Change of User Approval by Kiambu County Government
COUNTY GOVERNMENT OF KIAMBU
LANDS, HOUSING & PHYSICAL PLANNING SECTOR

THE PHYSICAL PLANNING ACT (NO.6 OF 1996) [S.33 (1)(A)]

NOTIFICATION OF APPROVAL OF DEVELOPMENT PERMISSION - CHANGE OF USE

To: Socfinaf Company Limited

Thru’ Registered Planner: Jane M. Manasseh

Your Application, Registration Number JUJA-COU-AAA061, submitted on 19 January 2017 seeking permission for: PROPOSED CHANGE OF USE FROM AGRICULTURAL TO COMPREHENSIVE MIXED-USE DEVELOPMENT FOR PLOT L/R. NO. 11294 (OAKLAND)

Plot L/R No: L.R. NO. 11294

Situated: Juja has been approved by the County Planning Technical Committee held on 31 August 2017 Minute Item No CPTC/031/2017/052

The conditions of approval are listed overleaf:

Signed: ________________________________

Date of Issue: 12 September 2017

Hannah Maranga
County Director Physical Planning

ce
The National Land Commission, Nairobi
The Director of Surveys, Kiambu
The County Land Registrar
CONDITIONS OF THE DEVELOPMENT APPROVAL

1. Payment of revised rates as will be determined by the County Director of Land Valuation
2. Subject to the land not constituting part of the disputed public/private utility land/allocations
3. Subject to compliance sections 36, 41 and 52 of the Physical Planning Act
4. Subject to Compliance with County Spatial Plan Zoning Guidelines
5. Subject to provisions of appropriate setback(s) as per zoning plan
6. Subject to provisions of adequate and functional onsite parking to the satisfaction of the County Government of Kiambu

7. Provide a detailed layout plans before any development.
8. Carry out strategic environmental assessment (SEA) before development.
9. Submit approved traffic management report before development.
10. Obtain recommendation from WARMA on riparian reserve and management of water bodies.
11. Provide 1.5 M planted strips along major roads and 6 M service road along 40m road
12. Submission of civil works drawing and development of trunk infrastructure to county standards before development.
13. Development of public amenities (2 schools, recreational parks, health, police station, bus park) as planned in consultation with county government
14. Amendment of structure plan to be done after 3 years.
15. Opening up of the Kiambu-Kigumo road inorder to ease traffic.
16. All highrise developments to be limited to four(4) floors
17. All water bodies should be open to public
18. Plot densities should not be less than 0.2hect
19. Industrial use to be retained as light industrial &/or agro based industry
Appendix 6: Laboratory Results to Baseline Analysis (Water, Ambient Air & Noise Survey)
# Water Quality Analysis Results

**LABORATORY TEST REPORT**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>METHOD</th>
<th>RESULTS</th>
<th>Low</th>
<th>Ctl.</th>
<th>High</th>
<th>Standard (Max Limits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>ISO 10523</td>
<td>6.57</td>
<td></td>
<td></td>
<td></td>
<td>6.5-8.5</td>
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<tr>
<td>Total Suspended Solids, TSS mg/L</td>
<td>APHA 2540</td>
<td>&lt;0.01</td>
<td></td>
<td></td>
<td></td>
<td>30</td>
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<tr>
<td>Nitrate mg/L</td>
<td>ISO 7287</td>
<td>0.04+</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
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<tr>
<td>Ammonium Nitrogen, mg/L</td>
<td>ISO 11732</td>
<td>&lt;0.01</td>
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<td></td>
<td>0.5</td>
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<tr>
<td>Nitrite, NO2 mg/L</td>
<td>ISO 6777</td>
<td>0.01</td>
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<tr>
<td>Total Dissolved Solids, TDS mg/L</td>
<td>APHA 2540 C</td>
<td>1244</td>
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<td></td>
<td></td>
<td>1300</td>
</tr>
<tr>
<td>Fluoride mg/L</td>
<td>APHA 5880</td>
<td>6.46</td>
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<td>1.5</td>
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<tr>
<td>E. coli: per 100ml</td>
<td>ISO 9588-1</td>
<td>Ndl</td>
<td></td>
<td></td>
<td></td>
<td>Ndl</td>
</tr>
<tr>
<td>Phenols</td>
<td>APHA 5530</td>
<td>Ndl</td>
<td></td>
<td></td>
<td></td>
<td>Ndl</td>
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<tr>
<td>Arsenic mg/L</td>
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<td>&lt;0.01</td>
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<td>0.01</td>
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<tr>
<td>Calcium mg/L</td>
<td>ISO 8285</td>
<td>&lt;0.01</td>
<td></td>
<td></td>
<td></td>
<td>0.01</td>
</tr>
<tr>
<td>Lead mg/L</td>
<td>ISO 8285</td>
<td>&lt;0.01</td>
<td></td>
<td></td>
<td></td>
<td>0.05</td>
</tr>
<tr>
<td>Zinc mg/L</td>
<td>ISO 8285</td>
<td>&lt;0.01</td>
<td></td>
<td></td>
<td></td>
<td>1.5</td>
</tr>
<tr>
<td>Copper mg/L</td>
<td>ISO 8285</td>
<td>&lt;0.01</td>
<td></td>
<td></td>
<td></td>
<td>0.05</td>
</tr>
</tbody>
</table>

**METHOD**

Standard values quoted from environmental management & coordination (Water Quality) regulation 2006, Legal Notice No. 130, 1st Schedule guidelines, for Sources of Domestic water.

N*: No Standard limits provided
ISO: International organization for standardization

LS/WTP: Lab works test procedure

**INTERPRETATION OF ANALYSIS: RESULTS**
The sample performed as shown above

---

**Authorized signatory:**
Mark Oluwando

**Technical signatory:**
Beatrice Wanja

**Technical signatory:**
David Mwiru
Particulate Matter Analysis Results

BASELINE PARTICULATE DUST QUALITY MEASUREMENT REPORT

PREPARED FOR:
MANGAT IB. PATEL LTD (MIBP) CONSULTING ENGINEERS
P.O. Box 48674 00100 – GPO
Nairobi, Kenya
Tel.: +254-20-2710500
Email: mibp.nairobi@mibp.co.ke

PREPARED BY:
Lab Works East Africa Limited
P.O. Box 6459-00100, NAIROBI
Shelter Afrique Centre, Upper Hill Nairobi

MARCH, 2020
MANGAT Baseline Particulate Dust Quality Measurement Report- March 2020

REPORT CERTIFICATION INFORMATION

<table>
<thead>
<tr>
<th>REFERENCE</th>
<th>LBEA 2020.03.048</th>
</tr>
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<tbody>
<tr>
<td>REPORT TITLE</td>
<td>Baseline Particulate Dust Measurement Report</td>
</tr>
<tr>
<td>DATE SUBMITTED:</td>
<td>1 April 2020</td>
</tr>
<tr>
<td>CLIENT:</td>
<td>MANGAT IB. PATEL LTD (MIBP) CONSULTING ENGINEERS</td>
</tr>
<tr>
<td>PREPARED BY:</td>
<td>VINCENT ODUK</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:vincent@labworksea.com">vincent@labworksea.com</a></td>
</tr>
<tr>
<td>SIGNED:</td>
<td>MARK OWUONDO</td>
</tr>
<tr>
<td>REVIEWED BY:</td>
<td><a href="mailto:technical@labworksea.com">technical@labworksea.com</a></td>
</tr>
<tr>
<td>STATUS</td>
<td>Final Report</td>
</tr>
</tbody>
</table>

Lab Works East Africa Limited
P.O. Box 6459-00100, NAIROBI

Company Stamp

Disclaimer

The information contained herein reflects Labworks East Africa Ltd findings as at the time of its assessment and Monitoring only and within the limits of the contract with the Client. Any unauthorised alteration, forgery or falsification of the content or appearance of this Report is unlawful.
EXECUTIVE SUMMARY

Lab Works East Africa Limited was contracted by MANGAT IB. PATEL LTD (MIBP) CONSULTING ENGINEERS to carry out baseline particulate dust quality assessment as part of a comprehensive Environmental and Social Impact Assessment (ESIA) undertaken by Mangat IB. Patel Ltd on behalf of Mega pipes solution Ltd (the Company) which intends to develop a HDPE manufacturing factory. The ESIA intends to collect information about the natural and socioeconomic environment in the vicinity of the Project.

The preliminary baseline dust study outlined in this report focuses on the collection of representative data at 1 one monitoring location within the Project area. This survey was undertaken from 3rd March 2020 to 4th March 2020.

The air samples were collected from four points within the boundary of the facility. The points of air sampling were determined after site inspection in the company of Africa Coffee Roasters staff member. The criteria used to evaluate the measured values are derived from NEMA EMCA (Air Quality) Regulations, 2014 and the WHO ambient air quality standards.

Particulate Matter: From the results obtained the point sampled for PM_{10} and PM_{2.5} was within the EMC Air Quality Regulations, 2014, and the World Health Organization Air quality guidelines.
MANGAT Baseline Particulate Dust Quality Measurement Report - March 2020

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DEFINITION OF TERMS AND ABBREVIATIONS

BDL  
Below Detection Limit

m³  
Cubic metres

mg  
Milligrams

mg/m³  
Milligrams per Cubic Metre

LOR  
Limit of Reporting
MANGAT Baseline Particulate Dust Quality Measurement Report - March 2020

1.0 INTRODUCTION

This Particulate dust baseline has been prepared by Labworks East Africa Ltd (Labworks EA) as part of a comprehensive Environmental and Social Impact Assessment (ESIA) undertaken by Mangat IB. Patel Ltd on behalf of Mega pipes solution Ltd (the Company) which intends to develop a HDPE manufacturing factory. The ESIA intends to collect information about the natural and socioeconomic environment in the vicinity of the Project.

The preliminary baseline dust study outlined in this report focuses on the collection of representative data at one monitoring location within the Project area. This survey was undertaken from 3rd March 2020 to 4th March 2020.

The criteria used to evaluate the measured values are derived from EMCA Air Quality Regulations, 2014 and the WHO ambient air quality standards.

1.1 TERMS OF REFERENCE

The objective of the baseline dust study was to evaluate the existing particulate levels at the monitoring locations based on methods and guidelines outlined in the WHO Air Quality and the Environmental and Management Act (Air Quality) Regulations, 2014.

This was achieved by doing the following:

- Conducting measurements at the location that was identified at the proposed facility boundary.
- Undertaking monitoring for PM10 and PM2.5 using active volume sampling
- Compiling the findings of the survey in an air quality report.
MANGAT Baseline Particulate Dust Quality Measurement Report - March 2020

2.0 LEGISLATION AND GUIDELINES

Kenya has imposed an air quality regulation to address air pollution known as Environmental Management and Co-ordination Act (Air Quality) Regulations, 2014. Therefore, the standards used to evaluate the measured particulate dust values are derived from the EMCA (air quality) regulations 2014 and the WHO Ambient Air Quality Standards.

3.0 EMC (AIR QUALITY) REGULATIONS, 2014

These rules under the property boundary states that No person, operator or owner of any facility shall cause or allow fugitive emissions to cause the ambient air quality at its property boundary to exceed the limits prescribed under the First Schedule. It further states that, No person, owner or operator of a facility shall cause or allow the emission of air pollutants in excess of the limits stipulated under the Third Schedule.

Table 1: EMCA (Air Quality) Regulations, 2014: Property Boundary

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Time Weighted Average</th>
<th>Property Boundary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulate matter (PM)</td>
<td>Annual Average*</td>
<td>50 µg/m³</td>
</tr>
<tr>
<td></td>
<td>24 hours**</td>
<td>50 µg/m³</td>
</tr>
<tr>
<td>Oxides of Nitrogen (NOₓ)</td>
<td>Annual Average*</td>
<td>80 µg/m³</td>
</tr>
<tr>
<td></td>
<td>24 hours**</td>
<td>150 µg/m³</td>
</tr>
<tr>
<td>Sulphur Oxides (SOₓ)</td>
<td>Annual Average*</td>
<td>50 µg/m³</td>
</tr>
<tr>
<td></td>
<td>24 hours**</td>
<td>125 µg/m³</td>
</tr>
</tbody>
</table>
MANGAT Baseline Particulate Dust Quality Measurement Report - March 2020

2.2 World Health Organization, Air Quality Guidelines

The World Health Organization (WHO) Air Quality Guidelines (AQG) are intended for worldwide use but have been developed to support actions to achieve air quality that protects public health in different contexts. The International Finance Corporation (IFC), Environmental, Health and Safety Guidelines also refer to WHO standards for ambient air quality. The guidelines are in table below.

Table 2: WHO Air Quality Guidelines

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Time Weighted Average</th>
<th>Air Quality Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphur Oxides, SOx</td>
<td>24-Hr Mean</td>
<td>20 µg/m³</td>
</tr>
<tr>
<td>Nitrogen Dioxide, NOx</td>
<td>Annual Mean</td>
<td>40 µg/m³</td>
</tr>
<tr>
<td>Respirable Particulate Matter (&lt;10µm)</td>
<td>24-Hr Mean</td>
<td>50 µg/m³</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>24-Hr Mean</td>
<td>25 µg/m³</td>
</tr>
</tbody>
</table>

In addition to guideline values, interim targets are given for each pollutant. These are proposed as incremental steps in a progressive reduction of air pollution and are intended for use in areas where pollution is high. These targets aim to promote a shift from high air pollutant concentrations, which have acute and serious health consequences, to lower air pollutant concentrations. If these targets were to be achieved, one could expect significant reductions in risks for acute and chronic health effects from air pollution. Progress towards the guideline values should, however, be the ultimate objective of air quality management and health risk reduction in all areas.
3.0 AIR QUALITY MEASUREMENTS METHODOLOGY

3.1 Particulate Matter Sampling

Particulate Matter sampling was done using a pumped air sampler. The sampler is positioned with the intake upward in an unobstructed area, free from any obstruction to airflow. The sampler is fitted with a PM<sub>2.5</sub> and PM<sub>10</sub> separator, which only allows for particles of an aerodynamic diameter of less than 2.5 and 10 µm to pass through it.

The EVM is a portable-area monitoring instrument with a laser-photometer that measures and stores concentration levels of airborne-dust over time. It is designed to measure and help you identify the air pollutants, existing as matter (gases and aerosols) in the environment. The methodology used entails a handful of components including: an air inlet, the impactor (which is the particle size selector), the collection of particulates, gravimetric sampling, and the pump which are addressed in the upcoming sections.

Particulate Matter sampling was also done using a pumped air sampler. The sampler is positioned with the intake upward in an unobstructed area, free from any obstruction to airflow. The Machine/Equipment used for the survey was Model EPAM-5000, IHAZ-DUST Particulate Air Monitoring Equipment. The EPAM-5000 is a high sensitivity real-time particulate monitor designed for ambient environmental and indoor air quality applications. This unit combines traditional filter techniques with real-time monitoring methods. These techniques combined overcome limitations of all other aerosol monitoring products.
MODEL EPAM-5000 consists of a 24-hour rechargeable battery capacity. Automatic clean air purging of sensor for increased stability and accuracy and internal temperature compensation for ambient use.

![MODEL EPAM-5000](image)

**Figure 1:** Picture of Model EPAM-5000 HAZ-DUST Particulate Monitor.

**Figure 2:** Components of a MODEL EPAM-5000.
MANGAT Baseline Particulate Dust Quality Measurement Report - March 2020

Dust particles are drawn into the sensor head and are detected once every second. Dust concentrations are instantaneously calculated and displayed on the MODEL EPAM-5000’s LCD. The user controls all functionality and programming using menus displayed on a high contrast LCD. All data points are stored in memory for later analysis. The LCD displays real time concentration in milligram per cubic meter (mg/m³) in accordance with EPA or OSHA Reference Methods.

Statistical information of TWA, STEL, Max and Min levels can be viewed instantly. The MODEL EPAM-5000 is calibrated using Arizona Road Dust (ARD) against NIOSH method 0600 for respirable dust with a + 10% accuracy. The calibration of the MODEL EPAM-5000 can be adjusted to compensate for changes in particle composition and distribution.

3.2.1 Real-Time Dust Monitoring Principles for EPAM-5000.

The MODEL EPAM-5000 uses the principle of near-forward light scattering of an infrared radiation to immediately and continuously measure the concentration in mg/m³ of airborne dust particles. This principle utilizes an infrared light source positioned at a 90-degree angle from a photo detector. As the airborne particles enter the infrared beam, they scatter the light. The amount of light received by the photo detector is directly proportional to the aerosol concentration. A unique signal processes internally and compensates for noise and drift. This allows high resolution, low detection limits and excellent base line stability.
4.0 MEASUREMENT ANALYSIS RESULTS

4.1 PARTICULATE MATTER RESULTS

Table 3: PM₁₀ Results

<table>
<thead>
<tr>
<th>POINT</th>
<th>Total Weighted Average (TWA) (mg/m³)</th>
<th>Max (mg/m³)</th>
<th>Min (mg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DML₁</td>
<td>0.12</td>
<td>1.24</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Table 4: PM₂₅ Results

<table>
<thead>
<tr>
<th>POINT</th>
<th>Total Weighted Average (TWA) (mg/m³)</th>
<th>Max (mg/m³)</th>
<th>Min (mg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DML₁</td>
<td>0.575</td>
<td>1.044</td>
<td>0.102</td>
</tr>
</tbody>
</table>

5.0 CONCLUSION

From the results obtained, the point sampled for PM₁₀ and PM₂₅ was within the EMC Air Quality Regulations, 2014, and the World Health Organization Air quality guidelines.

We recommend that Mangat to be carrying out a continuous monitoring of the ambient air quality for particulates as well as SO₂, NO₂ and VOCs. This will assist in obtaining concrete information on the status of air pollution and this should be done at different time’s preferably quarterly basis during the project implementation.
MANGAT Baseline Particulate Dust Quality Measurement Report - March 2020

PM 2.5 Concentration Vs. Sample Time

PM 10 Concentration Vs. Sample Time
APPENDIX III: EQUIPMENT CALIBRATION CERTIFICATE
Noise Survey Results
DRAFT REPORT ON

BASELINE NOISE SURVEY FOR THE PROPOSED HDPE MANUFACTURING FACTORY

Submitted to:
MANGAT IB. PATEL LTD (MIBP)
P.O. Box 48674 00100 – GPO
Nairobi, Kenya
Tel.: +254-20-2710500
Email: mibp.nairobi@mibp.co.ke

Prepared by:
Labworks East Africa
Shelter Afrique Centre 3rd Floor
Longonot Road, Upper Hill
P.O. Box 6459-00100, Nairobi

MARCH 2020
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1.3 STUDY OBJECTIVES .............................................................................................................. 1
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I INTRODUCTION

1.1 PROJECT BACKGROUND

This noise baseline has been prepared by Labworks East Africa Ltd (Labworks EA) as part of a comprehensive Environmental and Social Impact Assessment (ESIA) undertaken by Mangat IB. Patel Ltd on behalf of Megapipes solution Ltd (the Company) which intends to develop a HDPE manufacturing factory. The ESIA intends to collect information about the natural and socioeconomic environment in the vicinity of the Project.

The preliminary baseline noise study outlined in this report focuses on the collection of representative data at one monitoring location within the Project area. This survey was undertaken from 3rd March 2020 to 4th March 2020.

Presented within this document are the baseline methodology and a summary of relevant baseline conditions, including the background noise levels adopted at the Noise monitoring location.

1.2 RELEVANT DOCUMENTS, STANDARDS AND GUIDELINES

- Environmental Management and Coordination Act (EMCA) LN 61

1.3 STUDY OBJECTIVES

The objective of the baseline noise study was to evaluate the existing noise levels at the noise monitoring locations based on methods and guidelines outlined in the International Organizations for standardization (ISO) 1996 and the Environmental and Management Act (EMCA) LN 61.

1.4 STUDY AREAS

The on-site monitoring location for the proposed project was selected to be the representative of the entire project area (Table 1-1) below lists the coordinates for the noise monitoring locations selected. Figure 1-1 below presents the aerial photograph image of the Noise measurement point.
<table>
<thead>
<tr>
<th>Noise Monitoring Location</th>
<th>Longitude</th>
<th>Latitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>NML 1</td>
<td>1°10'32.08'S</td>
<td>36°34'17.58'E</td>
</tr>
</tbody>
</table>

NML – Noise monitoring Location
2 BASELINE METHODOLOGY

2.1 SOUND LEVEL MEASUREMENT PROCEDURE

The baseline noise monitoring survey was performed at twelve monitoring locations during the months of February and March. The survey consisted of a series of operator attended noise measurements (OANM) at each monitoring location.

The noise level measurement methods used were consistent with the ISO 1996-2(1996). One 24hr survey was conducted at each of the 12 monitoring locations described in section 1.2 above. Surveys of this type and duration provide information on daily variability in noise levels, as well as provide an expected typical or average daily condition.

The monitoring surveys were conducted to measure ambient noise levels and determine background noise levels within the study area. The baseline environment can be defined as the conditions that would prevail in the absence of the proposed development. This information sets the scene for the assessment of the potential noise impacts at the NSRs created by the proposed Project.

The baseline noise monitoring surveys components of measurement are as presented in box 1 below

**Box 1: Noise Measurement Procedure**

- Continuous measurement period; measuring L_{Aeq}, L_{Amx}, L_{Apeak}, L_{Ao5}, and L_{Amin}, statistical noise parameters;

2.2 MEASUREMENT INSTRUMENTS

A model 824 Larson and Davis serial number – 0004897 Type 1 precision grade Sound Level Meter (SLM) real time acquisition system was used. The meter logs noise levels and records audible sound over a set monitoring period selected by the user. The effective measurement range of the instrument is 20-140 dBA to ±1 dBA accuracy. The logging rate was set for one minute and the monitoring period was set for 24 hours (sound recordings were saved every 10 minutes). The instrument was duly calibrated before the noise measurement.
3 NOISE MONITORING RESULTS

The 24-hour measurement data collected for the study are summarized in this section. Noise sources that were not captured during the measurement period due to their impact on representative of expected, typical ambient conditions were excluded from the calculated hourly, daytime, or nighttime results. All “hourly” Leq values were based on at least 30 minutes of data. Measured hourly LAeq, and L90 values for the noise monitoring locations are shown in the following sections.

The hourly calculated baseline noise level from the survey are as shown in Table 3-1. presents the summary of the adapted baseline levels the logarithmic average 24hr (10 Minute) Leq, LA and L90 results for both the daytime (7:00 AM to 11:00 PM) and nighttime (11:00 PM to 7:00 AM) periods, and a 24-hour time-average sound level LAeq and L90 value based on IS7-time period guidelines for the twelve monitoring locations identified for the project. The gray shaded areas represent the average Nighttime results.

The full measurement results for every 24 hours of monitoring at the NML is presented graphically within Annex 1 of this report.

3.1 MONITORING LOCATION 1

Hourly LAeq, and LA90 results recorded at monitoring location NML 1 are presented in Table 3-1 below. Noise sources identified for day and night were predominantly wind induced Interference, Aircrafts, dawn chorus, crickets and other night creatures among others.

The lowest hourly LAeq value recorded at the monitoring location was 40.1 dBA. The lower calibration limit of the noise meter is 20 dBA, which corresponds to the lower limit of human hearing. Values less than 20 dBA measured by the meter are not considered valid since they fall outside the calibration range.

The full measurement results for every 24 hours of monitoring at the NML 1 is presented graphically within Appendix 1 of this report.
### Table 1: Hourly Noise Measurement Results

<table>
<thead>
<tr>
<th>Date</th>
<th>Hour</th>
<th>L_Aeq</th>
<th>L_Neq</th>
<th>Noise Environment Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-Mar-2020</td>
<td>09:30 AM</td>
<td>49.8</td>
<td>36.4</td>
<td>Primary sources are wind trees, bird songs, other sources are rustling leaves</td>
</tr>
<tr>
<td>3-Mar-2020</td>
<td>10:30 AM</td>
<td>48.4</td>
<td>31.9</td>
<td>Primary sources are bird songs, noise from wind turbine generators and electrical substations is also audible</td>
</tr>
<tr>
<td>3-Mar-2020</td>
<td>12:30 PM</td>
<td>40.1</td>
<td>40.5</td>
<td>Primary sources are barking dogs, other sources are wind turbine generators and rustling trees. Train noise is barely audible.</td>
</tr>
<tr>
<td>3-Mar-2020</td>
<td>18:30 PM</td>
<td>49.3</td>
<td>40.9</td>
<td>Primary sources are rustling leaves and village noise (public, music, traffic)</td>
</tr>
<tr>
<td>3-Mar-2020</td>
<td>19:30 PM</td>
<td>51.2</td>
<td>35.2</td>
<td>Primary sources are traffic noise and bird song.</td>
</tr>
<tr>
<td>3-Mar-2020</td>
<td>20:30 PM</td>
<td>45.3</td>
<td>32.7</td>
<td>Primary sources are bird song, traffic noise (Station Road), and train noise (Train Side, 500 m southwest)</td>
</tr>
<tr>
<td>3-Mar-2020</td>
<td>21:30 PM</td>
<td>59.0</td>
<td>35.4</td>
<td>Primary sources are crickets, other night creatures, wind induced interference, and Aircrafts</td>
</tr>
<tr>
<td>3-Mar-2020</td>
<td>22:30 PM</td>
<td>48.2</td>
<td>35.1</td>
<td>Primary sources are crickets, other night creatures, wind induced interference, Aircrafts</td>
</tr>
<tr>
<td>9-Mar-2020</td>
<td>23:30 PM</td>
<td>45.1</td>
<td>35.1</td>
<td>Primary sources are crickets, other night creatures, wind induced interference, Aircrafts</td>
</tr>
<tr>
<td>04-Mar-2020</td>
<td>00:30 AM</td>
<td>44.9</td>
<td>34.2</td>
<td>Primary sources are crickets, other night creatures, wind induced interference, Aircrafts</td>
</tr>
<tr>
<td>04-Mar-2020</td>
<td>01:30 AM</td>
<td>39.4</td>
<td>36.7</td>
<td>Primary sources are crickets, other night creatures, wind induced interference, Aircrafts</td>
</tr>
<tr>
<td>04-Mar-2020</td>
<td>02:30 AM</td>
<td>45.8</td>
<td>32.0</td>
<td>Primary sources are crickets, other night creatures, wind induced interference, Aircrafts</td>
</tr>
<tr>
<td>04-Mar-2020</td>
<td>03:30 AM</td>
<td>40.8</td>
<td>31.4</td>
<td>Primary sources are crickets, other night creatures, dog barking</td>
</tr>
<tr>
<td>04-Mar-2020</td>
<td>04:30 AM</td>
<td>41.7</td>
<td>33.2</td>
<td>Primary sources are crickets, other night creatures, wind induced interference, Aircrafts</td>
</tr>
<tr>
<td>04-Mar-2020</td>
<td>05:30 AM</td>
<td>36.2</td>
<td>32.2</td>
<td>Primary sources are crickets, other night creatures, wind induced interference, Aircrafts</td>
</tr>
<tr>
<td>04-Mar-2020</td>
<td>06:30 AM</td>
<td>41.3</td>
<td>32.3</td>
<td>Primary sources include, dawn chorus (singing Birds)</td>
</tr>
<tr>
<td>04-Mar-2020</td>
<td>07:30 AM</td>
<td>491</td>
<td>35.3</td>
<td>Primary sources include, dawn chorus (singing Birds)</td>
</tr>
<tr>
<td>04-Mar-2020</td>
<td>08:30 AM</td>
<td>48.6</td>
<td>35.4</td>
<td>Primary sources include, dawn chorus (singing Birds)</td>
</tr>
<tr>
<td>04-Mar-2020</td>
<td>09:30 AM</td>
<td>49.1</td>
<td>35.8</td>
<td>Primary sources include, dawn chorus (singing Birds)</td>
</tr>
</tbody>
</table>

1. All times are in Local time
2. Nighttime (8:00 PM - 6:00 AM)
3. Daytime (6:00 AM - 8:00 PM)
4 DISCUSSION

Table 2 and 3 below summarizes the logarithmic average of hourly LAeq and LAeq results for both the daytime and nighttime periods and recorded 24-hour time sound level LAeq and L90 value based on EMCA time period guidelines for the monitoring location.

Table 2: Summary of Baseline Daytime and Night time Results

<table>
<thead>
<tr>
<th>Monitoring Location</th>
<th>Logarithmic Average Daytime And Nighttime 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daytime 6.01 AM – 8.00 PM &amp; Nighttime 8.01 PM – 6.00 AM</td>
</tr>
<tr>
<td>NML 1</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>Daytime 6.01 PM – 8.00 PM &amp; Nighttime 8.01 PM – 6.00 AM</td>
</tr>
<tr>
<td></td>
<td>43</td>
</tr>
</tbody>
</table>

1. All times referenced are local time

Table 3: Noise Measurement Results - 3rd – 4th March

<table>
<thead>
<tr>
<th>Monitoring Location</th>
<th>L eq dBA</th>
<th>LAeq dBA</th>
<th>Lmax dBA</th>
<th>L min dBA</th>
<th>Lpeak dBA</th>
</tr>
</thead>
<tbody>
<tr>
<td>NML 1</td>
<td>49.1</td>
<td>34</td>
<td>86</td>
<td>29</td>
<td>111</td>
</tr>
</tbody>
</table>

The average noise levels recorded at the monitoring location was low during the nighttime period. Most of the values recorded were below 50dBA the ambient noise level at the monitoring locations was comprised of sounds from birds, other wildlife, and the general surrounding. Only noise levels generated by direct interaction between wildlife and the equipment were filtered from the measurements.

The measured baseline sound levels in Table 3 (background noise level) are useful for establishing the ambient noise levels at sensitive receptors prior to project activities.
5 SUMMARY AND CONCLUSION

The baseline noise study is one component of a comprehensive environmental and socio-economic baseline program to collect information about the natural and socio-economic environment in the vicinity of the Project. The objective is to provide existing sound levels representative of the noise sensitive receptors near the Project area.

A monitoring program consisting of 1 monitoring location (identified as NML 1.4) was conducted from 3 March 2020 to 4th March 2020. The program was conducted based on National Environmental Management Authority (EMCA LN 61) and ISO 1996 methods for ambient noise measurement. This includes determining average noise levels during specific times of day.

The LAeq and LA90 measurements were presented with all anomalous data or noise events that were not considered part of normal background for the area were excluded (such as direct interference between wildlife and the noise meter, precipitation, and technician interference).

The minimum L eq measurement of 29.3 dBA used in this report is above the calibration limit of the noise meter, which also qualifies to be above the lower limit of human hearing (20dBA).

The adapted ambient noise levels for the monitoring location are as shown in Table 5, below

Table 4: Adapted Baseline Noise Levels

<table>
<thead>
<tr>
<th>Monitoring Location</th>
<th>Baseline Noise Level Measurements (Dba)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LAeq</td>
</tr>
<tr>
<td>NML 1</td>
<td>49</td>
</tr>
</tbody>
</table>
# 6 ACOUSTIC GLOSSARY OF TERMS

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Noise</td>
<td>The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.</td>
</tr>
<tr>
<td>dB</td>
<td>Decibels</td>
</tr>
<tr>
<td>dB(A)</td>
<td>Unit representing the sound level measured with the A weighting network of a sound level meter. A-Weighted filter is an electronic circuit whose sensitivity to sound pressure levels varies in the same way as the human ear.</td>
</tr>
<tr>
<td>EMC Act</td>
<td>Environmental Management Coordination Act</td>
</tr>
<tr>
<td>GPS</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>ISO</td>
<td>International Standard Organization</td>
</tr>
<tr>
<td>IFC</td>
<td>International Finance Corporation</td>
</tr>
<tr>
<td>Lₐ10</td>
<td>Those noise levels that are exceeded for 10% of each sample period.</td>
</tr>
<tr>
<td>Lₐ50</td>
<td>Those noise levels that are exceeded for 50% of each sample period.</td>
</tr>
<tr>
<td>Lₐ90</td>
<td>Those noise levels that are exceeded for 90% of each sample period.</td>
</tr>
<tr>
<td>Lₐeq</td>
<td>Value of A-weighted sound pressure level of a continuous steady sound that, within a specified interval, has the same mean square sound pressure as a sound under consideration whose level varies with time.</td>
</tr>
<tr>
<td>Lₐmax</td>
<td>Maximum sound pressure level obtained during the measurement period.</td>
</tr>
<tr>
<td>Lₐmin</td>
<td>Minimum sound pressure level obtained during the measurement period.</td>
</tr>
<tr>
<td>NEEMA</td>
<td>National Environmental Management Authority</td>
</tr>
<tr>
<td>Noise</td>
<td>Any sound, that has the potential to cause disturbance, discomfort or psychological stress to a subject exposed to it, or any sound, that could cause actual physiological harm to a subject exposed to it, or physical damage to any structure exposed to it, is known as noise.</td>
</tr>
</tbody>
</table>
### Noise Sensitive Locations

Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.
ANNEX 1: STATISTICAL NOISE LEVEL RESULTS

[Graph showing noise measurement levels over time]

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ANNEX 2: PHOTOGRAPHIC REPORT

Daytime noise measurement

Early Morning Noise Measurement
ANNEX 3: CALIBRATION CERTIFICATE

REQUESTED BY: LAB WORKS EAST AFRICA LIMITED
ADDRESS: P.O BOX 6449-01100 NAIROBI
TYPE/MODEL: SOUND LEVEL METER
SERIAL NO.: 004497
MANUFACTURER: LARSON DAVIS
MICROPHONE TYPE: PCB 77802
LAW PHYNE SERIAL NO.:
LABORATORY: ACOUSTICS AND VIBRATION - NP 15
DATE: 2020-02-14
CERTIFICATE NO.: BSMET/19/15/37/87
STICKER SERIAL NO.: 55489

1.0. STANDARDS AND REFERENCE EQUIPMENT USED
 Pulse 3600 calibration unit consisting of:
• B&K controller module type 3560C S/No. 2522855
• Agilent 34970A Data acquisition switch unit S/No. AYA 44516404
• B&K Inline capacitor WA 0302- A 12 pF S/No. 2541338
• Multifunction Acoustic Calibrator Type 4226 S/No. 2532059

2.0. METROLOGICAL TRACEABILITY
This calibration certificate documents traceability to the National Standards, which
realize units of measurement according to the International System of Units (SI). KEBS
is a signatory of the CIPM Mutual Recognition Arrangement (CIPM MRA).

3.0. CALIBRATION PROCEDURE
The Sound Level Meter was calibrated using Kenya Bureau of Standards Laboratory
Procedure MET/15/CP102: Sound level meter calibration and in accordance with the
requirements of IEC61651 and IEC 80601.

Prepared By: Collins Taiti
Checked By: Andrew Mante
Signed:
For: Director Metrology and Testing

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Appendix 7: Lead Expert's Year 2020 Practicing License
NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)
THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT
ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

M/S GODWIN LIDAHULI SAKWA
(individual or firm) of address

P.O. Box 18075-00500, NAIROBI

is licensed to practice in the

capacity of a (Lead Expert/Associate Expert/Firm of Experts) Lead Expert

registration number 2492

in accordance with the provision of the Environmental Management and Coordination Act Cap

387.

Issued Date: 3/10/2020

Expiry Date: 12/31/2020

Signature....

(Seal)

Director General
The National Environment Management Authority

P.T.O.
ISO 9001: 2008 Certified