Environmental and Social Impact Assessment (ESIA) Study Report for the Proposed Residential Development on Plot L.R. No. Mombasa/Block X/85 in Tudor area, Mombasa County.

Proponent	Firm of Experts
Ultra Modern Homes Limited, P.O. Box 99848-80100, Mombasa, Kenya.	Envasses Environmental Consultants Limited, P.O. Box 2013-80100, Mombasa, Kenya.

Version: Final Report
Date: September 2023

CERTIFICATION

Certification by Lead Experts

We, Envasses Environmental Consultants Limited hereby confirm that this Environmental and Social Impact Assessment (ESIA) Study Report has been prepared by ourselves pursuant to Section 58 of the Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya.

Signed for and on behalf of: Envasses Environmental Consultants Limited
Firm of Experts No. 6175

Name: Mr. Simon Nzuki Designation: Chief Executive Officer

Signature: SIMON K. NZUKI, M.PHIL (Env. St.)
NEMA EIA / EA LEAD EXPERT
REGISTRATION No. 1350
Tel: 0722 347 155

Date: 4/9/2023

ENVASSES ENVIRONMENTAL CONSULTANTS LTD
Tel:0722 347 155
04 SEP 2023
Email: info@envasses.org
P.O. Box 2013-80100, MOMBASA

Certification by Proponent

We, **Ultra Modern Homes Limited**, hereby confirm that this Environmental and Social Impact Assessment (ESIA) Study Report has been prepared and submitted to NEMA with our authority pursuant to Section 58 of the Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya.

Signed for and on behalf of: Ultra Modern Homes Limited

Name: Fridah Khamalishi

Designation: Representative

Signature:

Date: 04th September 2023

ACKNOWLEDGEMENT

The preparation of this Report was supported by the proponent, State and Non-State Actors, and the local community.

Ultra Modern Homes Limited provided the financial resources required to carry out the ESIA process and supported the consultant in logistical and stakeholder engagement activities.

Lahvens (K) Limited assisted the consultant in collection and analysis of baseline environmental quality data including water and air quality and noise measurements at the project site.

We acknowledge the area chief for mobilizing the community and key stakeholders to engage with the consultant during the public participation meetings held at the project site on 22nd and 29th August and 4th September, 2023.

EXECUTIVE SUMMARY

Ultra Modern Homes Limited proposes to construct a residential development on Plot L.R. No. Mombasa/Block X/85 in Tudor area, Mombasa County. The proposed project activities will involve construction and occupation of 350 apartments with a total build up area of 41,854.601m^2. Pursuant to section 58 of the Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya, urban developments including establishment of new housing estate developments exceeding one hundred housing units are listed under the Second Schedule (3g) as high risk projects and hence subject to ESIA process. To comply with this legal requirement, Ultra Modern Homes Limited contracted Envasses Environmental Consultants Limited to prepare an Environmental and Social Impact Assessment (ESIA) Study Report for the proposed project.

The Third Schedule of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003 informed the approach and methodology for preparing the ESIA. Literature review focused on publications and previous reports prepared by the consultant while the reconnaissance and field surveys were carried out from 16th – 19th August 2023 in collaboration with the proponent. In addition, three public participation meetings were held on 22nd and 29th August and 4th September, 2023 at the proposed project site.

The baseline results informed the environmental and social background upon which construction of the proposed residential development will occur. The ESIA predicts that both positive and negative impacts will occur throughout the project cycle. The anticipated socio-economic benefits are the key drivers for the project and include meeting the housing demand in Tudor area and its environs, contribution of the project towards attainment of Vision 2030, provision of employment opportunities and generation of revenue to the government. Against the background of positive impacts, the project will have negative environmental and social impacts at construction, operation, and decommissioning phases. In addition, grievances by both the local community and other stakeholders may arise throughout the project cycle leading to conflicts that may hinder progress and operations of the project.

At construction phase, the environmental and social concerns will include demolition of the existing residential house, change of land use, environmental risks of sourcing raw materials, loss of terrestrial vegetation cover, water demand and effluent generation, solid waste generation and management, occupational safety and health risks, noise and air pollution, and traffic congestion. At operational phase, environmental and social concerns will include increase water demand, effluent generation and management, solid waste generation and management, fire risks and emergency preparedness, traffic congestion, security concerns and increased energy demand. The socio-economic importance of the proposed project to the proponent makes decommissioning phase a remote possibility. Hence the ESIA does not consider the impacts at this phase as significant even in the long term. However, in the event that decommissioning becomes imminent possibly because of a court order, change of user or natural calamities, it is recommended that the proponent will prepare and submit a due diligence decommissioning audit report to NEMA for approval at least three (3) months in advance.

Overall, the project cycle impacts are within the range of low to high and the ESIA has recommended mitigation measures and a suite of ESMPs to address them to either low or negligible levels. Prior to commencement of the project, the proponent should apply for and obtain change of land use from low to high density residential from the County Government of Mombasa. Effective waste management will be key during the demolition, construction and operation of the development where the proponent should comply with the Sustainable Waste Management Act,

2022 and Water Quality Regulations, 2006. In combating occupational safety and health risks, the proponent should register the site as a workplace with the Directorate of Occupational Safety and Health Services (DOSHS) and comply with the Occupational Safety and Health Act (OSHA), 2007. Noise and air pollution will be addressed by provision of adequate Personal Protective Equipment (PPE) and complying with Noise and Air Quality Regulations gazetted in 2009 and 2014 respectively. In addition, the proponent should ensure compliance with the recommendations of the public participation meetings. To prevent conflicts and ensure sustainability of the project, the ESIA has recommended a Grievances Redress Mechanism (GRM) which should be a shared responsibility between the contractor and proponent at construction phase and the proponent at operational and decommissioning phases.

Implementing these mitigation measures, the ESMPs and continuous monitoring of the project activities would potentially lower all the identified risks from high to levels of low or no significance. On this basis the ESIA findings and the commitment by the proponent to implement the ESMPs, the ESIA recommends the issuance of an EIA Licence pursuant to the Environmental Management and Coordination Act Cap 387 of the Laws of Kenya.

TABLE OF CONTENTS

CERTIFICATION ii
Certification by Lead Experts ii
Certification by Proponent ii
ACKNOWLEDGEMENT iii
EXECUTIVE SUMMARY iv
LIST OF FIGURES viii
LIST OF TABLES ix
LIST OF ACRONYMS x

1 PROJECT BACKGROUND INFORMATION 1
1.1 Introduction 1
1.2 Location of the proposed project site, site status and neighbourhood 1
1.3 Project design and description 3
1.4 Land ownership 4
1.5 Approach and methodology 4
1.5.1 Reconnaissance survey 4
1.5.2 Baseline environmental quality monitoring 5
1.5.3 Stakeholder mapping and analysis 6

2 BASELINE INFORMATION ON THE PROJECT SITE 9
2.1 Topography and climate 9
2.2 Water quality 9
2.3 Mangrove distribution and species composition 10
2.4 Terrestrial vegetation cover 10
2.5 Air quality 12
2.6 Noise levels 12
2.7 Demographic characteristics 13
2.8 Water supply in Mombasa County 13
2.9 Status of sanitation in Mombasa County 13
2.10 Solid waste management 13
2.11 Infrastructure 14
2.11.1 Transport Network 14
2.11.2 Energy Supply 14
2.11.3 Telecommunication 14
2.12 Climate change and adaptation strategies 14

3 ENVIRONMENTAL IMPACTS IDENTIFICATION, ANALYSIS AND PROPOSED MITIGATION MEASURES 15
3.1 Positive impacts of the proposed project 15
3.2 Negative environmental and social impacts 15
3.2.1 Construction phase impacts 15
3.2.2 Operational phase impacts 19
3.2.3 Decommissioning phase impacts 21
3.3 Public and stakeholders' consultations and findings 22
3.3.1 Stakeholder's kick-off meeting 22
3.3.2 Second stakeholder's meeting to review the Draft ESIA Study Report 24
3.3.3 Third stakeholder's meeting to validate the Draft ESIA Study Report 26
3.4 Impact analysis 27
3.5 Analysis of alternatives 30
3.5.1 The 'No Project' alternative 30
3.5.2 The 'Yes Project' alternative 30

3.5.3 Alternative site 30
3.5.4 Downscaling the project 30

4 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS 31
4.1 Introduction 31

5 ENVIRONMENTAL AND SOCIAL MONITORING PLANS 36
5.1 Introduction 36
5.2 Air quality monitoring plan 36
5.2.1 Introduction 36
5.2.2 Monitoring location 36
5.2.3 Monitoring parameters 36
5.2.4 Monitoring methods 37
5.2.5 Monitoring frequency 37
5.3 Noise monitoring plan 37
5.3.1 Introduction 37
5.3.2 Monitoring location 37
5.3.3 Monitoring methods 38
5.3.4 Monitoring frequency 38
5.4 Water quality monitoring plan 38
5.4.1 Introduction 38
5.4.2 Monitoring locations 38
5.4.3 Monitoring parameters 38
5.4.4 Monitoring methods 39
5.4.5 Monitoring frequency 40
5.5 Solid waste monitoring plan 40
5.5.1 Introduction 40
5.5.2 Monitoring frequency 40
5.5.3 Monitoring strategy 41
5.6 Grievances Redress Mechanism 41
5.6.1 Introduction 41
5.6.2 Grievances prevention 41
5.6.3 Grievances Redress Mechanism Tool 41

6 GOVERNANCE FRAMEWORK 43
6.1 Introduction 43
6.2 Policy Framework 43
6.2.1 National Environment Policy, 2013 43
6.2.2 National Climate Change Framework Policy, 2016 43
6.2.3 The National Water Policy, 2012 43
6.2.4 The National Sustainable Waste Management Policy, 2020 44
6.2.5 Integrated Coastal Zone Management Policy, 2017 44
6.2.6 The Shoreline Management Strategy for Kenya, 2010 44
6.2.7 Integrated Strategic Urban Development Plan (Mombasa Vision 2035) 45
6.3 Legal framework 45
6.3.1 The Kenya Constitution, 2010 45
6.3.2 The Environmental Management and Co-ordination Act Cap. 387 of the Laws of Kenya 46
6.3.3 The Sustainable Waste Management Act, 2022 46
6.3.4 The Mombasa County Solid Waste Management Act, 2021 47
6.3.5 The Climate Change Act, 2023 47
6.3.6 The Fisheries Management and Development Act, 2016 47
6.3.7 Forest Conservation and Management Act, 2016 48
6.3.8 Physical and Land Use Planning Act, 2019 48

6.3.9 The Public Health Act, 2012 48
6.3.10 Occupational Safety and Health Act, 2007 48
6.3.11 The Water Act, 2016 49
6.3.12 The Energy Act, 2019 49
6.3.13 The County Government Act, 2012 49
6.4 Institutional arrangements to implement the legal framework 50

7 CONCLUSION AND RECOMMENDATIONS 51
8 REFERENCES 52
9 ANNEXURES 53

LIST OF FIGURES

Figure 1: The location of the proposed project site (Source: Google Earth, 2023). 2
Figure 2: The existing residential development at the proposed project site (Source: Site visit, August 2023). 3
Figure 3: Some of the residential developments neighboring the proposed project site (Source: Site visit, August 2023). 3
Figure 4: Baseline water quality monitoring carried out on 19th August 2023 within Tudor Creek (Source: Lahvens (K) Limited, 2023). 5
Figure 5: Stakeholder analysis and engagement considerations based on interest and influence in the project. 7
Figure 6: Annual rainfall and temperature distribution in Mombasa County (Source: World Weather Online, August 2023). 9
Figure 7: Mixed strands of Avicennia marina and Sonerratia alba along Tudor Creek (Source: Site visit, August 2023). 11
Figure 8: Green Ashok and Ivory Coast Almond (Left) and Neem and Palm trees (Right) within the proposed project site (Source: Site visit, August 2023). 11
Figure 9: A section of Tom Mboya Road (Source: Site visit, August 2023). 14
Figure 10: Sections of the participants following deliberations during the stakeholder's kick-off meeting at the proposed project site (Stakeholder's kick-off meeting, August 2023). 23
Figure 11: Sections of the participants following deliberations during the second stakeholder's meeting to review the Draft ESIA Study Report at the proposed project site (Second stakeholder's meeting to review the Draft ESIA Study Report, August 2023). 25
Figure 12: Sections of the participants following deliberations during the third stakeholder's meeting to validate the Draft ESIA Study Report at the proposed project site (Third stakeholder's meeting to validate the Draft ESIA Study Report, September 2023). 27
Figure 13: Grievances Redress Mechanism Tool flow chart (Source: Envasses Environmental Consultants Limited, 2023). 42

LIST OF TABLES

Table 1: The built-up areas of the proposed residential development (Source: Ultra Modern Homes Limited, 2023). 4
Table 2: Summary of results of the screening criteria for the ESIA study for the proposed residential development (Source: EIA/EA Regulations, 2003). 5
Table 3: Key stakeholder groups engaged in the preparation of the ESIA. 8
Table 4: Water quality results based on the sample obtained across the water column at -8m (Source: Water quality monitoring, August 2023). 10
Table 5: Baseline air quality measurements for the proposed project site (Source: Air quality monitoring, August 2023). 12
Table 6: Baseline noise level measurements for the proposed project site (Source: Noise survey, August 2023). 12
Table 7: Summary of the key issues raised during the stakeholder's kick-off meeting and responses provided by the proponent, consultant and stakeholders on 22nd August 2023 (Stakeholder's kick off meeting, August 2023). 23
Table 8: Summary of the key issues raised during the second stakeholder's meeting to review the Draft ESIA Study Report and responses provided by the proponent, consultant and stakeholders on 29th August 2023 (Second stakeholder's meeting to review the Draft ESIA Study Report, August 2023). 25
Table 9: Summary of the key issues raised during the stakeholder's meeting to validate the Draft ESIA Study Report and responses provided by the project engineer/contractor, housing agent, consultant and stakeholders on 4th September 2023 (Third Stakeholder's meeting to validate the Draft ESIA Study Report, September 2023). 27
Table 10: Risk and impact significance matrix for the proposed project. 29
Table 11: Environmental and Social Management Plan for the construction phase of the proposed residential development. 31
Table 12: Environmental and Social Management Plan for the operational phase of the proposed residential development. 33
Table 13: Environmental and Social Management Plan for the decommissioning phase of the proposed residential development. 35
Table 14: Air quality parameters and ambient air quality tolerance limits as per the First Schedule of the Environmental Management and coordination (Air Quality) Regulations, 2014. 36
Table 15: Maximum permissible intrusive noise levels for construction sites as per the Second Schedule of the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009. 37
Table 16: Water quality monitoring parameters as per KS EAS 12:2018 specification for natural potable water. 38
Table 17: Water quality monitoring parameters and the standards prescribed under the Third Schedule of the Environmental Management and Coordination (Water Quality) Regulations, 2006. 39
Table 18: Water Quality Monitoring Tests and Methods. 39
Table 19: Water Quality Monitoring Methods and Equipment. 40
Table 20: Sample outline for solid waste monitoring plan. 41
Table 21: An extract of Sediment Cell 19 and 20 where the project site is listed under the Shoreline Management Strategy for Kenya including the conservation objectives and strategies (Source: Shoreline Management Strategy for Kenya, 2010). 44
Table 22: Regulations under the Environmental Management and Coordination Act Cap 387 of the Laws of Kenya. 46
Table 23: Institutions and their legislative mandate as it applies to the proposed project. 50

LIST OF ACRONYMS

BMU	Beach Management Unit
BOD	Biological Oxygen Demand
CBOs	Community Based Organisations
CCTV	Closed Circuit Television
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
DOSHS	Directorate of Occupational Safety and Health Services
EDL	Effluent Discharge License
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GOK	Government of Kenya
GPS	Global Positioning System
GRM	Grievances Redress Mechanism
HCVs	Heavy Commercial Vehicles
ICZM	Integrated Coastal Zone Management
ITCZ	Inter-Tropical Convergence Zone
KNBS	Kenya National Bureau of Statistics
MWSSCL	Mombasa Water Supply and Sewerage Company Limited
NCA	National Construction Authority
NEMA	National Management Authority
NGOs	Non-Governmental Organisations
OSHA	Occupational Safety and Health Act
PE	Population Equivalent
PM	Particulate Matter
PPE	Personal Protective Equipment
SDGs	Sustainable Development Goals
SEA	Strategic Environmental Assessment
SLM	Sound Level Meter
TBD	To Be Determined
TDS	Total Dissolved Solids
TORs	Terms of References
TSS	Total Suspended Solids
UN	United Nations
WIOMSA	Western Indian Ocean Marine Science Association
WRA	Water Resources Authority
WRUA	Water Resources Users Association
WSB	Water Service Board
WSP	Water Services Providers
WSRB	Water Services Regulatory Board
WSTF	Water Sector Trust Fund

1 PROJECT BACKGROUND INFORMATION

1.1 Introduction

The demand for residential developments in Kenyan urban areas has remained under tremendous pressure. Much of this is due to rural-urban migration of people in search of jobs, higher education or higher standards of living. It must be appreciated that there is imbalance in demand and availability of affordable residential facilities in the Kenyan urban areas. One of the ways the country aims to attain the 2030 vision for housing and urbanization is through better development of and access to affordable and adequate housing.

Kenya has an annual housing demand of 250,000 units with an estimated supply of 50,000 units, culminating to 80% housing deficit (Habitat for Humanity, 2019). In addition, Mombasa County had an estimated annual housing deficit of 21,000 units in the first quarter of 2022 (WIOMSA and UN-Habitat, 2021). To address the deficit, real estate developers have and /or constructed rental units, such as apartments, townhomes and co-living spaces within the County.

The proponent, Ultra Modern Homes Limited (Annexures 1 & 2), proposes to construct a residential development on Plot L.R. No. Mombasa/Block X/85 in Tudor area, Mombasa County. The proposed project activities will involve construction and occupation of 350 apartments with a total build up area of 41,854.601m^2. Pursuant to section 58 of the Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya, urban developments including establishment of new housing estate developments exceeding one hundred housing units are listed under the Second Schedule (3g) as high risk projects and hence subject to ESIA process. To comply with this legal requirement, Ultra Modern Homes Limited contracted Envasses Environmental Consultants Limited to prepare an Environmental and Social Impact Assessment (ESIA) Study Report for the proposed project and submit it to NEMA for decision making.

1.2 Location of the proposed project site, site status and neighbourhood

The proposed project will be located on Plot L.R. No. Mombasa/Block X/85 along Tom Mboya Road in Tudor area, Mombasa County. The GPS coordinates are Latitude **4°02'02.51''South** and Longitude **39°40'08.72''East** (Figure 1). The site is currently occupied by a residential development secured by a boundary wall and access gate (Figure 2).

The neighborhood predominantly comprises of residential developments (Figure 3). It neighbors Creek View Homes and Citadel Royal School to the West, Marine Creek Apartments and Tudor Block Khoja Flats to the East, Tudor Creek to the North and Technical University of Mombasa to the South-West.

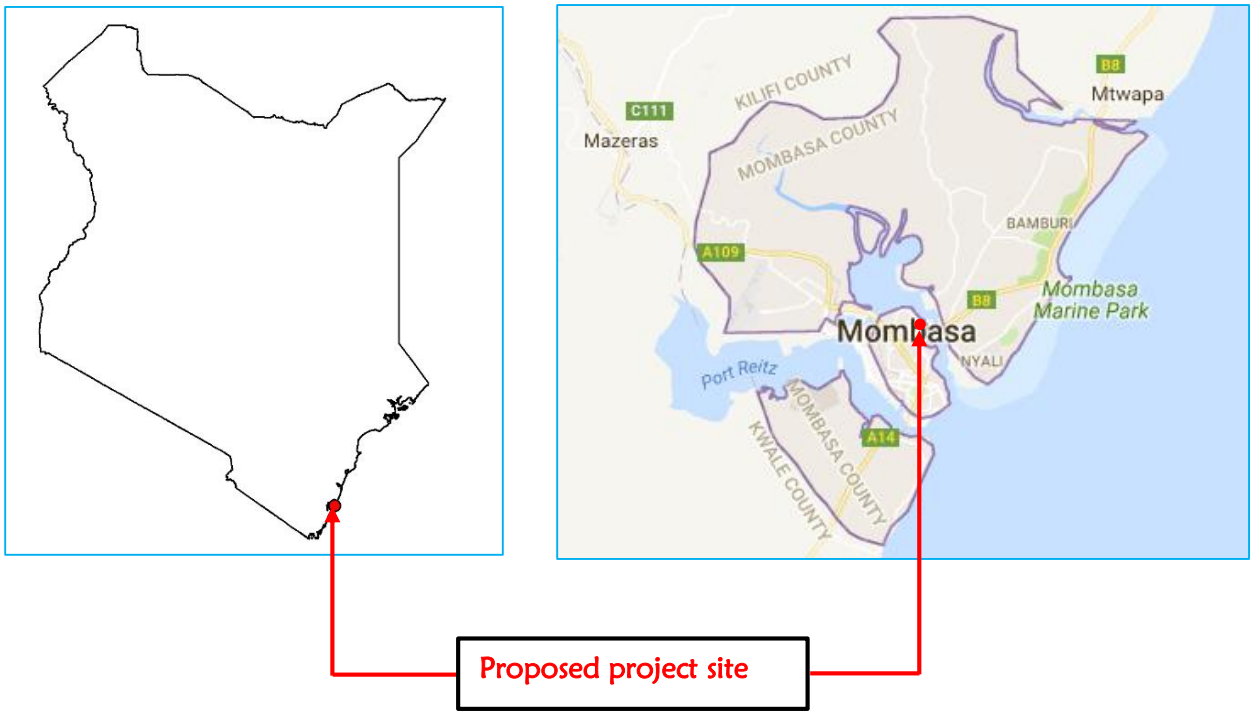


Figure 1: The location of the proposed project site (Source: Google Earth, 2023).

Figure 2: The existing residential development at the proposed project site (Source: Site visit, August 2023).

Figure 3: Some of the residential developments neighboring the proposed project site (Source: Site visit, August 2023).

1.3 Project design and description

The proposed residential development will comprise of seven residential blocks (A, B, C1, C2, D, E1 & E2) of basement, ground plus thirteen (13) floors with a total of 350 apartments. Residential blocks A, B, C1 & C2 will comprise of 246 two bedrooms units while D, E1 & E2 will comprise of 104 three bedrooms units (Table 1 & Annexure 3). Other associated amenities will include living/dining, kitchen, laundry, balcony, parking areas, shops, underground water tanks, six bio-digesters, stand by generator, lift shaft and rooftop. The total built up area will be 41,878.001m^2.

Table 1: The built-up areas of the proposed residential development (Source: Ultra Modern Homes Limited, 2023).

Built up areas		Description	No. of units	Total Area in M²
Basement Floor		Parking area	-	3,603.000
Ground Floor		Parking area	-	3,603.000
Blocks	A	Two bedrooms, living/dining, kitchen, laundry and balcony	90	7333.300
	B		52	4064.255
	C1		52	4751.695
	C2		52	4749.615
	D	Three bedrooms, living/dining, kitchen, laundry and balcony	52	6795.308
	E1		26	3488.914
	E2		26	3488.914
Total			**350**	**41,878.001**

1.4 Land ownership

The land is owned by Ultra Modern Homes Limited. A copy of the Title deed has been attached to the report (Annexure 4).

1.5 Approach and methodology

The Third Schedule of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003 informed the approach and methodology used in preparing the ESIA study. Initially, the consultant prepared a scoping report and Terms of References (TORs) as required under Regulation 11 of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003 and submitted them to NEMA for consideration for approval. The scoping report and TORs were approved on 18th August 2023 (Annexure 5) and the consultant began preparation of the ESIA study report.

Data collection methods were literature review, reconnaissance survey, baseline monitoring of physical, biological, and social and cultural environment and stakeholder engagement meetings.

1.5.1 Reconnaissance survey

A reconnaissance survey was carried out on 16th August 2023. The objective of the survey was to conduct a scoping and screening exercise to identify key environmental and social issues that would be addressed by the ESIA study, carry out stakeholder mapping, establish key informants contacts and data requirements for the ESIA process.

The Second Schedule of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003 informed the environmental and social screening criteria (Table 2).

Table 2: Summary of results of the screening criteria for the ESIA study for the proposed residential development (Source: EIA/EA Regulations, 2003).

Criteria	Results
Ecological impacts	• Excavations and vegetation clearance will occur • No endangered species of trees and plants found at the site • No endemic species reported on site
Social-economic considerations	• Meeting housing demand in Tudor area • Income to the proponent and businesses supplying raw materials • Employment creation • Revenue to the government through taxes &licenses • No cultural or heritage issues at the site
Landscape impacts	• Project is consistent with existing landscape • The landscape of the area will be altered and new views created
Land use	• Land uses in the area include residential developments, learning institutions and places of worship • Project is consistent with land-uses in the area
Water	• The construction and subsequent operations of the proposed project will increase water demand and impact on water resources

1.5.2 Baseline environmental quality monitoring

1.5.2.1 Water quality

The objective of the water quality sampling and analysis was to assess the variation in water turbidity and chemical properties due to construction activities which could alter the physical or chemical characteristics of the water in the Creek; and to provide a baseline for assessing the effectiveness of the environmental management plans designed to minimize water contamination.

One water sample was obtained along the water column (-8m) at Tudor Creek (Latitude 4°1'59.83"S and Longitude 39°40'9.34"E) on 19th August 2023 in collaboration with Lahvens (K) Limited, a NEMA designated laboratory (Figure 4). The sample was analyzed for Dissolved Oxygen (DO), pH, Turbidity, Total Suspended Solids (TSS), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Dissolved Solids (TDS), Ammonia (NH+), Total Coliforms and *Escherichia Coli*.

Figure 4: Baseline water quality monitoring carried out on 19th August 2023 within Tudor Creek (Source: Lahvens (K) Limited, 2023).

1.5.2.2 Ambient air quality monitoring

Ambient air quality survey for this study consists of four representative monitoring runs. Information for the report is presented based on air monitoring completed for 4-hour weighted average. For the purpose of the baseline investigation, measurements were taken on site on the 17th August 2023 and thereafter the measurements were compared against the guidelines and standards while attention given to relevant referencing sites of similar nature. Ambient air quality data were obtained from a validated and approved air quality monitoring program.

Mobile and active monitoring was done by use of real time gas detector-pump suction equipment which Sampling of gases was done using a 24-hour AQM-09 is a device which can monitor the air quality via the value of O_3, SO_2, NO_2, CO, $PM_{2.5}$, PM_{10}, etc. The target value is converted into voltage signal by operational amplifier circuit, and then filtered through high-precision AD data acquisition system. Finally, the gas concentration is calculated by CPU. Particulates mainly use laser scattering method to produce different scattering light according to different particle diameters under laser scattering conditions. The scattered light intensity is collected by a response device, and the particle 4 concentration is obtained after amplification, filtering and AD acquisition. The obtained gas concentration and particulate matter concentration can be displayed on LCD screen in real time, and can also be transmitted to cloud platform or environmental protection platform through GPRS, 4G LTE and other network signals, so as to realize the monitoring of regional environmental quality. The gas meters were mounted at about 1 – 2 M above the ground surface. The laboratory results and sampling duration information were used to calculate the gaseous concentrations.

1.5.2.3 Baseline noise level measurements

Noise emission survey was achieved via initial examination of existing road traffic and other noise sources of significance. Noise levels was evaluated using a Sound Level Meter Model UT – 351, C150107874 class 2 was mounted on at 2.0m above ground level and at least 3.5m away from any sound reflecting surfaces at a boundary position and measurements taken at timed intervals of 15 minutes every one-hour period and stored in SLM's memory. The sound level meter was placed on the microphone to reduce any wind interference during measurements. The sound level meters, were within its calibration period, at the time of monitoring. In addition, the equivalent noise level (Leq), the maximum sound pressure level (Lmax) and the minimum sound pressure level (Lmin) during that measurement period were recorded. Factors such as time, duration and predictability of the noise emission, amplitude and frequency of the noise emission, nature of the source, location of noise sensitive receptors, ambient and background noise level, nature and character of the locality, presence of special acoustic characteristics and the incongruity or familiarity of the noise during noise survey and site placement were put into consideration. Furthermore, as each individual measurement was being taken, the nature of the noise climate in the area was assessed and recorded. This comprised an auditory observation by the surveyor, as well as identifying those noise incidents which influenced the sound level meter readings during that measurement period.

1.5.3 Stakeholder mapping and analysis

Engagement of stakeholders is crucial because it helps a project achieve transparent decision-making and overall sustainability. Public and stakeholder participation in the ESIA process was conducted consistent with International and National legal instruments.

- International Legal Instruments that make Stakeholder Consultation and Public participation during Environmental Impact Assessment process mandatory
  1. Aarhus Convention

2. United Nation Conference on Environment and Development
3. Convention on Environmental Impact Assessment in a Trans-Boundary Context
4. Principle 17 of the 1992 Rio Declaration on Environment and Development
5. Agenda 21

- National Legal instruments that make Stakeholder Consultation and Public participation during Environmental Impact Assessment process mandatory
  1. Constitution of Kenya 2010 Article 69 (1) (d)
  2. Regulation 17 of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003

Initially, the consultant carried out stakeholder identification where a list of all key stakeholders was prepared. The stakeholders were then be mapped based on influence and interest on an ordinal scale of 0-5 (for either interest or influence from low (0) to high (5)) (Figure 5). A total of 9 stakeholder categories were identified and involved in the ESIA process based on their availability (Table 3). The consultant in collaboration with the Ministry of Interior and National Administration organized and held three stakeholder meetings on 22nd and 29th August and 4th September, 2023.

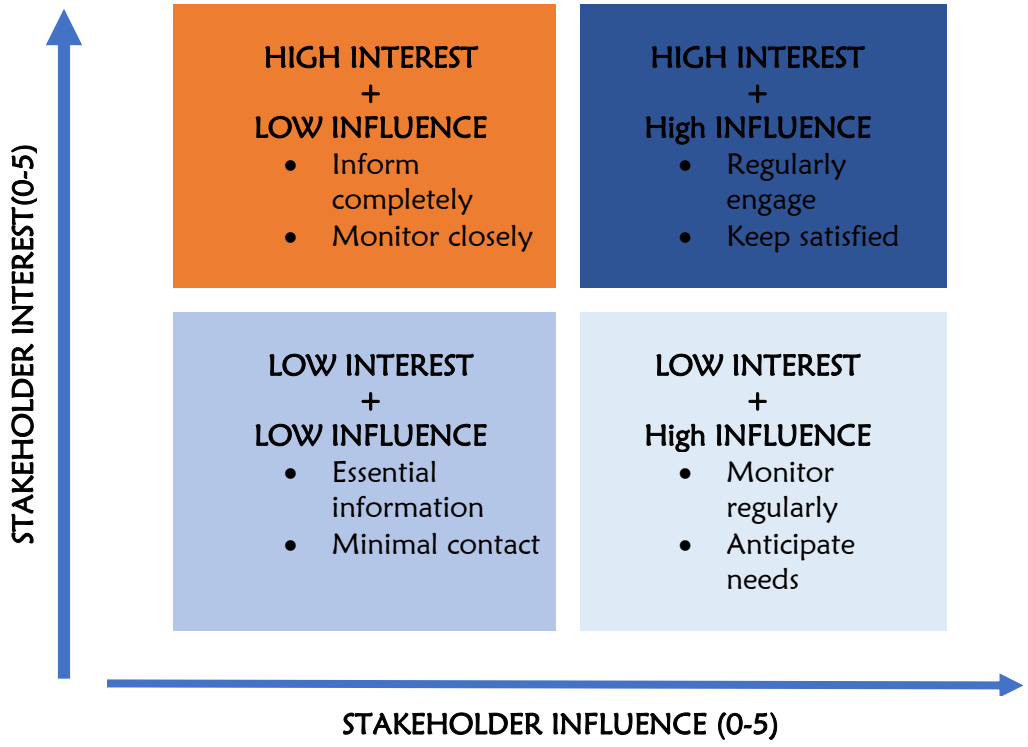


Figure 5: Stakeholder analysis and engagement considerations based on interest and influence in the project.

Table 3: Key stakeholder groups engaged in the preparation of the ESIA.

Key stakeholder group	Stakeholders engaged
National Government Agencies	• Ministry of Interior and National Administration • National Environment Management Authority • Kenya Forest Service • Water Resources Authority
County Government	• County Government of Mombasa
Beach Management Unit (BMU)	• Tudor-Shimanzi BMU
Community Based Organisations (CBOs)	• Self Help Groups • Women Groups • Youth Groups
Non-Governmental Organisations (NGOs)	• Local NGOs
Faith Based Institutions	• Religious leaders
Civil Society Groups	• Civil Society Groups
Special Interest Groups	• People with Disabilities
Media	• Print

2 BASELINE INFORMATION ON THE PROJECT SITE

Baseline conditions of the project site were assessed and documented for the purposes of determining the future impacts of the proposed project on the environment and social aspects of the local community. This section details on the findings of the survey which will form a basis for impact monitoring plans and improvement of the environmental and social performance of the project during implementation.

2.1 Topography and climate

Mombasa is a coastal lowland with extensive flat terrain rising gently from the sea level in the East to about 132m above sea level in the mainland. The climate of Mombasa is greatly influenced by the Migratory Inter-Tropical Convergence Zone (ITCZ) characterized by monsoon winds which create a bimodal rainfall pattern. The long rain season occurs from April to July and the short rains from October to December. The average annual rainfall for the area has been recorded as 1196mm.

Temperatures are fairly constant throughout the year ranging from 23°C to 28°C. The warmest temperatures are generally recorded during the months of November to April (mean daily temperature of 27°C) while slightly cooler temperatures are experienced from May to October (mean daily temperature of 24.5°C). The average annual evaporation rate within the project area is 2300mm and the climate is generally classified as semi to sub-humid as the ratio of rainfall to evaporation ranges from 57-68% (Figure 6).

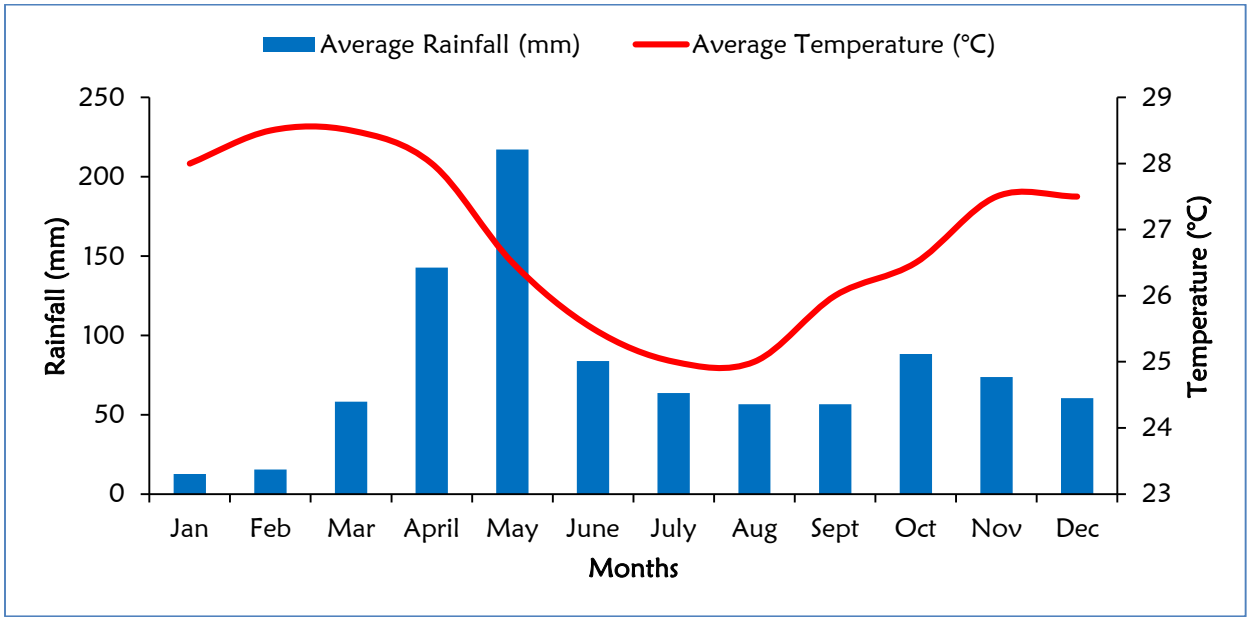


Figure 6: Annual rainfall and temperature distribution in Mombasa County (Source: World Weather Online, August 2023).

2.2 Water quality

The implementation of the project has a potential to degrade water quality within Tudor Creek. Poor water quality affects marine habitats and fauna including benthic communities due to reduced light and dissolved oxygen.

The water quality analysis results indicated that the temperature (26.0°C), pH (8.03) and DO (5.24mg/l) were within the typical marine water that supports fish species abundance and richness.

In addition, turbidity, TSS, BOD, COD and TDS were recorded at 7.2NTU, 16.0mg/l, 18.55mg/l, 31.1mg/l and 24.3mg/l respectively. In addition, Ammonia, Total Coliforms and *Escherichia Coli* were not detected an indication of a good baseline water quality (Table 4 & Annexure 6).

Table 4: Water quality results based on the sample obtained across the water column at -8m (Source: Water quality monitoring, August 2023).

Parameters	Results
Temperature (°C)	26.0
Dissolved oxygen (mg/L)	5.24
Electrical conductivity (S/cm)	44.27
Salinity (‰)	28.0
pH	8.03
Turbidity (NTU)	7.2
Total Suspended Solids (TSS) (mg/L)	16.0
Biological Oxygen Demand (BOD) (mg/L)	18.55
Chemical Oxygen Demand (COD) (mg/L)	31.1
Total Dissolved Solids (TDS) (mg/L)	24.3
Ammonia (NH+) (mg/L)	Not detected
Total Coliforms (cfu/100ml)	Not detected
Escherichia Coli (E-Coli / 100ml)	Not detected

2.3 Mangrove distribution and species composition

The project site neighbors a mangrove ecosystem that extend up to the Tudor Creek (Figure 7). The Creek has six out of the nine species of mangroves which occur along the Kenyan Coast i.e. *Avicennia marina, Bruguiera gymnorrhyza*, *Ceriops tagal*, *Rhizophora mucronata*, *Sonneratia alba* and *Xylocarpus granatum* (National Mangrove Ecosystem Management Plan, 2017 – 2027). The mangrove forests within the area have a forest cover of 767.39ha with an economic value of KES 964Million/year (Hilda *et al.,* 2021). The mangrove forests are mainly dominated by *Rhizophora mucronata, Avicennia marina* and *Sonneratia alba* (Mohammed *et. al.,* 2008). Additionally, the stocking density is 1,636 stems ha^{-1} with a volume of only $7m^3$ ha^{-1} (Comprehensive Environmental Management and Conservation Plan for the Mombasa Special Economic Zone Development Project, 2018). These mangroves provides both important environmental goods and services which include breeding grounds for fish, coastal stabilization, habitats for birds and other biodiversity, supports apiculture and regulation of climate through carbon sequestration.

2.4 Terrestrial vegetation cover

Vegetation cover at the proposed site and the surrounding areas comprises of indigenous trees and exotic species. The species include Green Ashok, Ivory Coast Almond, Neem and Palm trees (Figure 8).

Figure 7: Mixed strands of *Avicennia marina* and *Sonerratia alba* along Tudor Creek (Source: Site visit, August 2023).

Figure 8: Green Ashok and Ivory Coast Almond (Left) and Neem and Palm trees (Right) within the proposed project site (Source: Site visit, August 2023).

2.5 Air quality

There were notable gaseous concentrations of Carbon monoxide (CO), Nitrogen dioxide (NO_2), Oxides of Nitrogen (NO_x), Sulfur dioxide (SO_2), Ozone (O_3) and Total Volatile Organic Compounds (TVOC). Notable levels of particulate matter (PM_{10} and $PM_{2.5}$) and Total Suspended Particles (TSP) were also detected. However, the gaseous and particulate parameters measured were all within the stipulated standards under the First Schedule of Environmental Management and Coordination (Air Quality) Regulations, 2014 (Table 5 & Annexure 6).

Table 5: Baseline air quality measurements for the proposed project site (Source: Air quality monitoring, August 2023).

MONITORING LOCATIONS	Parameters								
	CO (mg/m^3)	NO_2 (ppm)	NO_x (ppm)	SO_2 (ppm)	O_3 (ppm)	TVOC ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	TSP ($\mu g/m^3$)
Location 1 S4°02'03.912" E39°40'06.7404"	0.003	0.0473	0.0539	0.064	0.0508	16	2.53	19.67	36.20
Location 2 S4°02'03.732" E39°40'06.9384"	0.005	0.0696	0.0718	0.0639	0.0451	15	1.90	15.13	28.00
Location 3 S4°02'03.7176" E39°40'07.176"	0.004	0.0684	0.0704	0.0628	0.0431	14	1.20	7.57	13.97
Location 4 S4°02'01.8168" E39°40'08.8968"	0.004	0.0689	0.0708	0.0632	0.0430	14	1.28	7.22	13.09
AVERAGE	**0.004**	**0.0635**	**0.0667**	**0.0635**	**0.0455**	**15**	**1.73**	**12.40**	**22.82**
EMC (Air Quality) Regulations Limits	**2.0**	**0.2**	**0.8**	**0.191**	**0.12**	**-**	**-**	**-**	**-**

2.6 Noise levels

The quantity of average noise measured and recorded from the selected survey locations complied with the EMC noise and vibration regulations 2009 maximum Noise Level Permitted (Leq) during the day. The baseline results show that the site is a noise insignificant area therefore no threat to the sensitive receptors is anticipated at the current state. The existing identifiable sources of noise emissions were environmental noise (wind breeze), vehicles along Tom Mboya Road and those accessing the site (Table 6 and Annexure 6).

Table 6: Baseline noise level measurements for the proposed project site (Source: Noise survey, August 2023).

Locations	Measured Sound Pressure Level (Noise) (dBA) (1150Hrs-1320Hrs)			EMCA Guidelines (Day time)
	LAeq	Lmax	Lmin	
Location 1 S4°02'03.912" E39°40'06.7404"	47.7	75.1	40.1	55
Location 2 S4°02'03.732" E39°40'06.9384"	49.2	78.2	42.3	55
Location 3 S4°02'03.7176" E39°40'07.176"	50.2	73.7	43.1	55
Location 4 S4°02'01.8168" E39°40'08.8968"	48.3	69.2	40.0	55

2.7 Demographic characteristics

The proposed project site lies in Tudor ward within Mvita Sub-County. The ward has a population of approximately 36,295 people comprising of 18,234 males and 18,061 females. In addition, it has 11,613 households with a population density of 14,545 persons per km^2 (KNBS, 2019).

2.8 Water supply in Mombasa County

Kenya is a water stressed country with a low per capita annual freshwater endowment. Access to water and sanitation is low because of limited water resources development and ageing/dilapidated infrastructure. Access to water falls below the Sustainable Development Goal (SDG) targets of universal access. Despite increased investments and improvements in levels of access in the last 5 years, the rapid population increase, urbanization and economic growth strain the existing water resources and infrastructure and hinder efforts towards achieving the sector SDGs.

Mombasa County is served by the reticulated supply from Mombasa Water Supply and Sewerage Company Limited (MWSSCL), which is sourced from Mzima Springs in Taita-Taveta County, Marere Springs and Tiwi Water Supply System through Kaya Bombo Reservoirs. Currently the water demand in the County is at 481,400m^3/day. The proposed development will source water from the reticulated supply and supplemented by borehole water.

2.9 Status of sanitation in Mombasa County

Mombasa County has three sewerage treatment plants at Kipevu, Kizingo and Tudor. The Kipevu Sewage Treatment Plant is the largest with a capacity of 17,000m^3/day and serves the households, institutions, hotels and industries in the West Mainland area. Kizingo sewage treatment plant has a capacity of 3,000m^3/day and serves the Island area. Tudor sewage treatment plant is a small sewerage scheme that was established to serve the Tudor Estate only.

Currently the sanitation infrastructure in Mombasa County is insufficient to meet the sanitation needs of the growing population and there is need for developing a sanitation system which is environmentally sustainable. Immediate sanitation measures have been developed such as rehabilitation of the existing sewerage system, construction of ablution blocks in public places and sludge handling facilities. The Final Wastewater Master Plan for Mombasa Island describes the development strategy for the long-term sanitation system comprising of a wastewater collection / conveyance system and the treatment / proper disposal of the treated effluent.

The rest of the County depends on privately constructed soak pits and pit latrines which have a potential to pollute water sources. There have been cases of housing estates, industrial establishments and hotels which empty their sewer into storm drains or discharge raw sewage directly into the sea and untreated industrial effluent discharged in the public sewer system. Households in Mombasa generate about 337,000m^3 wastewater per day and the County faces challenges in its disposal (Coast Water Services Board, 2012). Effluent generated from the development will be managed through six bio-digesters.

2.10 Solid waste management

Solid waste generation in Mombasa is estimated at 700metric tons per day (Envasses, 2019). The waste comprises of organic and inorganic forms. The main waste generation sources are domestic, commercial ventures, hotels, markets, industries and institutions including health facilities. The types of waste that are generated include: Plastic waste including papers and hard plastics, Organic materials including food remnants and wooden debris, rubber, paper, metals, chemicals, glass, biomedical waste.

Waste materials are collected from point sources or municipal dustbins in mixed form and transported to Mwakirunge dumpsite. All types of waste are transported to the site including hazardous types containing pesticides, heavy metals, oils, batteries, acids, domestic and hospital wastes. The distance to dumpsite and the lack of adequate facilities for waste has created a waste management problem for Mombasa County including proliferation of illegal dumpsites and indiscriminate dumping at the existing transfer stations.

2.11 Infrastructure

2.11.1 Transport Network

Mombasa County is served by a well-established network of all-weather access roads and public service vehicles. The project site lies along Tom Mboya Road (Figure 9) adjacent to Creek View Homes.

Figure 9: A section of Tom Mboya Road (Source: Site visit, August 2023).

2.11.2 Energy Supply

Tudor area has proper network of Kenya Power lines. Some developments in the area have also exploited solar energy as an alternative. The proposed project will source electricity from the National Grid and supplemented by a diesel powered generator.

2.11.3 Telecommunication

The proposed project area is well served with communication network including the main mobile phone services such as Safaricom, Airtel and Telkom.

2.12 Climate change and adaptation strategies

Climate change impacts have been felt across Mombasa County with areas being impacted differently. The prevalent climate change hazards included: increased high temperatures, unpredictable rainfall patterns, pests, diseases, floods, sea level rise, increased coastal storm damage, sea-shore erosion, salt water intrusion into estuaries and freshwater aquifers and springs (Mombasa County Climate Change Policy, 2021). Adaptation strategies to address these impacts include protection of water catchment areas, practicing climate smart agriculture and use of insecticides, relocation of vulnerable households to safer areas and climate proofing infrastructural developments across the County.

3 ENVIRONMENTAL IMPACTS IDENTIFICATION, ANALYSIS AND PROPOSED MITIGATION MEASURES

The proposed project will have both benefits and attendant negative environmental and social impacts. The purpose of the ESIA process is therefore to systematically assess the value of the benefits against the environmental concerns and provide measures to avoid, prevent or reduce the magnitude of the impacts. The following section provides details on these impacts and proposed mitigation measures to address the identified negative environmental and social impacts. The mitigation measures are based on the underlying principle of EIA that everyone is entitled to a clean and healthy environment and a duty to enhance and safeguard the environment.

3.1 Positive impacts of the proposed project

The proposed project will have the following benefits;

1. The proposed project seeks to establish 350 apartments which will meet the housing demand in Tudor area and its environs.
2. Housing and urbanization are key sectors of the social pillar of the Kenya's Vision 2030 and hence the project will contribute towards attainment of the same.
3. The project will provide employment opportunities throughout the project cycle. The workforce will include contractors, masons, carpenters, welders, painters, plumbers, engineers and electricians among others who will be sourced from Mombasa. Already the proponent has contracted NEMA consultants to prepare the ESIA.
4. The project will provide a market for goods and services during the construction phase. This includes raw materials for construction such as building blocks, cement, steel, paint and timber among others.
5. The proponent will earn an income from the tenants during the operational phase of the project or from the sale of the housing units.
6. The government will earn revenue in terms of taxes generated during the acquisition of licenses and products consumed such as construction materials.

3.2 Negative environmental and social impacts

The proposed residential development is predicted to result in negative environmental and social impacts throughout the project cycle.

3.2.1 Construction phase impacts

3.2.1.1 Demolition of the existing residential house

The proposed project site is currently occupied by a residential house which will be demolished to pave way for the construction activities. The main issues of concern will be solid waste generation, effluent management and safety and health risks. Solid waste that will be generated include glass, metal, wood cuttings, roofing waste and building rubbles among others which will need to be managed appropriately. On the other hand, safety and health risks are likely to emanate from accidental falls, cuts and injuries from machinery use, noise and air pollution.

Recommended mitigation measures

1. Obtain demolition permit for the residential house from the County Government of Mombasa
2. Demolition of the residential house should be carried out by experienced contractors who have successfully accomplished similar assignments
3. Recover re-usable materials for use in the proposed residential development
4. Procure NEMA contractor to dispose off demolition wastes which can't be re-used or repurposed in construction of the proposed residential development

5. Provide and enforce the use of PPEs throughout the demolition works
6. Train workers on first aid and provide first aid kits at the site
7. Comply with the Sustainable Waste Management Act, 2022

3.2.1.2 Change of land use

The current land use of the area is a low density residential. However, the proponent proposes to set up a high-density residential development of basement, ground plus thirteen floors which is inconsistent with the current land use.

Recommended mitigation measure

The proponent should apply for and obtain a change of user from low to high density residential from the County Government of Mombasa.

3.2.1.3 Environmental risks of obtaining raw materials

The construction activities will require raw materials such as building blocks, aggregates, cement and sand among others. The raw materials will be sourced from the environment and will have negative environmental impacts at their points of origin.

Recommended mitigation measures

1. Source raw materials from sites that are licensed as per the Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya
2. Have a procurement plan based on the Bill of Quantities prepared by a Registered Quantity Surveyor to avoid potential oversupply of materials and wastage
3. Re-use construction waste materials such as wood and metal cuttings which can be salvaged either from the existing residential house or from construction activities

3.2.1.4 Loss of terrestrial vegetation cover

Site preparation will involve clearing of vegetation and civil works. The proposed site is endowed with a number of tree species including Palm and Neem trees. These trees will have to be felled to pave way for the construction activities. Vegetation cover plays an important role in preventing soil erosion, carbon sequestration and habitat for other organisms among others. Therefore, clearance of the vegetation would lead to the loss of these benefits.

Recommended mitigation measures

1. Landscaping of the area post construction by planting trees and grass and establishing flower gardens to improve the aesthetics

3.2.1.5 Water demand and effluent generation

During the construction phase, water will be required for concrete mixing, casting and curing works, drinking and sanitation purposes which will lead to increased demand for water. Water for construction works will be sourced from the reticulated supply and supplemented by water bowsers. The wastewater emanating from the construction activities will potentially pollute the Creek and should therefore be managed effectively.

Recommended mitigation measures

1. Sensitize the workforce at the site on the need to conserve the available water resources
2. Procure and deliver to the site mobile toilets from a NEMA licensed waste contractor
3. Comply with the provisions of the Environmental Management and Coordination (Water Quality) Regulations, 2006

3.2.1.6 Solid waste generation and management

The construction activities will generate solid waste such as biomass, overburden, cuttings and rejected materials among others. Workers at the site will generate domestic waste such as food leftovers, plastics and wrappings while servicing of machinery, equipment and motor vehicles will generate wastes such as spare parts, oil and fuel containers and tyres. Poor disposal of solid wastes has negative environmental impacts which would include pollution of the Creek, providing habitat for disease causing pathogens and reducing the aesthetic value of the area and therefore a health risk to communities. Hence the proponent should implement measures to ensure proper management of solid wastes.

Recommended mitigation measures

1. Use of overburden in backfilling and landscaping post construction activities
2. Procure appropriate infrastructure for solid waste management including receptacles with segregation capacity
3. Designate a waste collection area for construction debris and commercial wastes
4. Procure the services of a NEMA licensed contractor for the disposal of construction debris and domestic wastes
5. Comply with the Sustainable Waste Management Act, 2022

3.2.1.7 Occupational safety and health risks

Machinery operations, use of construction tools and the actual construction activities are likely to expose the workforce, neighbors and visitors to safety and health risks such as accidental falls, air and noise pollution which could lead to impairment and death.

Recommended mitigation measures

1. The site should be registered with DOSHS as a work place
2. Ensure workers are allocated duties and responsibilities based on their training and competencies
3. Provide first aid kits at the site and train selected employees on first aid administration
4. Provide and enforce the use of appropriate PPEs throughout the construction phase
5. Erect safety signage and boards at all construction zones
6. Ensure moving parts of machines and sharp surfaces are securely protected with guards to avoid unnecessary contacts and injuries
7. All accidents should be reported, investigated and corrective action taken to prevent reoccurrence
8. Contractor should have appropriate insurance cover as per the Work Injury Benefits Act
9. Comply with the Occupational Safety and Health Act (OSHA), 2007

3.2.1.8 Noise pollution

The construction activities, delivery of construction materials by heavy trucks and the use of machinery will lead to high levels of noise and vibration within the construction site and the surrounding area which are above the baseline values. Noise may lead to hearing impairments which will reduce the workmanship of the employees. Neighbors to the project site will also be exposed to noise during site preparation and construction activities.

Pursuant to Second Schedule of Noise Regulations, 2009, construction sites can only emit noise levels of up to 60 dB(A) during the day and 35dB(A) during the night. The proponent should therefore ensure that these limits are not exceeded and where they are appropriate mitigation measures are implemented.

Recommended mitigation measures

1. Locate peak noise producing machines away from settlements
2. Procure and provide adequate earmuffs to workers and visitors to the site and enforce their use
3. Use serviceable machinery
4. Sensitize truck drivers to avoid unnecessary hooting and running of vehicle engines
5. Comply with the Noise Regulations, 2009

3.2.1.9 Air pollution

Air pollution will emanate from vehicles delivering raw materials, excavation and concrete mixing activities. Vehicle exhausts contain sulphur dioxide, carbon monoxide and hydrocarbons and together with fugitive dust constitute major pollutants which can affect air quality. The most relevant pollutant considered is particulate matter because of its potentially significant increase during the construction phase. Respirable particulate matter may present respiratory diseases, cause eye irritation and visual intrusion to workers, visitors to the project site and the neighbors if it is in excess of 100 $\mu g/Nm^3$ as per the First Schedule of the Environmental Management and Coordination (Air Quality) Regulations, 2014.

Recommended mitigation measures

1. Install appropriate and adequate dust screens around the project site
2. Sprinkle water at the excavation areas to suppress fugitive dust
3. Cover stockpiles of construction materials (aggregates, sand and fill material) to reduce dust emissions especially during windy conditions
4. Procure, provide and enforce the use of dust masks to workers and visitors to the project site
5. Use serviceable machinery/equipment and trucks
6. Comply Air Quality Regulations, 2014

3.2.1.10 Traffic congestion

The proposed residential development lies along Tom Mboya Road. Heavy Commercial Vehicles (HCVs) delivering construction materials to the site are likely to increase traffic along the road thus inconveniencing other road users.

Recommended mitigation measures

1. Erect signage and warnings along the road to forewarn other road users on the use of the road by HCVs
2. Offload construction materials on the site and not on the road reserves to ensure smooth flow of traffic
3. Sensitize drivers to observe the designated speed limit along the road
4. Comply with the provisions of the Traffic Act, 2016

3.2.1.11 Impacts of climate change

Climate change has not only led to drought, floods, diseases, pests, human-wildlife conflicts, wildfires in some parts of Kenya, but it has also caused unprecedented rainfall and sea level rise. Mombasa County is highly vulnerable to sea level rise as it lies between sea level and about 45 metres above sea level. The low lying areas of the County are already experiencing serious coastal/beach erosion as a result of the rise in sea level. This is having a negative impact on the County's and the livelihoods of the residents. It is estimated that sea level has been rising at a rate of approximately 2mm per year (Mombasa County Climate Change Policy, 2021). At this rate, it

is projected that about 17% of Mombasa, or 4,600 hectares of land area, will be submerged with a sea-level rise of only 0.3 metres.

Consequently, the proposed residential development could be negatively affected by sea level rise in future if climate change impacts are not considered in its design.

Recommended mitigation measures

1. Incorporate climate change proofing in the design of the proposed residential development
2. Comply with the Climate Change Act 2023 and National Climate Change Action Plan 2018-2022

3.2.2 Operational phase impacts

3.2.2.1 Increased water demand

The proposed development will have a total of 350 apartments and associated amenities. During operations, water will be required by the residents for purposes of general cleaning, sanitation and laundry. This will exert marginal increase in demand for water estimated at over 55m³/day. The proposed development will source water from the reticulated supply and supplemented by borehole water.

Recommended mitigation measures

1. Apply for and obtain water abstraction permit from Water Resources Authority (WRA)
2. Install water saving systems such as self-closing taps and low flush water closets
3. Liaise with Mombasa Water Supply and Sanitation Company Limited to ensure reliable supply of water to the development
4. Carry out regular inspection and maintenance of the water distribution network to ensure zero leaks and damages
5. Conduct domestic water quality analysis to ensure conformity with natural potable water standards pursuant to the Environmental Management and Coordination (Water Quality) Regulations, 2006

3.2.2.2 Effluent generation and management

Effluent will be generated from sanitation facilities, kitchen and laundry. Based on the industry standard of 1.5 persons per bedroom, the proposed development is expected to house 1,050 persons at full capacity. The Population Equivalent (PE) denotes that one-person resident is expected to produce 0.15m³ of effluent daily. Based on the above statistics, it is expected that a total of 157.5m³ of effluent will be produced daily and will be managed by six bio-digesters. In addition, kitchen operations are likely to produce a substantial amount of oil and grease that will likely be washed down the sinks and drains.

Recommended mitigation measures

1. Construct bio-digesters of 157.5m³ capacity to accommodate the daily effluent flows
2. Install oil and grease traps in the kitchen sinks to ensure the same doesn't end up into the bio-digester
3. Monitor the quality of effluent discharged from the bio-digester in compliance with the Third Schedule of Environmental Management and Coordination (Water Quality) Regulations, 2006
4. Apply for and obtain an Effluent Discharge License (EDL) from NEMA

5. Comply with the provisions of the Environmental Management and Coordination (Water Quality) Regulations, 2006

3.2.2.3 Solid waste generation and management

The bulk of solid waste from the development will be domestic in character including kitchen waste, glass, plastics, wrappings, cartons, paper and synthetic fiber among others. Poor disposal of solid wastes degrades environmental quality and may create breeding grounds for disease causing organisms thus leading to potential health challenges. The design plans have incorporated a garbage storage area where waste will be stored awaiting disposal.

Recommended mitigation measures

1. Procure and provide adequate solid waste collection bins with a capacity for segregation within the development
2. Sensitize the residents on the process of solid waste collection, segregation and proper disposal
3. Contract a NEMA licensed waste handler for disposal of solid waste
4. Comply with the Sustainable Waste Management Act, 2022

3.2.2.4 Fire risks and emergency preparedness

Fire risks and emergencies at the development can occur due to operational negligence, electrical faults and spillage/leakage of flammable and ignitable chemicals. Fire risks may also arise from facilities neighboring the site. If precautions are not taken to prevent their ignition, fire and subsequent safety risks may arise resulting in injuries, loss of lives and property.

Recommended mitigation measures

1. Insure the development with an insurance company to safeguard against loses from fire risks
2. Develop, clearly display and implement a fire and emergency response action plan
3. Install appropriate firefighting equipment at strategic locations within the development
4. Firefighting equipment should be serviced quarterly by fire service providers
5. Designate a fire assembly point and clearly display emergency exit points at strategic locations within the development
6. Size all staircases for emergency escape
7. Undertake regular inspection and maintenance of electrical appliances

3.2.2.5 Traffic congestion

The proposed development lies along Tom Mboya Road hence once occupied, we anticipate an increase in traffic especially during the peak hours. As per the design plans, the development has provided adequate parking areas. Additional mitigation measures are recommended as summarized below.

Recommended mitigation measures

1. Control entry and exit of vehicles to and from the development to avoid stalling of vehicles along the road
2. Comply with the provisions of the Traffic Act, 2016

3.2.2.6 Security concerns

The proposed project will have basement, ground plus thirteen floors and thus a high density residential development. Such developments tend to house short term residents and this may result into increased insecurity in the neighborhood.

Recommended mitigation measures

1. Contract a reputable security company to provide adequate guards, radio and alarm back-ups
2. Install CCTV cameras at strategic locations within the development
3. Control access to the development at all times
4. Provide adequate lighting along the sky streets and the fence areas of the development

3.2.2.7 Increased energy demand

During operation, energy will be required for powering electrical appliances, lighting and heating water resulting to increased demand. The development will source power from the National Grid and supplemented by a diesel-powered generator. The proponent will liase with Kenya Power and Lighting Company to upgrade the power infrastructure to avoid straining the existing community supply once the project commences.

Recommended mitigation measures

1. Sensitize the residents to switch off lights along the stairways and corridors when not in use
2. Promote the use of energy saving bulbs in the apartments
3. Harness solar energy to power lighting system in areas such walkways and parking areas among others
4. Install solar water heating systems

3.2.3 Decommissioning phase impacts

The socio-economic importance of the proposed project to the proponent makes decommissioning a remote possibility. Hence the ESIA does not consider the impacts at this phase as significant even in the long term. However, in the event that decommissioning becomes imminent possibly because of a court order, change of user or natural calamities, it is recommended that the proponent will prepare and submit a due diligence decommissioning audit report to NEMA for approval at least three (3) months in advance. For the purposes of prediction and information, the environmental and social concerns which may arise in this scenario include loss of housing units, occupational safety and health risks, solid wastes and effluent.

3.2.3.1 Loss of housing units

A decommissioning phase would mean loss of the housing units to the residents.

Recommended mitigation measures

1. Give three (3) months prior notice to the residents to find alternative housing units

3.2.3.2 Waste generation and management

Demolition works and dismantling of equipment and fixtures including electrical installations, furniture partitions, pipe-work and sinks among others will result in generation of significant quantities of solid waste. The waste generated will include glass, metal and wood cuttings, roofing waste and building rubbles among others. If not properly managed, the generated waste will pose safety and health risks and environmental pollution. Effluent from the bio-digester will also need to be disposed off appropriately as it has potential to pollute ground water and the Creek.

Recommended mitigation measures

1. Obtain demolition permits from the County Government of Mombasa
2. Recover re-usable materials for sale or use in other project sites
3. Contract a NEMA licensed waste handler to handle and dispose both solid waste and effluent generated from the demolition activities
4. Comply with the provisions of the Waste Management Regulations, 2006 and Water Quality Regulations, 2006

3.2.3.3 Safety and health risks

Safety and health risks are likely to emanate from accidental falls and cuts and injuries from machinery use. Noise and air pollution from decommissioning activities may also pose safety and health and safety risks to workers, neighbors and visitors to the site.

Recommended mitigation measures

1. Erect signage to forewarn people on ongoing demolition activities
2. Provide and enforce the use of PPE throughout the demolition works
3. Avail first aid kits on site throughout the entire period
4. Ensure the process of demolition is supervised by competent personnel
5. Comply with the Occupational Safety and Health Act, 2007

3.3 Public and stakeholders' consultations and findings

Public and stakeholders' participation in the ESIA process is important as outlined under Regulation 17 of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003. The aim of public and stakeholders' consultations was to obtain and document comments, views and concerns that the neighbors and stakeholders have regarding the proposed project. In this regard, three stakeholder meetings were convened i.e.

1. Stakeholder's kick-off meeting held on 22nd August 2023 at the project site
2. Stakeholder's meeting to review the Draft ESIA Study Report held on 29th August 2023 at the project site
3. Stakeholder's meeting to validate the Draft ESIA Study Report held on 4th September 2023 at the project site

3.3.1 Stakeholder's kick-off meeting

Pursuant to Regulation 17 of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003, a stakeholder's kick-off meeting was held on 22nd August 2023 at the proposed project site (Figure 10) and proceedings prepared (Annexure 7). The meeting was attended by 29 participants drawn from the Ministry of Interior and National Administration, County Government of Mombasa, local community, proponent and Envasses Environmental Consultants Limited. The meeting agenda was;

1. Introduction
2. Opening Remarks
3. Project overview
4. Plenary
5. Way Forward
6. Closing Remarks

Figure 10: Sections of the participants following deliberations during the stakeholder's kick-off meeting at the proposed project site (Stakeholder's kick-off meeting, August 2023).

During the meeting, the proponent provided a detailed overview of the project while the consultant provided the scope of the ESIA, the approach and methodology, the timeframe and the stakeholders' roles in the ESIA. Table 7 summarizes the key issues raised during the meeting and the responses provided by the proponent, consultant and stakeholders.

Table 7: Summary of the key issues raised during the stakeholder's kick-off meeting and responses provided by the proponent, consultant and stakeholders on 22nd August 2023 (Stakeholder's kick off meeting, August 2023).

No.	Issue	Response
1.	Carrying out concrete mixing during the night	• Concrete mixing will be limited to day time only.
2.	Mitigation measures for waste management, air and noise pollution from the demolition and construction activities	• The recommended mitigation measures will be presented during the second stakeholder's meeting to review the draft ESIA report.
3.	Access of the public beach adjacent to the proposed project site	• The public beach will be accessible to the local community/fishers during the entire project cycle. The proponent will not privatize the beach.
4.	Involvement of the National Construction Authority (NCA) and site immediate neighbors	• The NCA will conduct a site visit prior to licensing construction of the development. • The site immediate neighbors will participate in the second and third stakeholders meeting.
5.	Source of water for the proposed residential development	• Water will be sourced from MWSSCL and supplemented with borehole water. • The proponent will liase with MWSSCL to ensure reliable water supply to the development.
6.	Community benefits from the proposed project	• Prioritizing employment opportunities for both skilled and non-skilled labor to the local community. • Food vendors (women groups) to be allowed to sell food to construction workers.
7.	Corporate Social Responsibility	• Rehabilitation of the dilapidated sections of Tom Mboya Road.

No.	Issue	Response
1.	Carrying out concrete mixing during the night	• Concrete mixing will be limited to day time only.
2.	Mitigation measures for waste management, air and noise pollution from the demolition and construction activities	• The recommended mitigation measures will be presented during the second stakeholder's meeting to review the draft ESIA report.
3.	Access of the public beach adjacent to the proposed project site	• The public beach will be accessible to the local community/fishers during the entire project cycle. The proponent will not privatize the beach.
4.	Involvement of the National Construction Authority (NCA) and site immediate neighbors	• The NCA will conduct a site visit prior to licensing construction of the development. • The site immediate neighbors will participate in the second and third stakeholders meeting.
5.	Source of water for the proposed residential development	• Water will be sourced from MWSSCL and supplemented with borehole water. • The proponent will liase with MWSSCL to ensure reliable water supply to the development.
8.	Safety of Mombasa Island residents in relation with current increase in construction of multi-story buildings	• Competent consultant and engineers to assess all the possible issues of concern in every development stage of the project, and implementation of their recommendations will be supervised by relevant stakeholders.

3.3.2 Second stakeholder's meeting to review the Draft ESIA Study Report

Pursuant to Regulation 17 of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003, a second stakeholder's meeting was held on 29th August 2023 at the proposed project site (Figure 11) and proceedings prepared (Annexure 8). The meeting was attended by 38 participants drawn from the Ministry of Interior and National Administration, County Government of Mombasa, local community, Tudor-Shimanzi Beach Management Unit (BMU), proponent and Envasses Environmental Consultants Limited. The meeting agenda was;

1. Introduction
2. Opening Remarks
3. Presentation of the Draft ESIA Study Report
4. Plenary
5. Way Forward
6. Closing Remarks

Figure 11: Sections of the participants following deliberations during the second stakeholder's meeting to review the Draft ESIA Study Report at the proposed project site (Second stakeholder's meeting to review the Draft ESIA Study Report, August 2023).

During the meeting, the consultant presented the Draft ESIA Study Report. All the stakeholders' members welcomed the proposed project. They noted that the project will accrue to them numerous benefits which include creation of employment opportunities and providing affordable housing. Table 8 summarizes the key issues raised during the meeting and the responses provided by the proponent, consultant and stakeholders.

Table 8: Summary of the key issues raised during the second stakeholder's meeting to review the Draft ESIA Study Report and responses provided by the proponent, consultant and stakeholders on 29th August 2023 (Second stakeholder's meeting to review the Draft ESIA Study Report, August 2023).

No.	Issue	Response
1.	Cost and potential buyers for the apartments	• The cost of the apartments range from KES 4Million to KES 9Million. • The potential buyers are middle class income earners.
2.	Commencement of the proposed project	• The project will commence after the proponent has obtained pertinent approvals from relevant government authorities.
3.	Participation of the site immediate neighbors in the meeting	• The neighbors were invited and attended the meeting.
4.	Impacts of noise and air pollution to Citadel Royal School	• The report has recommended mitigation measures to mitigate the impacts to either low or negligible levels.
5.	Community benefits from the proposed project	• Prioritizing employment opportunities for both skilled and non-skilled labor to the local community. • Food vendors (women groups) to be allowed to sell food to construction workers.
6.	Impacts of the proposed project on the fishery within Tudor Creek	• The report has recommended mitigation measures to mitigate the impacts to either low or negligible levels.

No.	Issue	Response
		• The report has an environmental and social monitoring plan to enhance the environmental performance of the proposed project by providing data and information on compliance with legislative standards, conservation and preservation of the environment and determining the levels of deviation from the values obtained during the baseline monitoring.
7.	Agenda of third stakeholder's meeting to validate the Draft ESIA Study Report	• Confirmation of proceedings of the kick-off meeting and second meeting to review the Draft ESIA Study Report. • Providing each stakeholder with the design plans for the proposed project. • Attendance of the construction contractor to assure the community members that they will be given priority for both skilled and non-skilled labor and food vendors (women groups) will be allowed to sell food to the construction workers. • Disclosure of information on how to purchase the apartments.

3.3.3 Third stakeholder's meeting to validate the Draft ESIA Study Report

Pursuant to Regulation 17 of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003, a third stakeholder's meeting was held on 4th September 2023 at the proposed project site (Figure 12) and proceedings prepared (Annexure 9). The meeting was attended by 50 participants drawn from the Ministry of Interior and National Administration, County Government of Mombasa, local community, Tudor-Shimanzi BMU, Project Engineer/Contractor, Housing Agent and Envasses Environmental Consultants Limited. The meeting agenda was;

1. Introduction
2. Opening Remarks
3. Validation of the Draft ESIA Study Report
4. Plenary
5. Way Forward
6. Closing Remarks

During the meeting, the consultant presented the updated Draft ESIA Study Report after which it was validated as the Final ESIA Study Report to be submitted to NEMA. Table 9 summarizes the key issues raised during the meeting and the responses provided by the project engineer/contractor, housing agent, consultant and stakeholders.

Figure 12: Sections of the participants following deliberations during the third stakeholder's meeting to validate the Draft ESIA Study Report at the proposed project site (Third stakeholder's meeting to validate the Draft ESIA Study Report, September 2023).

Table 9: Summary of the key issues raised during the third stakeholder's meeting to validate the Draft ESIA Study Report and responses provided by the project engineer/contractor, housing agent, consultant and stakeholders on 4th September 2023 (Third Stakeholder's meeting to validate the Draft ESIA Study Report, September 2023).

No.	Issue	Response
1.	Confirmation of proceedings of the kick-off meeting and second meeting to review the Draft ESIA Study Report	• The consultant presented the key issues raised and responses provided by the proponent, consultant and stakeholders during the meetings.
2.	Providing each stakeholder with the design plans for the proposed project	• Each stakeholder was provided with a copy of the design plans for the proposed project.
3.	Procedure of purchasing the apartments	• The cost of the apartments range from KES 4Million to KES 9Million. • Anyone interested in purchasing the apartments should visit the housing agent office located at Kizingo area.
4.	Community benefits from the proposed project	• The contractor will liase with the Chief on employment opportunities and food vendors (women groups).

3.4 Impact analysis

Potential project impacts are predicted and quantified to the extent possible. The magnitude of impacts on resources such as water and air or receptors such as people, communities and habitats is defined. Magnitude is a function of the following impact characteristics;

1. Type of impact (direct, indirect, induced)
2. Size, scale or intensity of impact
3. Nature of the change compared to baseline conditions (what is affected and how)
4. Geographical extent and distribution (e.g. local, regional, international)
5. Duration and/or frequency (e.g. temporary, short-term, long term, permanent)

Magnitude describes the actual change that is predicted to occur in the resource or receptor. It takes into account all the various impact characteristics in order to determine whether an impact is negligible or significant. Some impacts can result in changes to the environment that may be

immeasurable, undetectable or within the range of normal natural variation. Such changes can be regarded as essentially having no impact and are characterized as having a negligible magnitude (Table 10).

1. **Negligible impact (very low) -** Where a resource or receptor would not be affected by a particular activity or the predicted effect is deemed to be imperceptible or is indistinguishable from natural background variations.
2. **Less than significant impact (Low**) - Is a minor impact where a resource or receptor would experience a noticeable effect but the impact magnitude is sufficiently low (with or without mitigation) and /or the resource or receptor is of low sensitivity. In either case, a less than significant impact must be sufficiently below applicable standard threshold limits.
3. **Potentially significant impact (moderate) -** A moderate impact that meets applicable standards but comes near the threshold limit. The emphasis for such moderate impacts is to demonstrate that the impact has been reduced to a level that is as minor as reasonably practicable so that the impact does not exceed standard threshold limits.
4. **Significant impact (high) -** One where an applicable standard threshold limit would or could be exceeded or if a highly valued or very scarce resource would be substantially affected.

Table 10: Risk and impact significance matrix for the proposed project.

Environmental impact	Magnitude of impact at construction phase		Magnitude of impact at operational phase		Magnitude of impact at possible decommissioning phase	
	WOM	WIM	WOM	WIM	WOM	WIM
Demolition of the existing residential house						
Change of land use						
Environmental risks of obtaining raw materials						
Loss of terrestrial vegetation cover						
Solid waste generation and management						
Water demand and effluent generation						
Occupational safety and health risks						
Noise pollution						
Air pollution						
Traffic congestion						
Fire risks and emergency preparedness						
Security concerns						
Increased energy demand						

***WOM**; Without Mitigation, **WIM**; With Mitigation

Legend

Impact magnitude	Colour
Negligible	
Low	
Moderate	
High	

3.5 Analysis of alternatives

Analyzing project alternatives is important as it allows the proponent to evaluate possible project options that could mitigate the environmental risks identified during the ESIA process through prevention, elimination of the risks all together or reduction of the severity of an impact. The analysis will also assist NEMA and lead agencies in decision making by either approving the project as proposed or advising the proponent on the need for a particular alternative such as an alternative site. In the current proposal, the alternatives identified are discussed in detail below.

3.5.1 The 'No Project' alternative

The 'No Project' alternative has the advantage of retaining the status quo, meaning that the predicted environmental impacts will not occur and is ideally a best-case scenario for mitigation. This option will however have the greatest implications on the socio-economic setting of the area and surrounding communities. This will mean the apartments will not be developed, the land will remain underutilized for the specific purpose it is supposed to serve and the positive impacts such as meeting the housing demand in Tudor and its environs, creation of the employment opportunities and revenue generation to the government will not occur. The "No project" alternative is therefore not considered viable in the light of the benefits and deprivations of the project.

3.5.2 The 'Yes Project' alternative

This option envisages that the proposed project will be implemented. It was considered as the most viable because the project will transform the project site into a viable residential property and hence contribute towards attainment of the social pillar of the Kenya's Vision 2030; Housing and urbanization. In addition, housing development is listed as a priority development under social and public facility sector that contribute to achieving development vision for Mombasa Gate City Master Plan. The implementation of the project will also create employment opportunities both during construction and operational phases.

3.5.3 Alternative site

An alternative site could be considered for the proposed project if it would present serious environmental challenges that cannot be effectively managed. However, the proposed mitigation measures are considered adequate to minimize the impacts to levels that do not warrant significant environmental damage. In addition, there is availability of adequate piece of land in which the proposed development will be built. This alternative is therefore not viable.

3.5.4 Downscaling the project

Another alternative would be to downscale the project by constructing lesser floors and hence lesser units. This alternative would serve to reduce the magnitude of the project impacts, but would also reduce the economic gain and social benefit of the project as proposed. In addition, the proposed project site has the capacity to accommodate the development as proposed. Downscaling is hence not considered a viable alternative.

4 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS

4.1 Introduction

The preceding section identified and analyzed the potential environmental and social impacts of the proposed residential development and mitigation measures to address the impacts. Under this section, three Environmental and Social Management Plans (ESMPs) are proposed to guide the proponent in implementing the mitigation measures. These are ESMPs for the construction, operational and possible decommissioning phases of the residential development (Tables 11, 12 & 13). Each of the ESMP is organized into five sections comprising of the environmental impact, the recommended mitigation measures, responsibility, timeframe, and budget. The strategies for mitigation include preventing the impact from occurring in the first place, minimizing the impact, taking corrective action where impact occurs among others.

Table 11: Environmental and Social Management Plan for the construction phase of the proposed residential development.

Environmental Impact	Recommended mitigation measures	Responsibility	Timeframe	Costs (KES)
Demolition of the existing residential house	Obtain demolition permit from the County Government of Mombasa	Contractor/Proponent	Prior to commencement	Quote from Mombasa County
	Demolition of the residential house should be carried out by experienced contractors	Contractor/Proponent	During demolition	Tender
	Recover re-usable materials for use in the proposed residential development	Contractor/Proponent	During demolition	Nil
	Procure NEMA contractor to dispose off demolition wastes	Contractor/Proponent	During demolition	Tender
	Provide and enforce the use of PPEs throughout the demolition works	Contractor/Proponent	During demolition	200,000
	Train workers on first aid and provide first aid kits at the site	Contractor/Proponent	During demolition	50,000
	Comply with the Sustainable Waste Management Act, 2022	Contractor/Proponent	During demolition	Nil
Change of land use	Apply for and obtain a change of user from the County Government of Mombasa	Proponent	Prior to commencement	Quote from Mombasa County
Environmental risks of obtaining raw materials	Source raw materials from sites that are EMCA compliant	Contractor/Proponent	During construction	Nil
	Have a procurement plan based on the Bill of Quantities	Contractor/Proponent	During construction	Nil
	Re-use construction waste materials such as wood and metal cuttings	Contractor/Proponent	During construction	Nil
Loss of terrestrial vegetation cover	Landscaping of the area post construction	Contractor/Proponent	After construction	Tender
Water demand and effluent generation	Promote water conservation	Contractor/Proponent	During construction	50,000 for posters
	Procure mobile toilet facilities	Contractor/Proponent	During construction	Tender
	Comply with the Water Quality Regulations, 2006	Contractor/Proponent	During construction	Nil
	Use of overburden in backfilling and landscaping	Contractor/Proponent	After construction	Nil

Environmental Impact	Recommended mitigation measures	Responsibility	Timeframe	Costs (KES)
Solid waste generation and management	Procure appropriate infrastructure for solid waste management including receptacles with segregation capacity	Contractor/Proponent	During construction	200,000
	Designate of a waste collection area	Contractor/Proponent	During construction	Nil
	Procure the services of a NEMA licensed contractor	Contractor/Proponent	During construction	Tender
	Comply with the Sustainable Waste Management Act, 2022	Contractor/Proponent	During construction	Nil
Occupational safety and health risks	Register the site with DOSHS as a workplace	Contractor/Proponent	During construction	5,000
	Ensure workers are allocated duties and responsibilities based on their training and competencies	Contractor/Proponent	During construction	Nil
	Provide first aid kits at the site and train selected employees on first aid administration	Contractor/Proponent	During construction	50,000
	Provide and enforce the use of appropriate PPEs	Contractor/Proponent	During construction	Procured at demolition
	Erect safety signage and boards at all construction zones	Contractor/Proponent	During construction	Included in project costs
	Ensure moving parts of machines and sharp surfaces are securely protected with guards to avoid unnecessary contacts and injuries	Contractor/Proponent	During construction	Nil
	All accidents should be reported, investigated and corrective action taken to prevent reoccurrence	Contractor/Proponent	During construction	Nil
	Contractor should have appropriate insurance cover as per the Work Injury Benefits Act	Contractor/Proponent	During construction	TBD based on employees
	Comply with the Occupational Safety and Health Act, 2007	Contractor/Proponent	During construction	Nil
Noise pollution	Locate peak noise producing machines away from settlements	Contractor/Proponent	During construction	Nil
	Procure and provide adequate earmuffs	Contractor/Proponent	During construction	Procured at demolition
	Use serviceable machinery	Contractor/Proponent	During construction	Nil
	Sensitize truck drivers to avoid unnecessary hooting and running of vehicle engines	Contractor/Proponent	During construction	Nil
	Comply with the Noise Regulations, 2009	Contractor/Proponent	During construction	Nil
Air pollution	Install appropriate and adequate dust screens around the project site	Contractor/Proponent	During construction	Included in project costs
	Sprinkle water at the excavation areas to suppress fugitive dust	Contractor/Proponent	During construction	Included in project costs
	Cover stockpiles of construction materials	Contractor/Proponent	During construction	Nil

Environmental Impact	Recommended mitigation measures	Responsibility	Timeframe	Costs (KES)
	Procure, provide and enforce the use of dust masks	Contractor/Proponent	During construction	Procured at demolition
	Use serviceable machinery/equipment and trucks	Contractor/Proponent	During construction	Nil
	Comply Air Quality Regulations, 2014	Contractor/Proponent	During construction	Nil
Traffic congestion	Erect signage and warnings along the road to forewarn other road users on the use of the road by HCVs	Contractor/Proponent	During construction	Included in project costs
	Offload construction materials on the site and not on the road reserves to ensure smooth flow of traffic	Contractor/Proponent	During construction	Nil
	Sensitize drivers to observe the designated speed limit along the road	Contractor/Proponent	During construction	Nil
	Comply with the provisions of the Traffic Act, 2016	Contractor/Proponent	During construction	Nil
Impacts of climate change	Incorporate climate change proofing in the design of the proposed residential development	Contractor/Proponent	During construction	Included in project costs
	Comply with the Climate Change Act 2023 and National Climate Change Action Plan 2018-2022	Contractor/Proponent	During construction	Nil

Table 12: Environmental and Social Management Plan for the operational phase of the proposed residential development.

Environmental Impact	Recommended mitigation measures	Responsibility	Timeframe	Costs (KES)
Increased water demand	Apply for and obtain water abstraction permit from WRA	Proponent	Prior to operations	Quote from WRA
	Install water saving systems such as self-closing taps and low flush water closets	Proponent	Prior to operations	In project costs
	Liaise with Mombasa Water Supply and Sanitation Company Limited to ensure reliable supply of water to the development	Proponent	During operations	Nil
	Carry out regular inspection and maintenance of the water distribution network to ensure zero leaks and damages	Proponent	Monthly	50,000
	Conduct domestic water quality analysis	Proponent	Quarterly	20,000
Effluent generation and management	Construct bio-digesters of 157.5m^3 capacity to accommodate the daily effluent flows	Proponent	Prior to operations	In project costs
	Install oil and grease traps in the kitchen sinks	Proponent	Prior to operations	In project costs
	Monitor the quality of effluent discharged from the bio-digester	Proponent	Quarterly	30,000
	Apply for and obtain an EDL from NEMA	Proponent	Annually	Quote from NEMA
	Comply with the Water Quality Regulations, 2006	Proponent	During operations	Nil

Environmental Impact	Recommended mitigation measures	Responsibility	Timeframe	Costs (KES)
Solid waste generation and management	Procure and provide adequate solid waste collection bins with a capacity for segregation	Proponent	During operations	Procured at construction
	Sensitize the residents on the process of solid waste collection, segregation and proper disposal	Proponent	During operations	Nil
	Contract a NEMA licensed waste handler for disposal of solid waste	Proponent	During operations	Procured at construction
	Comply with the Sustainable Waste Management Act, 2022	Proponent	During operations	Nil
Fire risks and emergency preparedness	Insure the development with an insurance company to safeguard against loses from fire risks	Proponent	During operations	TBD
	Develop, clearly display and implement a fire and emergency response action plan	Proponent	During operations	10,000
	Install appropriate firefighting equipment at strategic locations within the development	Proponent	During operations	200,000
	Firefighting equipment should be serviced by fire service providers	Proponent	Quarterly	Tender
	Designate a fire assembly point and clearly display emergency exit points at strategic locations within the development	Proponent	During operations	10,000 for signage
	Size all staircases for emergency escape	Proponent	During operations	Nil
	Undertake regular inspection and maintenance of electrical appliances	Proponent	Monthly	50,000
Traffic congestion	Control entry and exit of vehicles to and from the development	Proponent	During operations	Nil
	Comply with the provisions of the Traffic Act, 2016	Proponent	During operations	Nil
Security concerns	Contract a reputable security company to provide adequate guards, radio and alarm back-ups	Proponent	During operations	Tender
	Install CCTV cameras at strategic locations within the development	Proponent	During operations	In project costs
	Control access to the development at all times	Proponent	During operations	Nil
	Provide adequate lighting along the sky streets and the fence areas of the development	Proponent	During operations	In project costs
Increased energy demand	Sensitize the residents to switch off lights along the stairways and corridors when not in use	Proponent	During operations	Nil
	Promote the use of energy saving bulbs in the apartments	Proponent	During operations	Nil

Environmental Impact	Recommended mitigation measures	Responsibility	Timeframe	Costs (KES)
	Harness solar energy to power lighting system in areas such walkways and parking areas among others	Proponent	During operations	In project costs
	Install solar water heating systems	Proponent	During operations	In project costs

Table 13: Environmental and Social Management Plan for the decommissioning phase of the proposed residential development.

Environmental Impact	Recommended mitigation measures	Responsibility	Timeframe	Costs (KES)
Loss of housing units	Give three (3) months prior notice to the residents to find alternative housing units	Proponent	Prior to decommissioning	Nil
Waste generation and management	Obtain demolition permits from the County Government of Mombasa	Contractor/Proponent	Prior to decommissioning	Quote from Mombasa County
	Recover re-usable materials for sale or use in other project sites	Contractor/Proponent	During decommissioning	Nil
	Contract a NEMA licensed waste handler to handle and dispose both solid waste and effluent	Contractor/Proponent	During decommissioning	Tender
	Comply with the provisions of the Waste Management Regulations, 2006 and Water Quality Regulations, 2006	Contractor/Proponent	During decommissioning	Nil
Safety and health risks	Erect signage to forewarn people on ongoing demolition activities	Contractor/Proponent	During decommissioning	10,000
	Provide and enforce the use of PPE	Contractor/Proponent	During decommissioning	200,000
	Avail first aid kits on site	Contractor/Proponent	During decommissioning	20,000
	Ensure the process of demolition is supervised by competent personnel	Contractor/Proponent	During decommissioning	Nil
	Comply with the Occupational Safety and Health Act, 2007	Contractor/Proponent	During decommissioning	Nil

5 ENVIRONMENTAL AND SOCIAL MONITORING PLANS

5.1 Introduction

Effective implementation of the Environmental and Social Management Plan requires the development and implementation of a suite of monitoring plans for the environmental media and socio-economic issues identified during the baseline survey. The objective of the monitoring plans is to enhance the environmental performance of the proposed project by providing data and information on compliance with legislative standards, conservation and preservation of the environment and determining the levels of deviation from the values obtained during the baseline monitoring. This is in turn informs the corrective measures if any that need to be implemented to comply with the legislative standards and best industry practices. Based on the baseline monitoring results, the ESIA proposes four environmental media monitoring plans and a social one focusing on Grievances Redress Mechanism. They are;

1. Air quality monitoring plan
2. Noise monitoring plan
3. Water quality monitoring plan
4. Solid waste monitoring plan
5. Social monitoring plan (Grievances Redress Mechanism)

5.2 Air quality monitoring plan

5.2.1 Introduction

Potential sources of air pollution include dust emissions and exhaust fumes during the construction phase. Air pollution above the acceptable level can potentially cause health problems which include respiratory diseases and visual irritants. The purpose of the air quality monitoring plan is to therefore measure the concentrations of dust and gaseous emissions emanating from the project activities and compare with the results obtained during the baseline survey. In addition, the results will be used to evaluate if the adopted air pollution controls and management are effective.

5.2.2 Monitoring location

Air quality monitoring will be conducted at monitoring stations within the project site based on the baseline sampling points (Location 1: Latitude 4°02'03.912"S and Longitude 39°40'06.7404"E, Location 2: Latitude 4°02'03.732"S and Longitude 39°40'06.9384"E, Location 3: Latitude 4°02'03.7176"S and Longitude 39°40'07.176"E and Location 4: Latitude 4°02'01.8168"S and 39°40'08.8968"E).

5.2.3 Monitoring parameters

Construction activities are a source of fugitive emissions and these should be monitored during the construction phase as per the First Schedule of the Environmental Management and coordination (Air Quality) Regulations, 2014 (Table 14).

Table 14: Air quality parameters and ambient air quality tolerance limits as per the First Schedule of the Environmental Management and coordination (Air Quality) Regulations, 2014.

Pollutant	Time weighted average	Residential area, Rural & other areas
Sulphur Oxides (SO_X)	Annual Average*	60 $\mu g/m^3$
	24 hours**	80 $\mu g/m^3$
Oxides of Nitrogen (NO_x)	Annual Average*	60 $\mu g/m^3$
	24 hours**	80 $\mu g/m^3$
Nitrogen Dioxide	Annual Average	0.05 ppm
	24 hours	0.1 ppm
Suspended Particulate Matter (SPM)	Annual Average*	140 $\mu g/m^3$
	24 hours**	200 $\mu g/m^3$

Pollutant	Time weighted average	Residential area, Rural & other areas
Respirable particulate matter (< 10μm) (RPM)	Annual Average*	50 $\mu g/m^3$
	24 hours**	100 $\mu g/Nm^3$
Carbon monoxide/ Carbon dioxide	Annual Average*	2.0 mg/m^3
	24 hours**	4.0 mg/m^3
Non methane hydrocarbons	Instant Peak	700ppb
Ozone	One hour	0.12 ppm
	8 hour (instant peak)	1.25 ppm

5.2.4 Monitoring methods
Air quality measurements should be carried out at the project area for a 24-hour period by employing Aeroqual portable air monitors which uses a mix of sensor technologies and dust samplers using the laser particles sensors for monitoring particulate suspended matter. The results interpretation and analysis as well as sampling duration information should be used to calculate the gases concentrations.

5.2.5 Monitoring frequency
Air quality monitoring will be done on a quarterly basis in collaboration with a NEMA designated laboratory.

5.3 Noise monitoring plan
5.3.1 Introduction
Potential sources of noise pollution will emanate mainly from the actual construction activities, machinery and equipment operations and vehicular movements among others. Noise may lead to hearing impairments which will reduce the workmanship of the employees and affect their finances due to treatment and medication. The objectives of the noise level measurements are to inform measures to safeguard the health of employees and visitors during construction phase and ensure compliance with the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009 (Table 15).

Table 15: Maximum permissible intrusive noise levels for construction sites as per the Second Schedule of the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009.

Zone		Maximum Noise Level Permitted (Leq) in db(A)	
		Day	Night
(i)	Health facilities, educational institutions, homes for disabled etc.	60	35
(ii)	Residential	60	35
(iii)	Areas other than those prescribed in (i) and (ii)	75	65

5.3.2 Monitoring location
The monitoring locations will coincide with those of the air quality monitoring stations within the project site based on the baseline sampling points.

5.3.3 Monitoring methods

Noise measurements will be conducted at the project site area for 24 hours. Prior to recording the noise measurements, an inspection of the monitoring points and implicated activities of the area should be undertaken. Noise levels will be determined by the noise level meter, with an inbuilt, w̄octave/octave band filter which does real time and octave analysis. The noise level meter will be raised 2 meters above the ground and fitted with a ½" electrets condenser microphone with a measurement range of between 30 - 130dB and a frequency range and weighting of 25Hz – 10KHz and A, C & Z respectively. For all measurements taken to establish the ambient noise levels, the equivalent noise level (LAeq), the sound pressure level at 5%, 50% & 95% (L5), (L50), (L95) respectively during that measurement period at 1-hour interval. The noise level will be measured in terms of the A-weighted equivalent continuous sound pressure level Leq. Each individual measurement will be taken simultaneously with the nature of the noise climate of the area. This will involve an auditory observation and identification of noise incidents influencing the noise level meter readings by the surveyor.

5.3.4 Monitoring frequency

Noise monitoring should be done on a quarterly basis in collaboration with a NEMA designated laboratory. Noise levels will be measured in dB (A).

5.4 Water quality monitoring plan

5.4.1 Introduction

The proponent should put in place consistent water quality monitoring plan for the borehole water and the effluent generated from the development. The purpose of the monitoring plan is to ensure the quality of water from the borehole is fit for portable water as per the KS EAS 12:2018 specification for natural potable water and effluent generated complies with the standards prescribed under the Third Schedule of the Environmental Management and Coordination (Water Quality) Regulations, 2006.

5.4.2 Monitoring locations

Water quality monitoring will be carried out at the borehole and at the discharge point of the bio-digesters.

5.4.3 Monitoring parameters

Borehole water will be monitored pursuant to the KS EAS 12:2018 specification for natural potable water (Table 16) whereas effluent from the bio-digesters will be monitored pursuant to the Third Schedule of Environmental Management and Coordination (Water Quality) Regulations, 2006 (Table 17).

Table 16: Water quality monitoring parameters as per KS EAS 12:2018 specification for natural potable water.

Parameter	KS EAS 12: 2018: Specification for natural portable water
PHYSICAL TESTS	
Appearance	Unobjectionable
Odour	Unobjectionable
Suspended matter	Not detectable
Colour hazen units, TCU	50 MAX
PH@25°C	5.5-9.5
Conductivity, μS/cm	2500 MAX
CHEMICAL TESTS	
Total dissolved solids, mg/L	1500 MAX

Parameter	KS EAS 12: 2018: Specification for natural portable water
Total hardness as $CaCO_3$,mg/L	600 MAX
Chlorides as Cl, mg/L	250 MAX
Aluminium as Al, mg/L	0.2 MAX
Manganese as M, mg/L	0.1 MAX
Iron as Fe, mg/L	0.3 MAX
Sodium as Na, mg/L	200 MAX
Magnesium as Mg, mg/L	100 MAX
Calcium as Ca, mg/L	150 MAX
Lead as Pb, mg/L	0.01 MAX
Copper as Cu, mg/L	1.0 MAX
Flouride as F, mg/L	1.5 MAX
Potassium as K, mg/L	50 MAX
Sulphates as SO_4, mg/L	400 MAX
Total alkalinity as $CaCO_3$, mg/L	-
Residual Chlorine as Cl_2, mg/L	Absent
MICROBIOLOGICAL TESTS	
Total plate count@ 37°C, cfu/ml	50 MAX
Total plate count@ 22°C, cfu/ml	100 MAX
Total coliform count, cfu/ml	Absent
Escherichia coli, cfu/ml	Absent
Pseudomonas aeruginosa, /100ml	Absent

Table 17: Water quality monitoring parameters and the standards prescribed under the Third Schedule of the Environmental Management and Coordination (Water Quality) Regulations, 2006.

Parameter	Standards
pH Value	6.5-8.5
Biological Oxygen Demand mg/L	30max
Chemical Oxygen Demand mg/L	50 max
Total Suspended Solids mg/L	30 max
Ammonia-NH+;mg/L	100 Max
Total Dissolved Solids mg/L	1200 Max
E. Coli Colonies count/100ml	Nil
Total coliform count/100ml	30mg/L

5.4.4 Monitoring methods

The water sample from the borehole and effluent from the bio-digesters will be analyzed as per the baseline parameters and methods (Tables 18 & 19).

Table 18: Water Quality Monitoring Tests and Methods.

Test	Method
PHYSICAL TESTS	
Appearance	APHA Method 2110
Odour	APHA Method 2150 B
Suspended matter	KS05-459-2
Colour hazen units, TCU	APHA Method 2120B
pH@25°C	APHA Method 4500-H^+
Conductivity, μS/cm	APHA Method 2510 B
CHEMICAL TESTS	
Total dissolved solids, mg/L	APHA Method 2540C
Total hardness as CaCO3,mg/L	KS05-459-2

Test	Method
Chlorides as Cl, mg/L	KS05-459-5
Aluminium as Al, mg/L	APHA Method 3111D
Manganese as M, mg/L	APHA Method 3111B
Iron as Fe, mg/L	APHA Method 3111B
Sodium as Na, mg/L	APHA Method 3111B
Magnesium as Mg, mg/L	APHA Method 3500-Mg B
Calcium as Ca, mg/L	APHA Method 3111B
Lead as Pb, mg/L	APHA Method 3111B
Copper as Cu, mg/L	APHA Method 3111B
Flouride as F, mg/L	PQA/LIM/061
Potassium as K, mg/L	APHA Method 3111B
Sulphates as SO4, mg/L	APHA Method 4500-S04 B
Total alkalinity as $CaCO_3$,mg/L	KS05-459-2
Residual Chlorine as Cl_2,mg/L	APHA Method 4500-Cl^- B
MICROBIOLOGIAL TESTS	
Total plate count@ 37°C,cfu/ml	APHA 6200B
Total plate count@ 22°C,cfu/ml	APHA 6200B
Total coliform count, cfu/ml	APHA 6200B
Escherichia coli, cfu/ml	APHA 6200B
Pseudomonas aeruginosa,/100ml	

Table 19: Water Quality Monitoring Methods and Equipment.

Parameters	Test Methods
pH Value	APHA method No. 4500-H*B
Biological Oxygen Demand	AOAC Method 973.44
Chemical Oxygen Demand	Standard wastewater method No. 5220-B
Ammonia –NH^{4+} (mg/L)	APHA Method 4500-NH_3 G
Total Suspended Solids	APHA method No. 2540-D
Total Dissolved Solids	APHA Method 2540 C
Total coliform count/100ml	KS 05-459
E.coli colonies count/100ml	APHA Method 9221G

5.4.5 Monitoring frequency

Borehole water sampling and analysis should be undertaken monthly whereas that for effluent should be undertaken quarterly in collaboration with a NEMA designated laboratory.

5.5 Solid waste monitoring plan

5.5.1 Introduction

Solid waste will be generated during constructional and operational phases of the proposed development. Poor disposal of solid waste causes environmental pollution and therefore poses a health risk to the workers, residents and visitors. The purpose of the monitoring plan is to therefore ensure solid waste is managed in such a way that it protects both the public health and environment.

5.5.2 Monitoring frequency

The frequency of solid waste monitoring will differ from the collection to the disposal stage in order to ensure reduced odours and accumulated heaps of waste. Table 20 describes the outline for which the activity will be monitored but can be adjusted depending on the amount generated.

Table 20: Sample outline for solid waste monitoring plan.

Activity	Frequency	Critical levels (Tons)	Target	Responsibility
Collection	Daily			
Storage	Daily			
Management	Daily			
Disposal	Weekly			

5.5.3 Monitoring strategy

The solid waste monitoring plan will document the collection, storage and disposal of solid waste from the proposed development. There is need to code each of the collection points, note the capacity and critical levels, frequency of disposal and the personnel and contractor responsible. In addition, it will be important to characterize the waste streams at the collection points to inform investments in segregation infrastructure.

Indicators of success will include timely collection and disposal of waste by the contractors and waste disposal tracking documents.

5.6 Grievances Redress Mechanism

5.6.1 Introduction

Project affected persons and other stakeholders will be provided with opportunities to raise their grievances and dissatisfactions about actual or perceived impacts of the project to find a satisfactory solution. These grievances, influenced by their physical, situational and/or social losses, can emerge at the different stages of the project cycle. Not only should the affected persons be able to raise their grievances and be given an adequate hearing, but also satisfactory solutions should be found that mutually benefit both the affected persons and the project. It is equally important that the affected persons have access to legitimate, reliable, transparent and efficient institutional mechanisms that are responsive to their complaints.

5.6.2 Grievances prevention

Grievances cannot be avoided entirely, but much can be done to reduce them to manageable numbers and reduce their impacts. This will be achieved by;

1. Providing sufficient and timely information to communities. Many grievances arise because of misunderstandings; lack of information; or delayed, inconsistent or insufficient information. Accurate and adequate information about a project and its activities, plus an approximate implementation schedule, should be communicated to the communities, especially affected parties, regularly.
2. Conduct meaningful community consultations. The project proponent should continue the process of consultation and dialogue throughout the implementation of the project. Sharing information, reporting on project progress, providing community members with an opportunity to express their concerns, clarifying and responding to their issues, eliciting communities' views, and receiving feedback on interventions will benefit the communities and the project management.
3. Overall good management of the development will ensure a reduction in potential conflicts with the local community and other stakeholders.

5.6.3 Grievances Redress Mechanism Tool

The proponent and contractor should develop and adopt a GRM during the construction phase. The objective of the GRM tool is to ensure that grievances by stakeholders are addressed and resolved in a fair and transparent manner and ensure careful documentation and reporting of

grievances and corrective actions. The flow chart below shows the steps followed during the implementation of the GRM tool by the proponent (Figure 13).

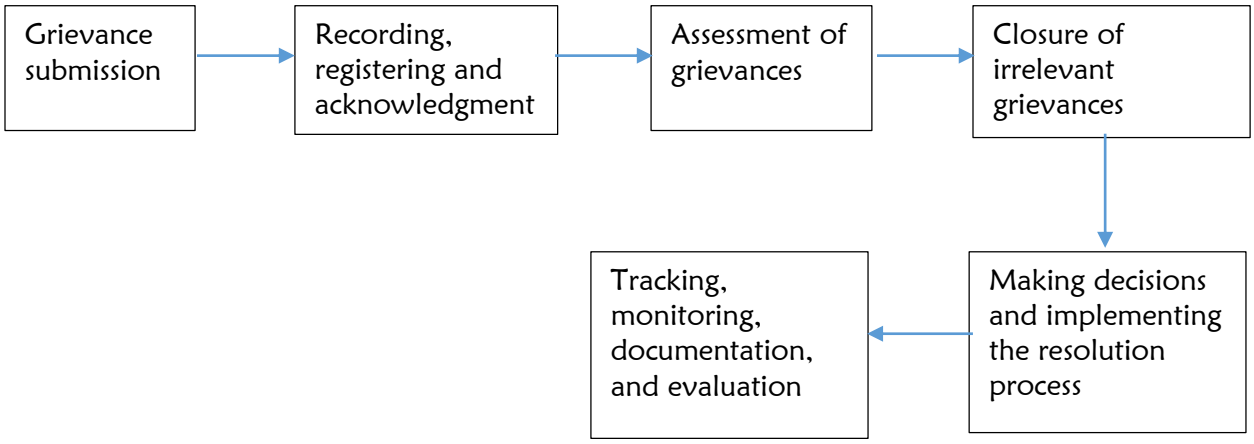


Figure 13: Grievances Redress Mechanism Tool flow chart (Source: Envasses Environmental Consultants Limited, 2023).

6 GOVERNANCE FRAMEWORK

6.1 Introduction

The Third Schedule of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003 stipulates the inclusion of environmental guidelines, standards, government policies, national legislation, and institutional arrangements in the ESIA. These frameworks are safeguards for protecting fragile environments and vulnerable communities while supporting the implementation of the Environmental and Social Management Plan (ESMP) for the proposed development. This section discusses the applicable policy, legal and institutional framework which the proponent and other project stakeholders must comply with for sustainable development.

6.2 Policy Framework

6.2.1 National Environment Policy, 2013

Kenya has a National Environment Policy prepared and approved in 2013 by the Ministry of Environment, Water and Natural Resources. Its overall goal is to provide better quality of life in Kenya for present and future generations through sustainable management of resources and environmentally- friendly development. Chapter 5 of the policy elaborates on environmental stewardship and specifically part 5.6 states that environmental impacts of infrastructural developments like buildings are distinct and unique such as effects on flora and fauna, social and psychological disruption, and vegetation clearance among others. Chapter 6 of the policy elaborates on environmental quality and health and the need to ensure a clean and health environment for all.

The relevant policy statements for the development are;

- Ensure Strategic Environmental Assessment (SEA), Environmental Impact Assessment, Social Impact Assessment and Public participation in the planning and approval of infrastructural projects.
- Develop and implement environmentally-friendly national infrastructural development strategy and action plan.

6.2.2 National Climate Change Framework Policy, 2016

The policy was developed to facilitate a coordinated, coherent and effective response to the local, national and global challenges and opportunities presented by climate change. An overarching mainstreaming approach has been adopted and applicable to the proposed project; is to ensure the integration of climate change considerations into the planning, budgeting, and implementation of the development activities. The climate change considerations will enhance adaptive capacity and build resilience of the project to climate variability and change, while promoting a low carbon development pathway.

6.2.3 The National Water Policy, 2012

The policy enhances water resource management and pollution control through abstraction permits and standards for effluent discharge. Its main aim is to treat water as economic good which the ministry claims to promote its conservation and efficient use. The project should therefore comply with the policy provisions through pollution prevention and obtaining the necessary permits for water use throughout the project cycle.

6.2.4 The National Sustainable Waste Management Policy, 2020

The overall objective of the policy is to advance Kenya towards a more sustainable and circular, green economy. Based on the policy, the County has prepared it's a solid waste management policy which seeks to move the Country towards realization of the Zero Waste principle, whereby waste generation is minimized or prevented. Additionally, the policy aims to ensure that waste is collected, separated at the source, reused and recycled, and that the remaining waste stream is destined to a secure, sanitary landfill. The proposed project will be required to comply with this policy by planning and implementing effective waste management strategies throughout the project cycle.

6.2.5 Integrated Coastal Zone Management Policy, 2017

The National Environment Policy statements tasks NEMA to develop and implement a harmonised ICZM Policy and Integrated Ocean Management Policy, Strategy and Action Plan. This policy statement has since been developed and is the process of being implemented in line with Section 55 of the Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya. The overall objective of the ICZM Policy is to guide the management and utilisation of the coastal and marine environment and its resources to ensure sustainable livelihoods and development through seven strategic areas which have been identified and prioritised for action in the ICZM Policy. These strategic areas include conservation of the Coastal and Marine Environment – conserve the coastal and marine resources and environment for sustainable development.

Based on the strategic areas identified and prioritised for action in the ICZM Policy, a National Plan of Action for the coastal and marine environment of Kenya, 2019-2023 has also been developed to promote sustainable development in the coastal zone. Its main objectives include cconservation and restoration of critical habitats and biodiversity, sustainable utilization of coastal and marine resources, prevention and control of pollution in the coastal and marine environment, protection and mitigation of shoreline change and conservation and restoration of cultural and heritage sites. A strategy for the shoreline management planning process has also already been developed (GOK, 2010).

6.2.6 The Shoreline Management Strategy for Kenya, 2010

NEMA developed a shoreline management plan consistent with the Environment and ICZM policies. The Strategy firstly identifies the key shoreline management issues in Kenya on a systematic basis using sediment cells, recommends shoreline management policies and objectives in response to these observed issues and finally outlines strategies to achieve these policies and objectives. A total of 29 sediment cells have been identified in the strategy. The project site is listed under sediment cell 19 and 20 (Mombasa Island and Mombasa Estuary) (Table 21).

Table 21: An extract of Sediment Cell 19 and 20 where the project site is listed under the Shoreline Management Strategy for Kenya including the conservation objectives and strategies (Source: Shoreline Management Strategy for Kenya, 2010).

Cell	Objectives	Strategies
Cell 19 (Mombasa Island)	Maintain infrastructure (ports, fish landing sites, etc.)	• Promote good planning and development of infrastructure
	Maintain private and commercial property	• Develop and implement residential areas development standards • Protect fish market from encroachment • Protect property from shoreline erosion

Cell	Objectives	Strategies
	Control and reduce pollution	• Enforce laws on pollution prevention and control • Revive waste treatment plants and ensure maintenance Put solid waste management infrastructure in place
	Maintain heritage sites	• Protect heritage sites against erosion
Cell 20 (Mombasa estuary)	Maintain infrastructure	• Promote good planning and development of infrastructure in residential areas • Develop and implement residential areas development standards
	Control and reduce pollution	• Enforce laws on pollution prevention and control • Revive waste treatment plants and ensure maintenance • Put solid waste management infrastructure in place. • Regulate river sand mining • Enforce pollution mitigation measures • Carry out infrastructure rehabilitation programmes
	Maintain commercial and residential property	• Protect property from shoreline erosion • Protect fish market from encroachment • Protect against flooding • Initiate river gauging to obtain data for formulation of mitigation measures

6.2.7 Integrated Strategic Urban Development Plan (Mombasa Vision 2035)

The overall aim is to promote and provide a Sustainable Development of Mombasa enabling it to accommodate the needs of existing and future residents, and also to facilitate its prime function as commercial and trading hub.

6.3 Legal framework

6.3.1 The Kenya Constitution, 2010

The Constitution of Kenya 2010 is the supreme law of the land. Under Chapter IV, Article 42 provides for the right to a clean and healthy environment for all. Further, Chapter V of the Constitution deals with Land and Environment. Specifically, Part 2 elaborates on the obligations of the proponent in respect to protection of the environment and enforcement of environmental rights.

Relevance to the proposed project

- The proponent should ensure that the construction and operation activities do not infringe on the right to a clean and healthy environment for all.
- The proponent must ensure that the operations are carried out in an ecologically, economically, and socially sustainable manner.
- The proponent is entitled to a fair administrative decision-making process from NEMA and other State Agencies.

6.3.2 The Environmental Management and Co-ordination Act Cap. 387 of the Laws of Kenya

The Act is the framework environmental law in Kenya and aims to improve the legal and administrative co-ordination of the diverse sectoral initiatives in the field of environment to enhance the national capacity for its effective management. The Act harmonizes the sector specific legislations relevant to the environment and aligned to the National Environment Policy, 2013.

Relevance to the proposed project

Sections 58 and 68 of the Act prescribe Environmental Impact Assessment (EIA) and Audit (EA) depending on whether a project is proposed or its ongoing respectively. To operationalize the Act the Ministry of Environment and Forestry has gazetted Regulations to inform and enforce compliance (Table 22).

Table 22: Regulations under the Environmental Management and Coordination Act Cap 387 of the Laws of Kenya.

Regulation	Article	Relevance to the proposed project and compliance requirements
Impact Assessment and Audit Regulations, 2003	EMCA (Section 58)	EIA Licence required prior to construction of the development hence the ESIA
Water Quality Regulations, 2006	EMCA (Section 50)	A bio-digester is required to ensure treatment of wastewater to the Standards in Third Schedule of the Regulations Once operational, the proponent should apply and obtain an Effluent Discharge Licence for the development from NEMA
Air Quality Regulations, 2014	EMCA (Section 78)	Proponent should provide and enforce the use of dust masks to workers and visitors to the site
Noise Regulations, 2009	EMCA (Section 101)	Proponent should provide and enforce the use of ear muffs to workers and visitors to the site
Waste Management Regulations, 2006	EMCA (Section 86)	Proponent should provide infrastructure for collection, segregation, and disposal of solid wastes by a NEMA Licensed contractor
Biodiversity Regulations, 2006	EMCA (Section 36(a)	Proponent should promote and ensure conservation of riparian and aquatic biodiversity

6.3.3 The Sustainable Waste Management Act, 2022

The Act seeks to establish the legal and institutional framework for sustainable management of solid waste and to ensure the realization of the constitutional provision of a clean and healthy environment and connected purposes. The objectives of the Act are; improving the health of all Kenyans by ensuring a clean and healthy environment; reduction of air, land, fresh water and marine pollution; ensuring the delivery of waste service; creating an enabling environment for employment in the green economy in waste management, recycling and recovery; circular economy practices promotion; mainstreaming resource efficiency principles in sustainable consumption; improving responsible public behavior on waste and environment. The Act is based on the following principles: precautionary principle; polluter pays principle; payment for ecosystem service and zero waste principle.

Relevance to the proposed project

The proponent will be required, under section 20 (1), to segregate waste at source in accordance with provisions of the Act and ensure waste disposal is carried out by licensed waste service providers or at collection points designated in accordance with the provisions of the Act.

6.3.4 The Mombasa County Solid Waste Management Act, 2021

It is an Act of the County Assembly of Mombasa to provide for the collection, transportation and disposal of solid waste and for connected purposes. The objectives of the Act is to; (a) provide for an effective, equitable, responsive and sustainable solid waste management system; (b) protect public, occupational and environmental health; (c) provide for affordable service in solid waste management that addresses local needs of the residents; (d) contribute to sustainable use of natural resources through prevention of waste, materials recovery and recycling; (e) enhance capacity development and empowerment of local residents in sustainable solid waste management; (f) promote acquisition and adoption of modern technology and innovation in solid waste management; and (g) promote research and development in solid waste management.

Relevance to the proposed project

The proponent should comply with Regulation 16 of the Act on installation of waste handling and storage receptacles. The Regulations state that;

1. The owner of a premise shall;
   - designate or construct an area within the premises where solid waste generated shall be deposited or stored;
   - place appropriate receptacles and maintain them in accordance with public health standards; and
   - ensure no waste is deposited within five metres of a premise.
2. The area designated for waste storage shall be enclosed to avoid open exposure and emission of obnoxious.

6.3.5 The Climate Change Act, 2023

The Act provides a regulatory framework for the development, management, implementation and regulation of mechanisms to enhance climate change resilience and low carbon development for the sustainable development of Kenya. It provides for mainstreaming of climate change responses into development planning, decision making and implementation as well as resilience and adaptation in all governance sectors. The global per capita Carbon (IV) oxide emission averaged 4.47metric tons per person in 2020.

Relevance to the proposed project

- The proponent should implement measures to ensure low carbon footprint at the project site through incorporating low carbon technologies in order to reduce emission intensity.
- The proponent should install renewable energy infrastructure for lighting and ensure compliance with the Environmental Management and Coordination (Air Quality) Regulations, 2014.

6.3.6 The Fisheries Management and Development Act, 2016

The Fisheries Management and Development Act provides the framework for the development, management, exploitation, utilization and conservation of fisheries and for connected purposes. Article 49 (1) and 50 (1) of the subsidiary Regulation fisheries conservation, management and development has provisions for the prevention of pollution and protection of fish breeding areas. The overall objective of this Act is to protect, manage, use and develop the aquatic resources in a

manner which is consistent with ecologically sustainable development, to uplift the living standards of the fishing communities and to introduce fishing to traditionally non-fishing communities and to enhance food security. As part of the implementation of the Act and improve community participation in the conservation and management of fisheries, the Kenya Government gazetted the Beach Management Units (BMUs) Regulations in 2007.

Relevance to the proposed project

The proponent will implement measures to prevent pollution of the Tudor Creek by both solid wastes and effluent generated by construction and operation activities which would degrade water quality and affect fisheries productivity.

6.3.7 Forest Conservation and Management Act, 2016

The Act provides for the development and sustainable management, including conservation and rational utilization of all forest resources for the socioeconomic development of the country and for connected purposes.

Relevance to the proposed project

The proponent should enhance protection of the mangrove ecosystem.

6.3.8 Physical and Land Use Planning Act, 2019

The Act provides for the planning, use, regulation and development of land and for connected purposes. It was enacted to ensure that every person engaged in physical and land use planning shall promote sustainable use of land and livable communities which integrates human needs in any locality. The Act allows the County Government to prepare a local physical and land use development plan in respect of a County, Sub-County, or unclassified urban area.

Relevance to the proposed project

The proponent will obtain applicable planning approvals from the County Government of Mombasa for the proposed development.

6.3.9 The Public Health Act, 2012

The Act aims at prohibiting activities that may be injurious to the general public. It outlines the responsibilities for the County Government to maintain a safe and clean environment by controlling the operational activities of any facility.

Relevance to the proposed project

The proponent should ensure compliance with Act by providing clean, healthy and safe environment throughout the project cycle.

6.3.10 Occupational Safety and Health Act, 2007

This Act of Parliament provides for the safety, health and welfare of workers and all persons lawfully present at workplaces. Although the OSHA, 2007 repealed the Factories and Other Places of Work Act Cap. 514 of the Laws of Kenya, it inherited all the subsidiary legislation issued under Cap. 514 which include;

- Docks Rules L.N. 306 of 1962
- Eyes Protection Rules L.N. 44 of 1978
- Building Operations and Works of Engineering Construction Rules L.N. 40 of 1984
- Electric Power Special Rules L.N. 340 of 1979
- First Aid Rules L.N. 87 0f 1964

- Cellulose Solutions Rule L.N. 87 of 1964
- Health and Safety Committee Rules L.N. 31 of 2004
- Medical Examination Rules L.N. 24 of 2005
- Noise Prevention and Control Rules L.N. 25 0f 2005
- Fire Risk Reduction Rules L.N. 59 0f 2007
- Hazardous Substances Rules L.N. 60 of 2007

Relevance to the proposed project

Under OSHA, the proponent should register the construction site as a workplace with DOSHS. In addition, the proponent should provide the workers with adequate and appropriate PPE and enforce their use at work during the construction phase.

6.3.11 The Water Act, 2016

The Constitution acknowledges access to clean and safe water as a basic human right and assigns the responsibility for water supply and sanitation service provision to the counties. The purpose of the 2016 Water Act is to align the water sector with the Constitution's primary objective of devolution. The Act establishes several organs to ensure development and sustainable use of water resources. These include the Water Resources Authority (WRA), the Water Sector Trust Fund (WSTF), Water Resources Users Associations (WRUAs), Water Services Providers (WSPs) and Water Works Development Agencies among others.

Relevance to the proposed project

The Water Act provides for the management, conservation, use and control of water resources and for the acquisition and regulation of rights to use water, to provide for the regulation and management of water supply and sewerage services. The proponent will obtain permits for water abstraction during operational phase.

6.3.12 The Energy Act, 2019

The Act stipulates the electrical supply requirements one has to meet and offenses related to supply and use of electricity.

Relevance to the proposed project

The proponent is required to ensure that the energy supplied is consumed in accordance to the provisions of the Act and undertake energy audits at least once every 3 years.

6.3.13 The County Government Act, 2012

The new constitution grants County Governments the powers to grant or to renew business licenses or to refuse the same. To ensure implementation of the provisions of the new constitution, the County Governments are empowered to make by-laws in respect of all such matters as are necessary or desirable for the maintenance of health, safety and well-being of the general public.

Relevance to the proposed project

The Act gives the right to always access all property by the County Government officers and servants for inspection purposes. The Management will be under obligation to allow County officers and inspectors at the premises and comply with the by-laws of the County with respect to public health and safety.

6.4 Institutional arrangements to implement the legal framework

Several institutions have been established to implement the policy and legal framework discussed in the preceding section (Table 23).

Table 23: Institutions and their legislative mandate as it applies to the proposed project.

Institutions	Legislative mandate
National Environment Management Authority	To implement the Environmental Management and Coordination Act and Associated Regulations
Water Resources Authority	To implement the Water Act, 2016
County Government of Mombasa	To implement the County Government Act, 2012 and its by-laws
Department of Public Health	To implement the Public Health Act, 2012
Directorate of Occupational Safety and Health Services	To implement the Occupational Safety and Health Act, 2007 alongside the subsidiary legislation

7 CONCLUSION AND RECOMMENDATIONS

The proposed residential development will have both positive and negative impacts throughout the project cycle. These benefits will include meeting the housing demand in Tudor area and its environs, contribution of the project towards attainment of Vision 2030, provision of employment opportunities and generation of revenue to the government.

Overall, the project cycle impacts are within the range of low to high and the ESIA has recommended mitigation measures and a suite of ESMPs to address them to either low or negligible levels. Prior to commencement of the project, the proponent should apply for and obtain change of land use from low to high density residential from the County Government of Mombasa. Effective waste management will be key during the demolition, construction and operation of the development where the proponent should comply with the Sustainable Waste Management Act, 2022 and Water Quality Regulations, 2006. In combating occupational safety and health risks, the proponent should register the site as a workplace with DOSHS and comply with OSHA, 2007. Noise and air pollution will be addressed by provision of adequate PPE and complying with Noise and Air Quality Regulations gazetted in 2009 and 2014 respectively. In addition, the proponent should ensure compliance with the recommendations of the stakeholder meetings. To prevent conflicts and ensure sustainability of the project, the ESIA has recommended a GRM which should be a shared responsibility between the contractor and proponent at construction phase and the proponent at operational and decommissioning phases.

Implementing these mitigation measures, the ESMPs and continuous monitoring of the project activities would potentially lower all the identified risks from high to levels of low or no significance. On this basis the ESIA findings and the commitment by the proponent to implement the ESMPs, the ESIA recommends the issuance of an EIA Licence pursuant to the Environmental Management and Coordination Act Cap 387 of the Laws of Kenya.

8 REFERENCES

1. Envasses, 2018. Comprehensive Environmental Management and Conservation Plan for the Mombasa Special Economic Zone Development Project, 2018.
2. Envasses, 2019. Assessment of Plastic Value Chain within the Kenyan Coast.
3. GOK (2017). National Mangrove Ecosystem Management Plan. Kenya Forest Service, Nairobi, Kenya.
4. Government of Kenya Policies:
   - National Environment Policy, 2013
   - National Climate Change Framework Policy, 2016
   - The National Water Policy, 2012
   - The National Sustainable Waste Management Policy, 2020
   - Integrated Coastal Zone Management Policy, 2017
   - The Shoreline Management Strategy for Kenya, 2010
   - Integrated Strategic Urban Development Plan (Mombasa Vision 2035)
5. Habitat for Humanity, 2019. The housing need in Kenya.
6. Hilda Manzi & Viola C. Kirui (2021). Assessment of the Socio Economic Role of Mangroves and their Conservation Framework in Kenya. IUCN Kenya and Geo-Spatial Research International, Nairobi.
7. Kenya National Bureau of Statistics, 2019. Kenya Population and Housing Census.
8. Mohamed, M. O. S., Neukermans, G., Kairo, J. G., Dahdouh-Guebas, F., and Koedam, N. (2008). Mangrove forests in a peri-urban setting: the case of Mombasa (Kenya). Wetlands Ecology and Management 17, 243-255., doi: 10.1007/s11273-008-9104-8.
9. Mombasa County Climate Change Policy, 2021.
10. Republic of Kenya Statutes:
    - Environmental Management and Coordination (Air Quality) Regulations, 2014
    - Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003
    - Environmental Management and Coordination (Noise and excessive vibration) Regulation, 2009
    - Environmental Management and Coordination (Waste Management) Regulations, 2006
    - Environmental Management and Coordination (Water Quality), 2016
    - Environmental Management and Coordination (Wetlands, River banks, Lake shores and Sea Shore Management) Regulations, 2009
    - Environmental Management and Coordination Act Cap 387 of the Laws of Kenya
    - Environmental Management and Coordination Act No. 8 of 1999 (Rev. 2015)
    - The Climate Change Act, 2023
    - The Constitution of Kenya, 2010
    - The County Government Act, 2012
    - The Energy Act, 2019
    - The Fisheries Management and Development Act, 2016
    - The Forest Conservation and Management Act, 2016
    - The Mombasa County Solid Waste Management Act, 2021
    - The Physical and Land Use Planning Act, 2019
    - The Public Health Act, 2012
    - The Sustainable Waste Management Act, 2022
    - The Occupational Safety and Health Act, 2007
    - The Water Act, 2016
11. WIOMSA, UN-Habitat, 2021. Coastal Cities of the Western Indian Ocean Region and the Blue Economy: Status Report. WIOMSA and UN-Habitat, Zanzibar, Tanzania, xxx pp.

9 ANNEXURES

1. Copy of Certificate of Incorporation
2. Copy of Pin Certificate
3. Copy of Site Layout Plan for the proposed project
4. Copy of Title Deed
5. Copy of approval of the scoping report and Terms of Reference for the ESIA study
6. Copies of the baseline monitoring reports for water and air quality, and noise level measurements
7. Copy of Proceedings of the kick-off meeting held at the project site on 22nd August 2023
8. Copy of Proceedings of the second stakeholder meeting held at the project site on 29th August 2023
9. Copy of Proceedings of the third stakeholder meeting held at the project site on 4th September 2023
10. Copy of NEMA practicing license for Envasses Environmental Consultants Limited
11. Copy of NEMA practicing license for Lead Expert, Mr. Simon Nzuki

Annexure 1: Copy of Certificate of Incorporation

No. **PVT-EYUBAV99**

CERTIFICATE OF INCORPORATION

I hereby **CERTIFY** that,

ULTRA MODERN HOMES LIMITED

is on this date 28 Sep 2022 Incorporated under the Companies Act, 2015 and that the Company is a **PRIVATE LIMITED COMPANY.**

.....

Registrar Of Companies

This is a system generated certificate. To validate this document send the word **BRS** to **21546**

Annexure 2: Copy of Pin Certificate

KENYA REVENUE AUTHORITY

PIN Certificate

For General Tax Questions
Contact KRA Call Centre
Tel: +254 (020) 4999 999
Cell: +254(0711)099 999
Email: callcentre@kra.go.ke

www.kra.go.ke

Certificate Date : 29/09/2022

Personal Identification Number
P052147153A

This is to certify that taxpayer shown herein has been registered with Kenya Revenue Authority

Taxpayer Information

Taxpayer Name	ULTRA MODERN HOMES LIMITED
Email Address	ULTRAMODERNHOMES2022LTD@GMAIL.COM

Registered Address

L.R. Number :	**Building :** na
Street/Road : haile selasi	**City/Town :** mombasa
County : Mombasa	**District :** Mombasa North District
Tax Area : Mombasa	**Station :** Mombasa North
P. O. Box : 81061	**Postal Code :** 80100

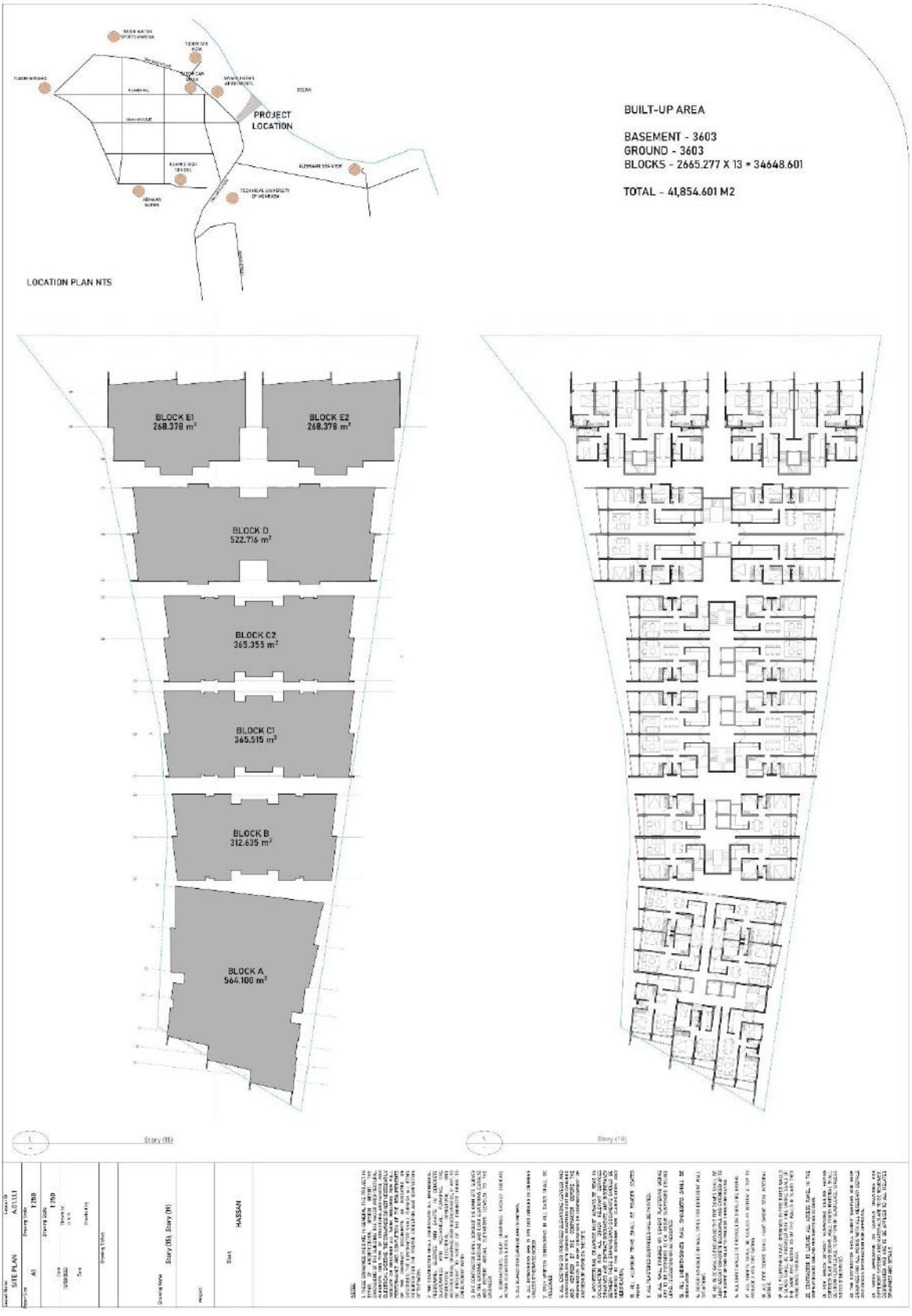
Tax Obligation(s) Registration Details

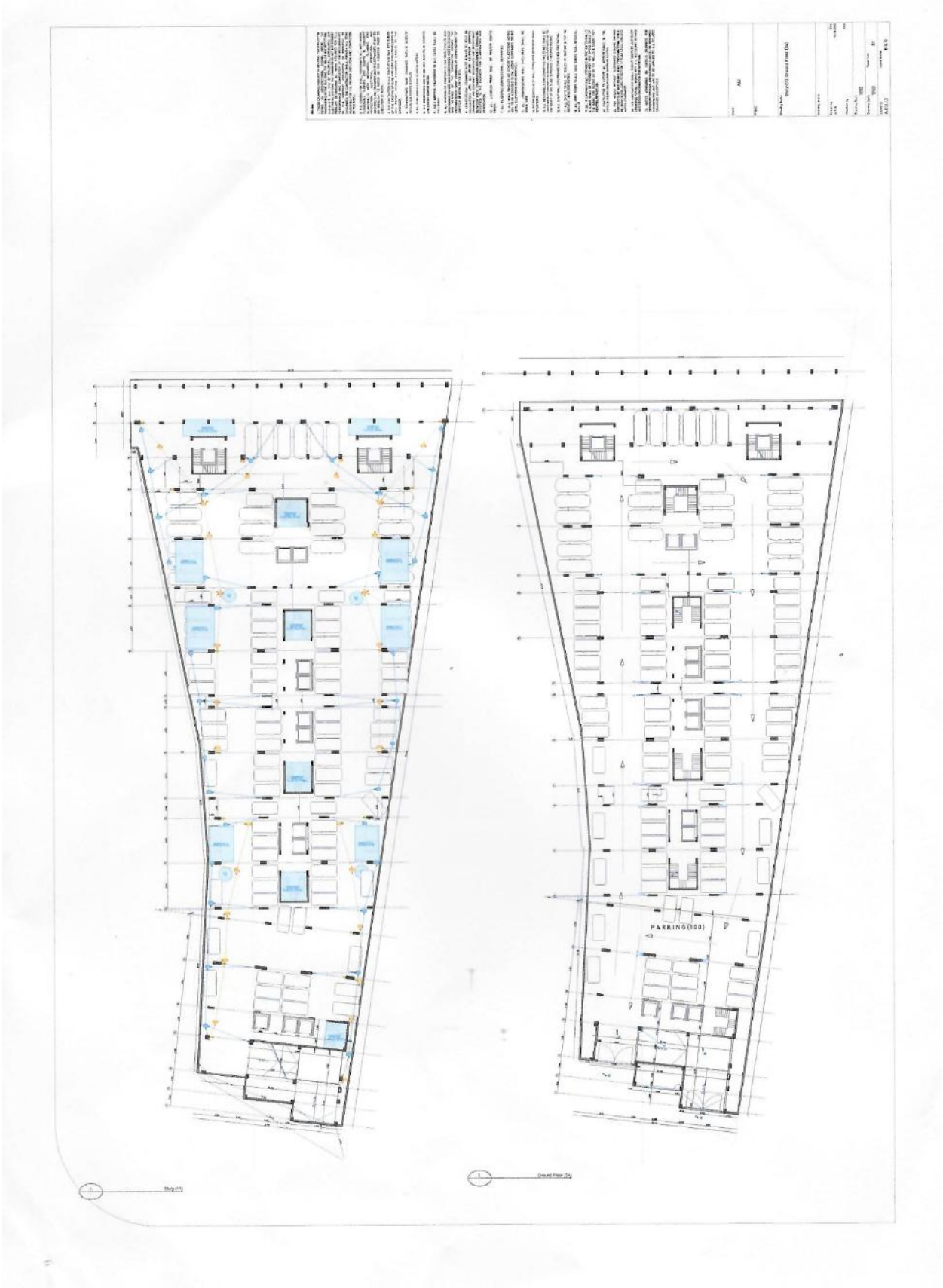
Sr. No.	Tax Obligation(s)	Effective From Date	Effective Till Date	Status
1	Income Tax - Company	29/09/2022	N.A.	Active

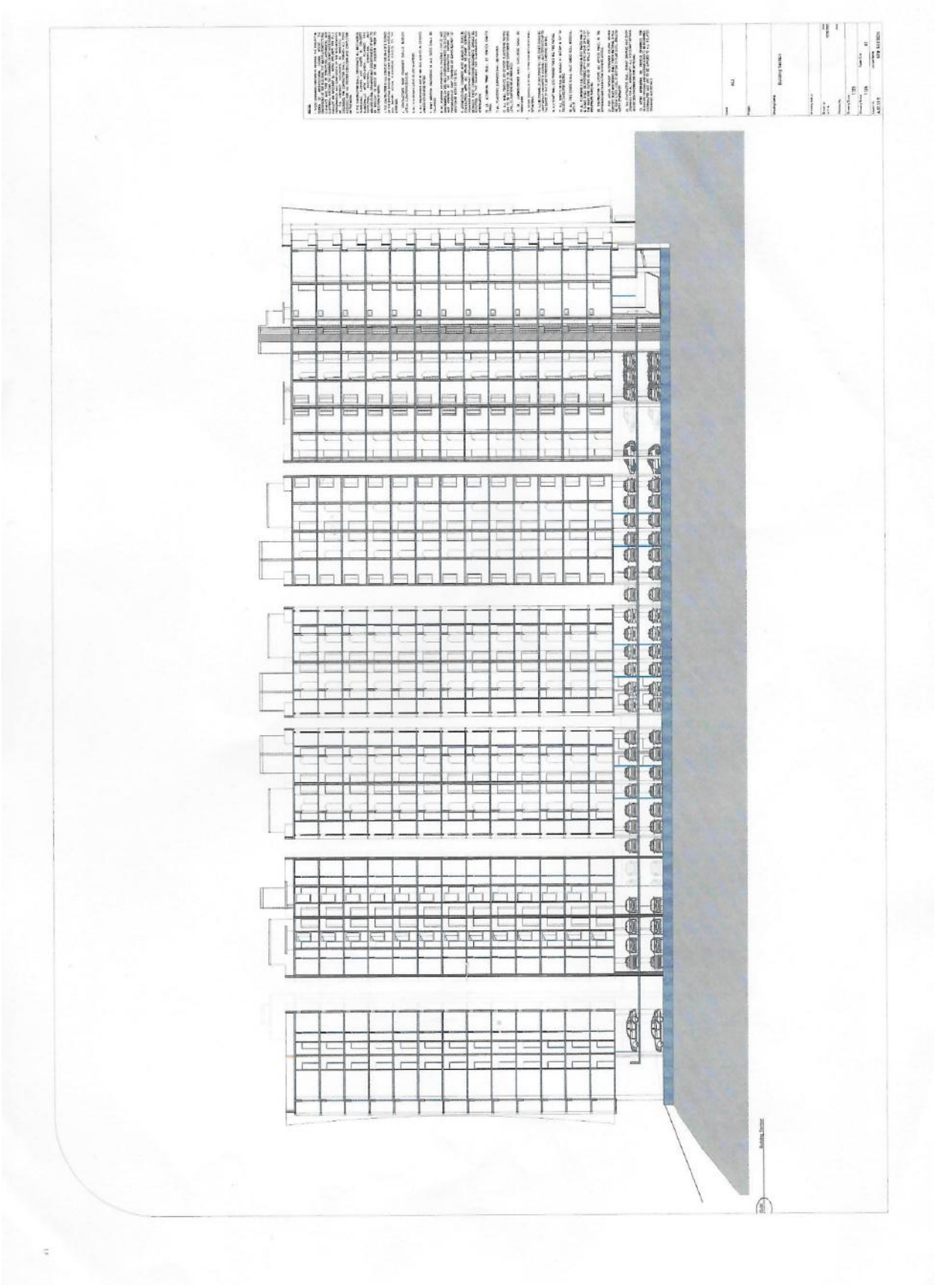
The above PIN must appear on all your tax invoices and correspondences with Kenya Revenue Authority. Your accounting end month is December unless a change has been approved by the Commissioner-Domestic Taxes Department. The status of Tax Obligation(s) with 'Dormant' status will automatically change to 'Active' on date mentioned in "Effective Till Date" or any transaction done during the period. This certificate shall remain in force till further updated.

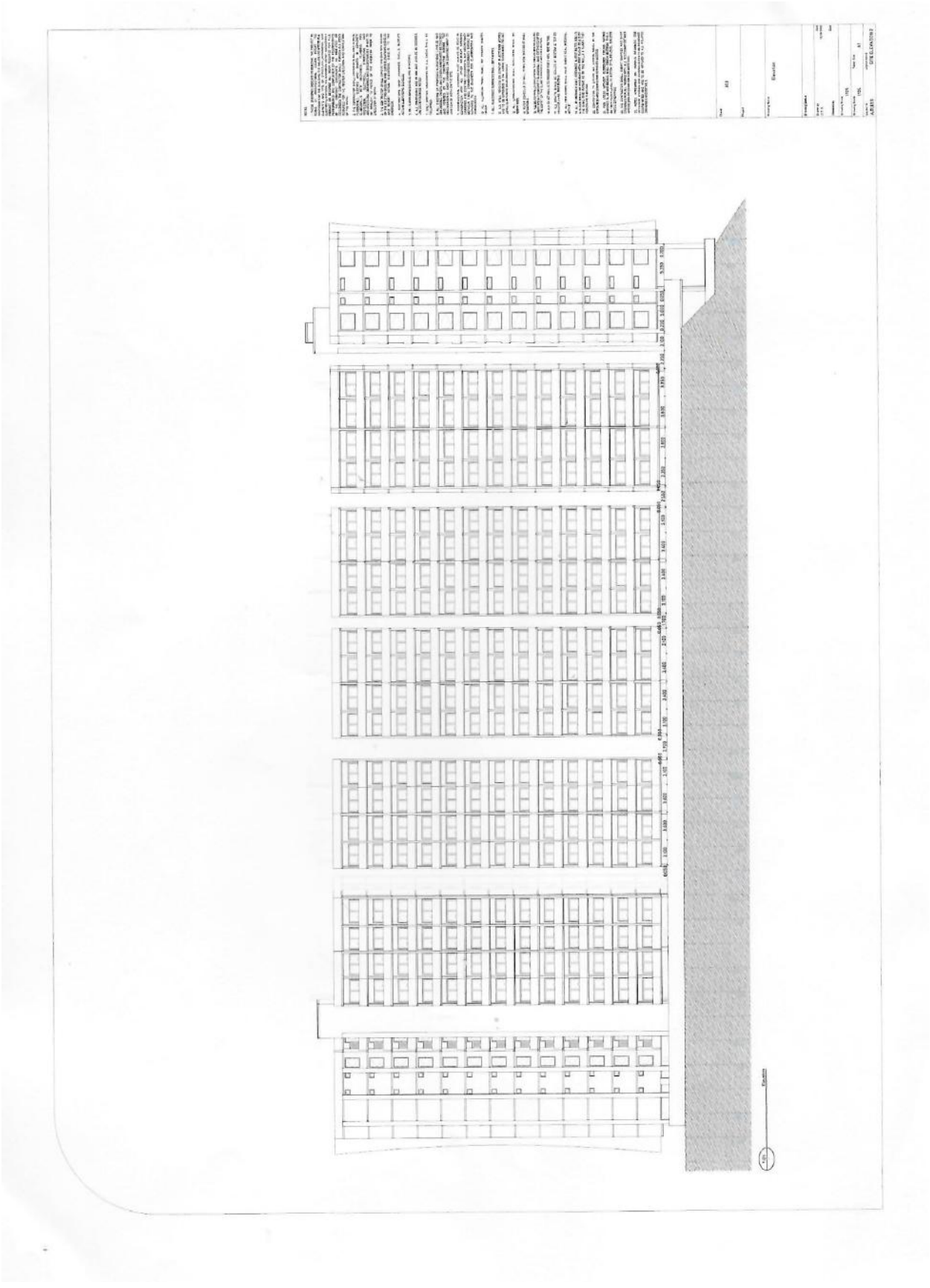
Disclaimer : This is a system generated certificate and does not require signature.

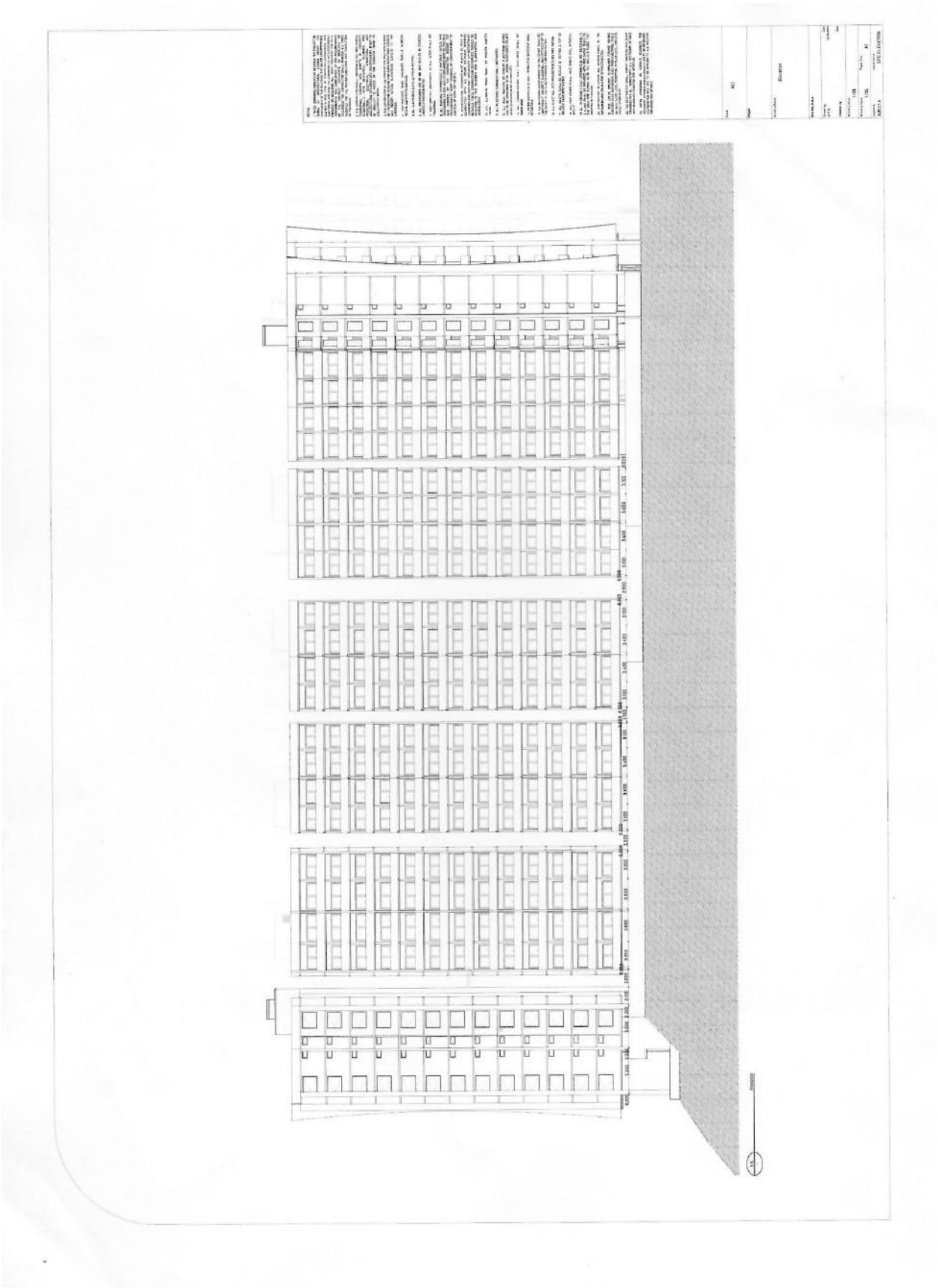
Annexure 3: Copy of Site Layout Plan for the proposed project

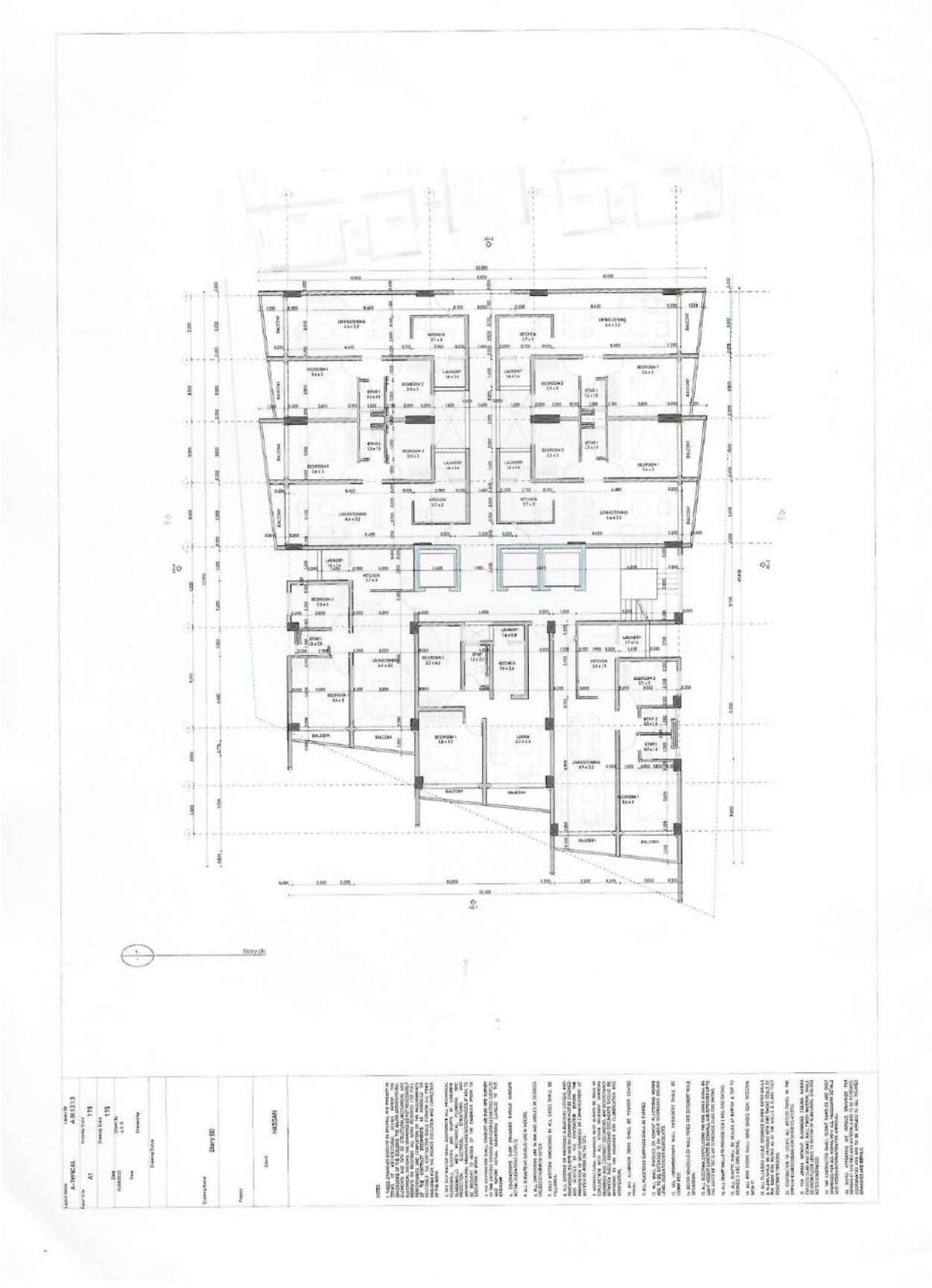


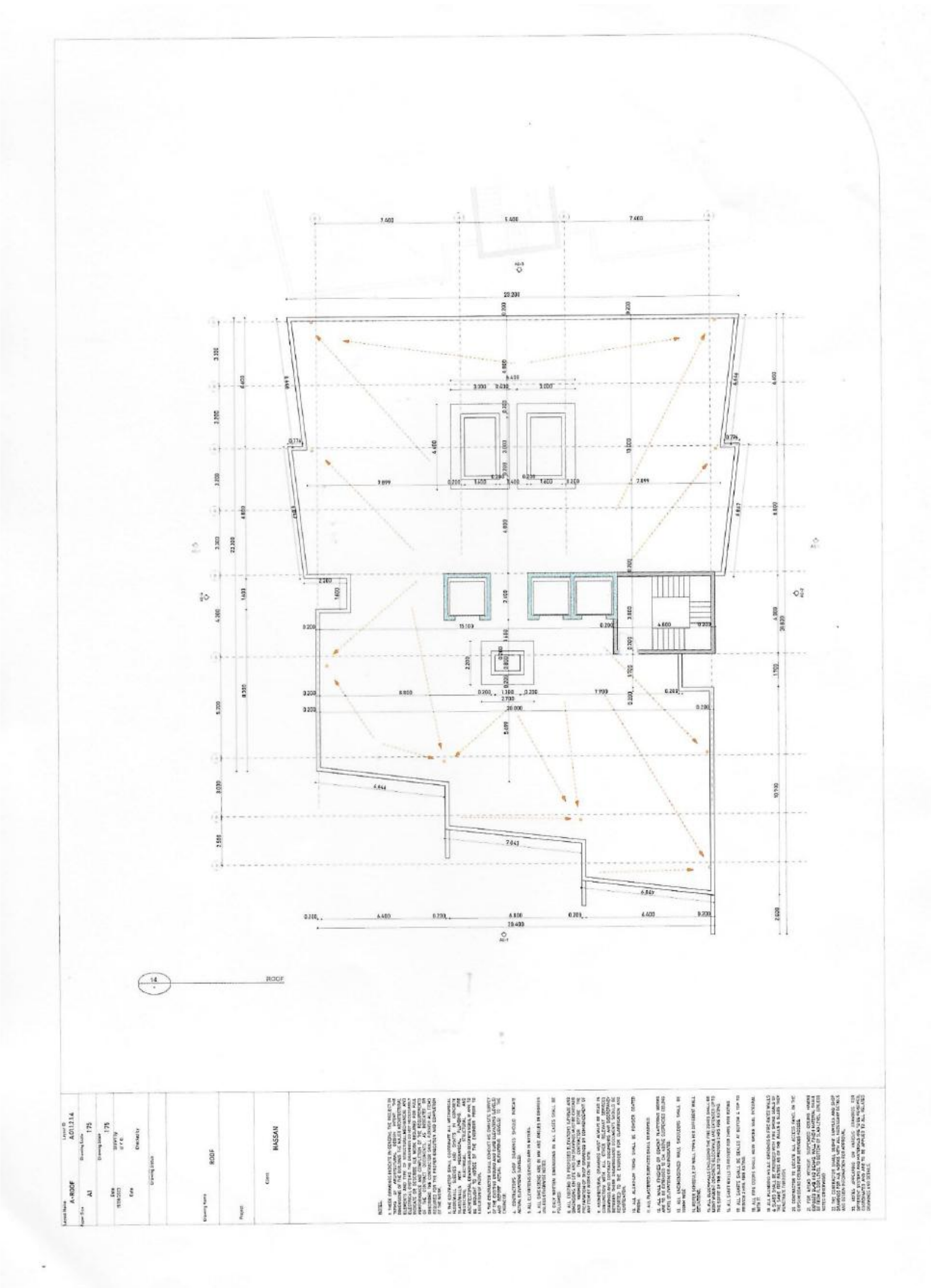

PARKING (100)

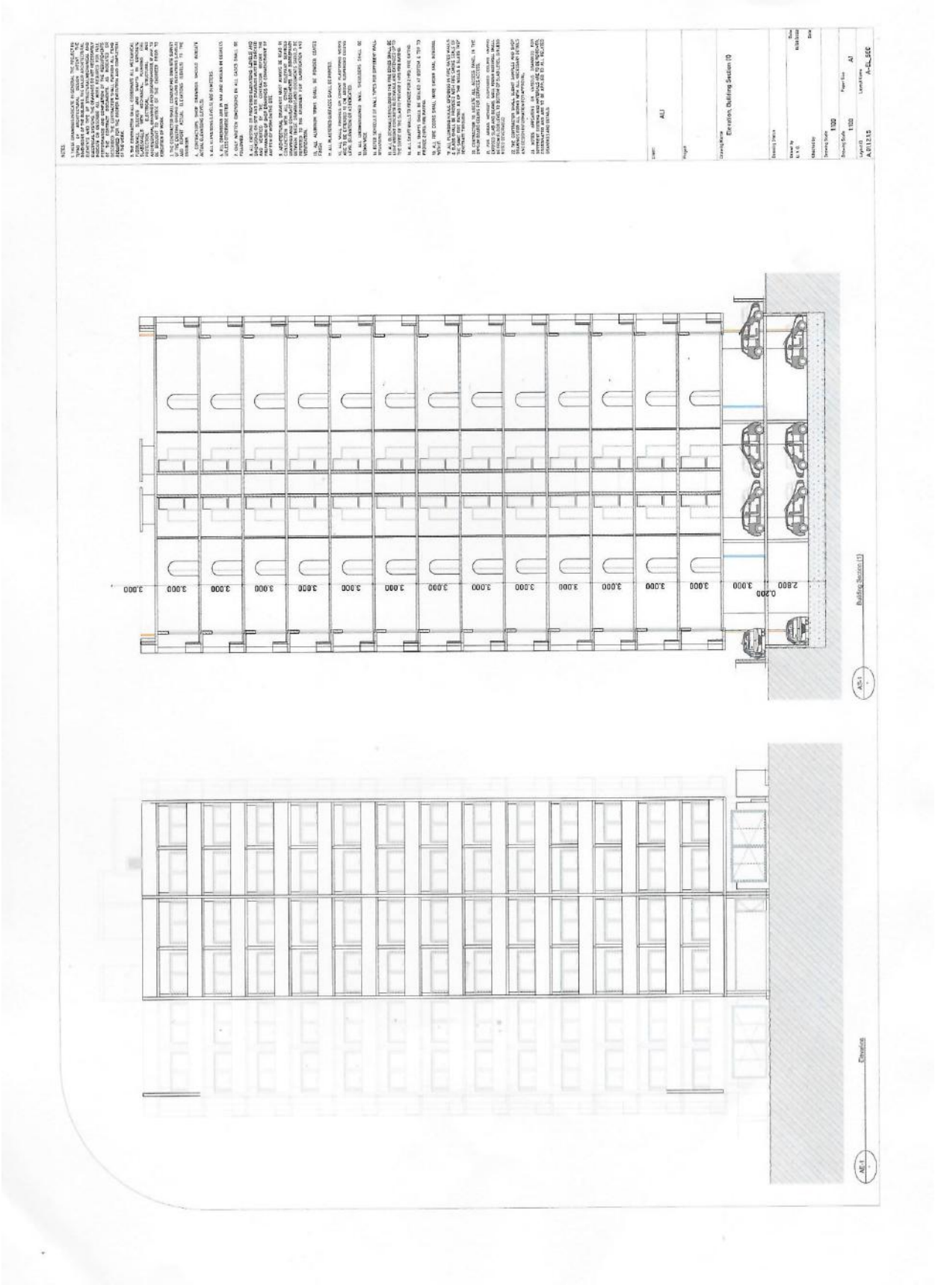


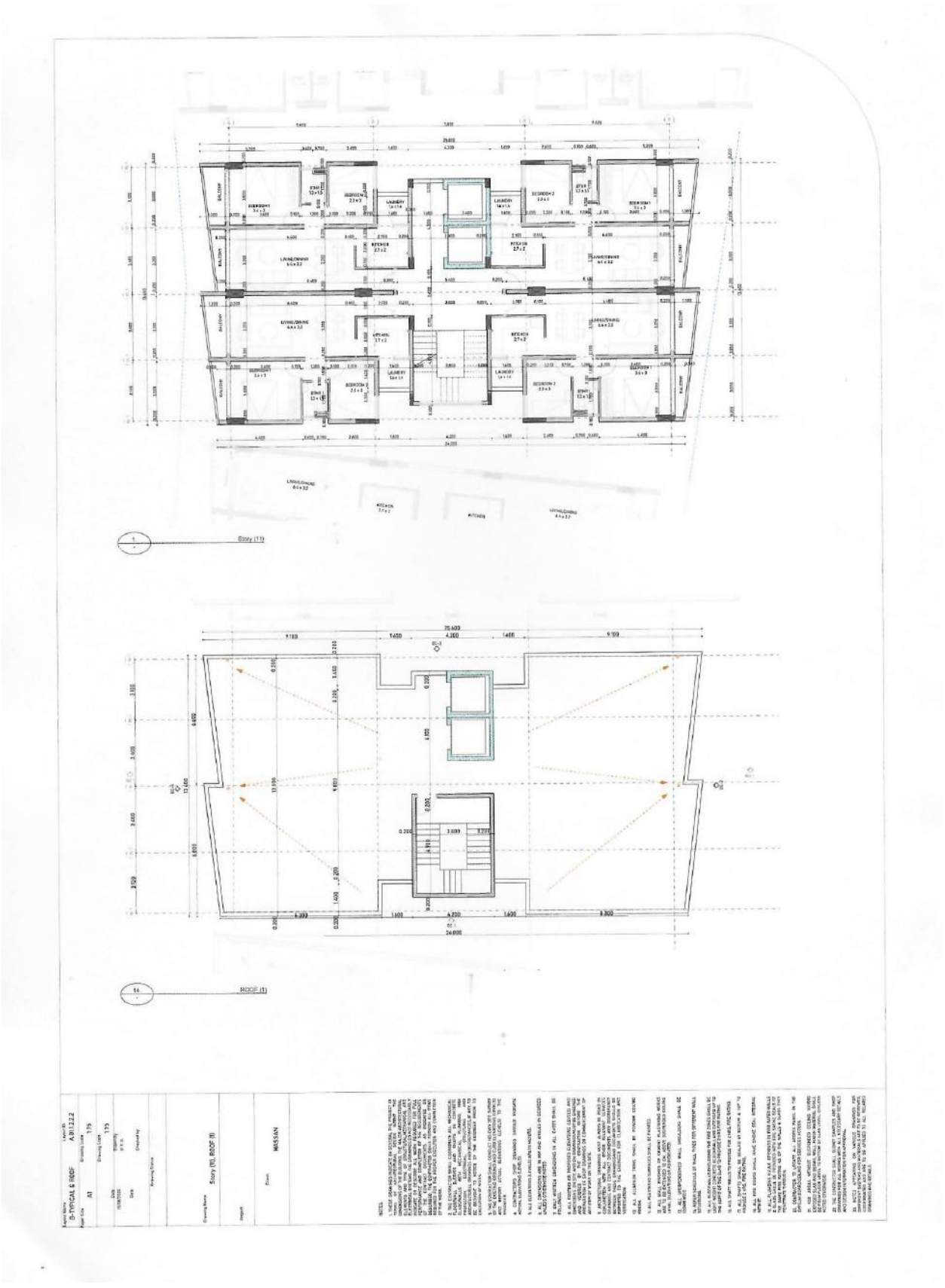


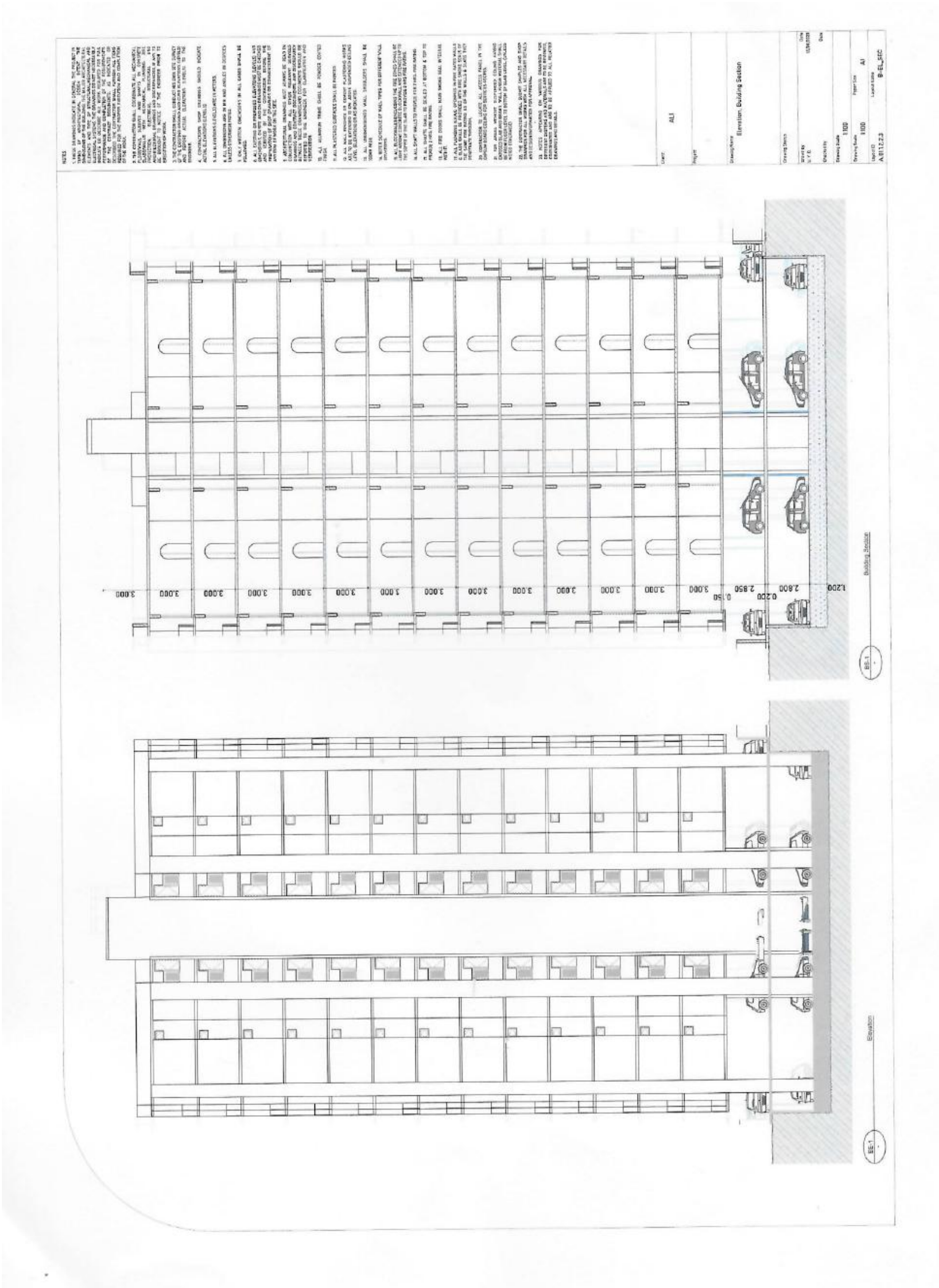


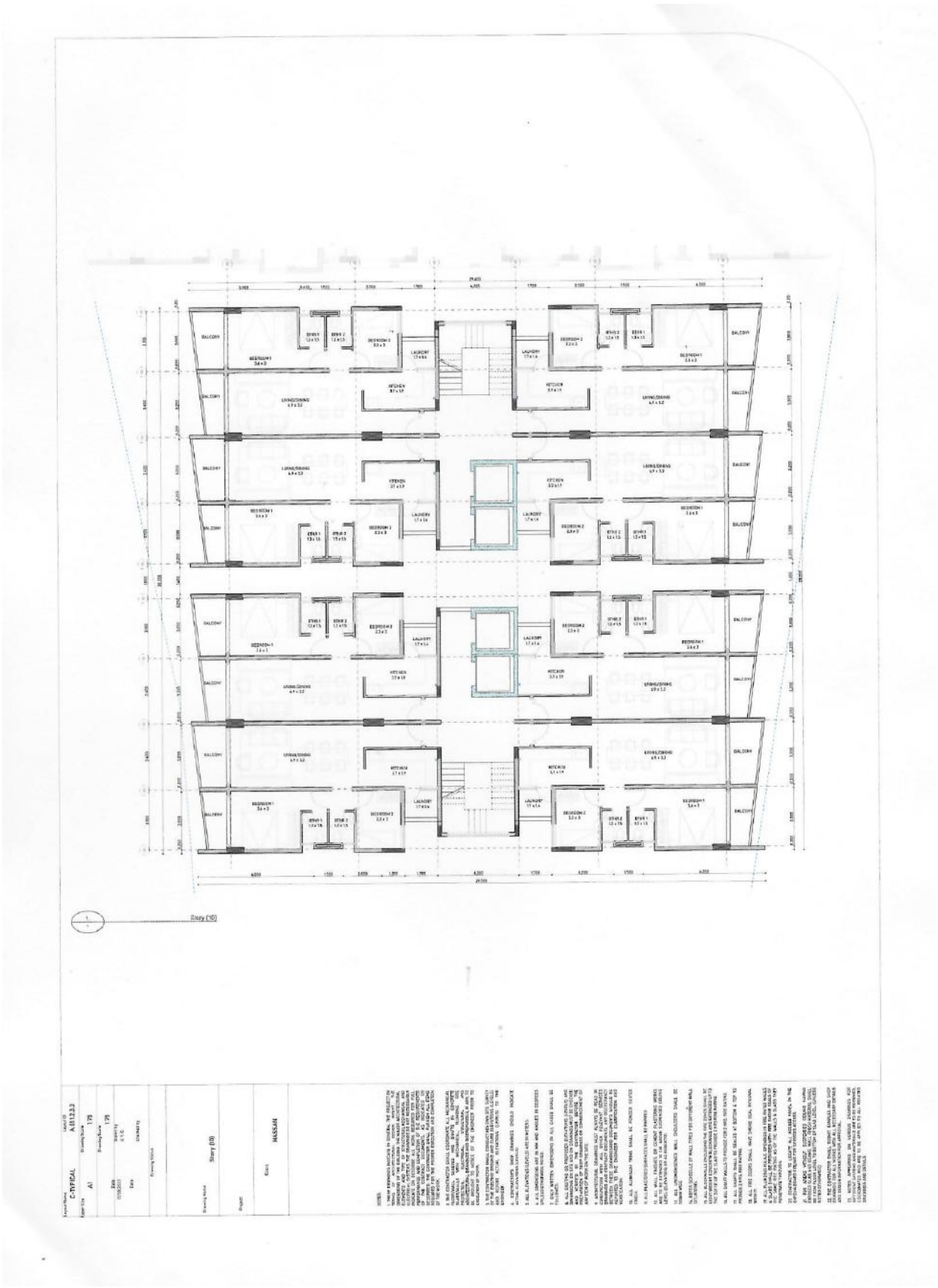


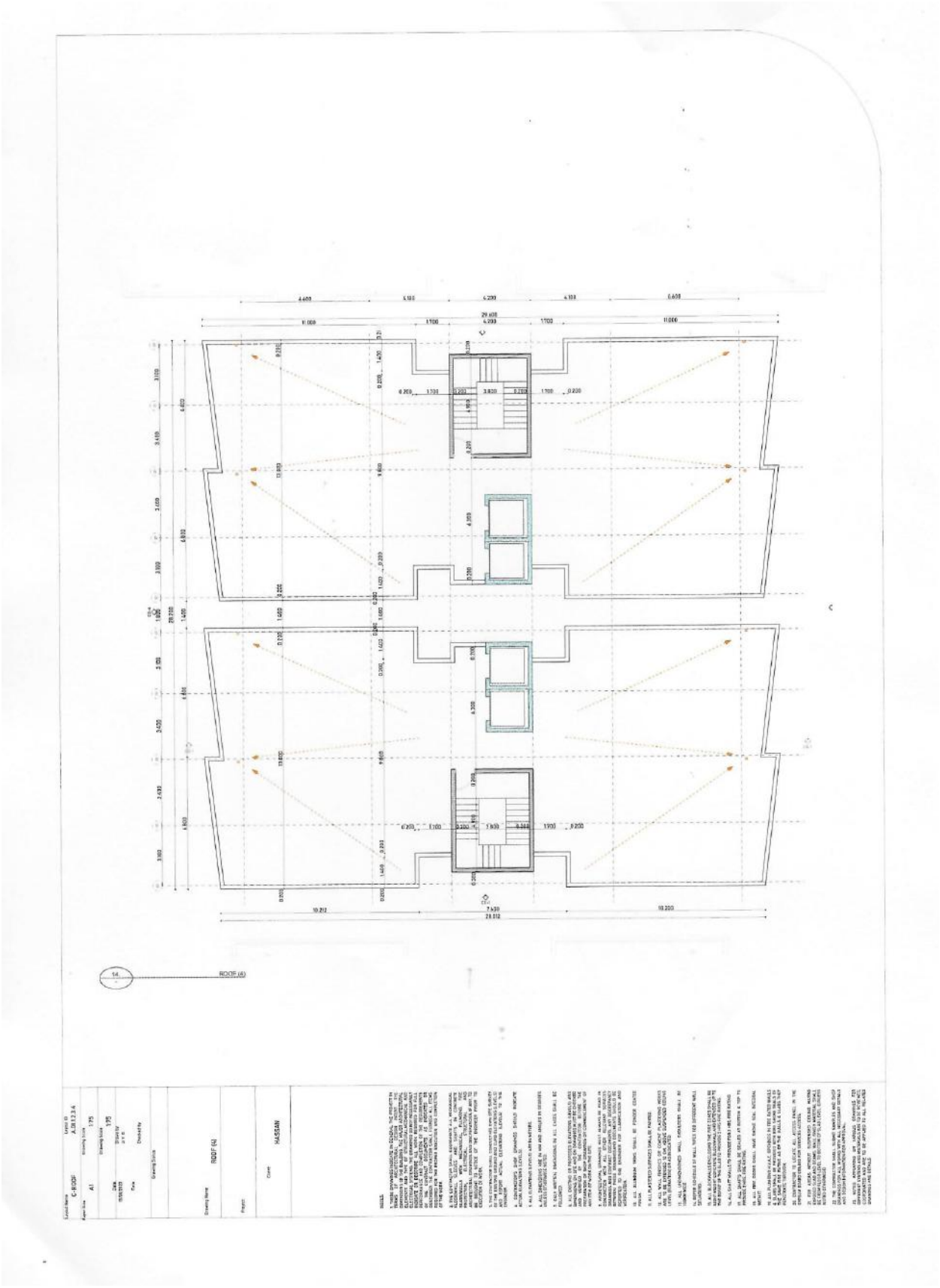


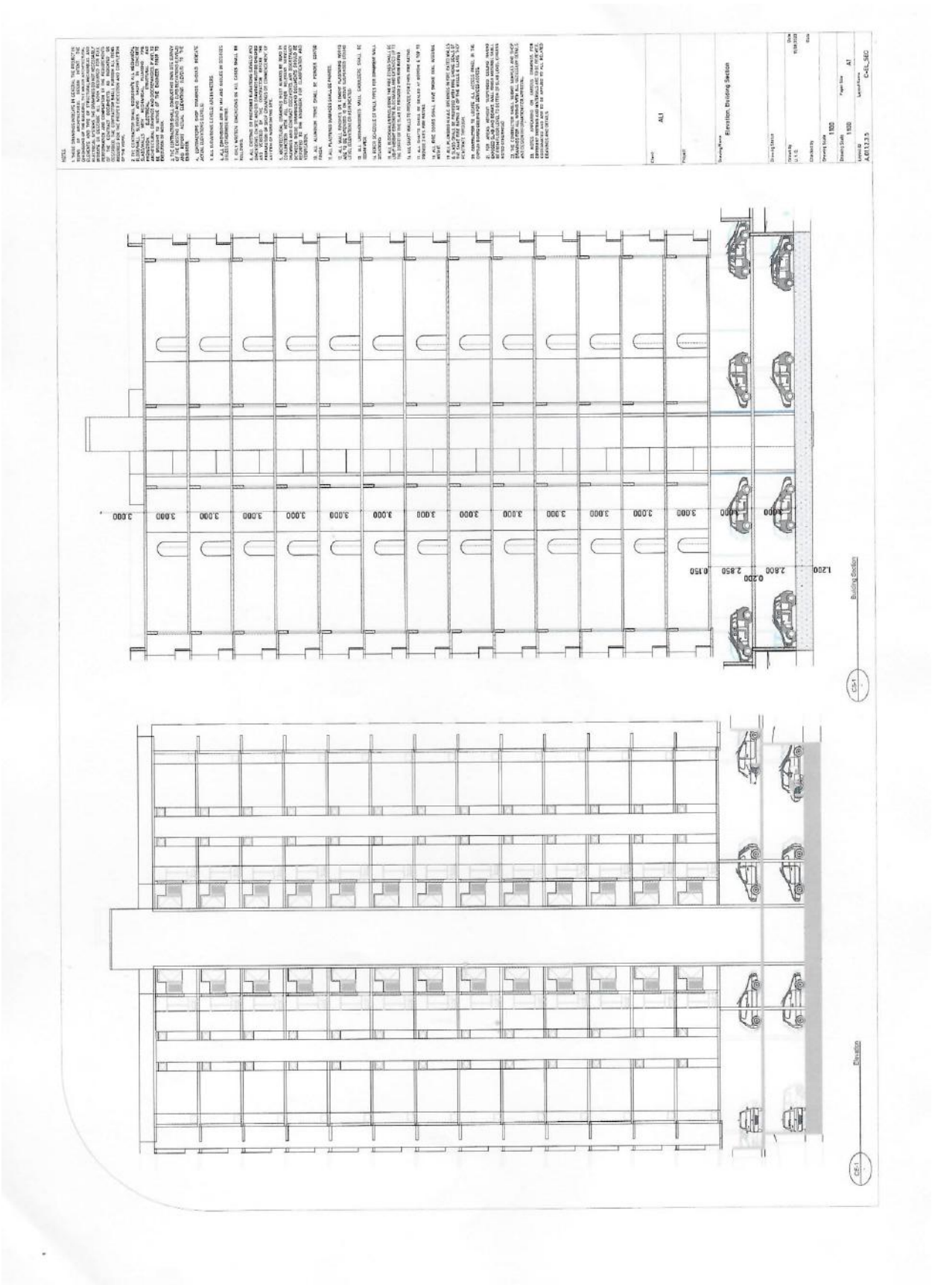


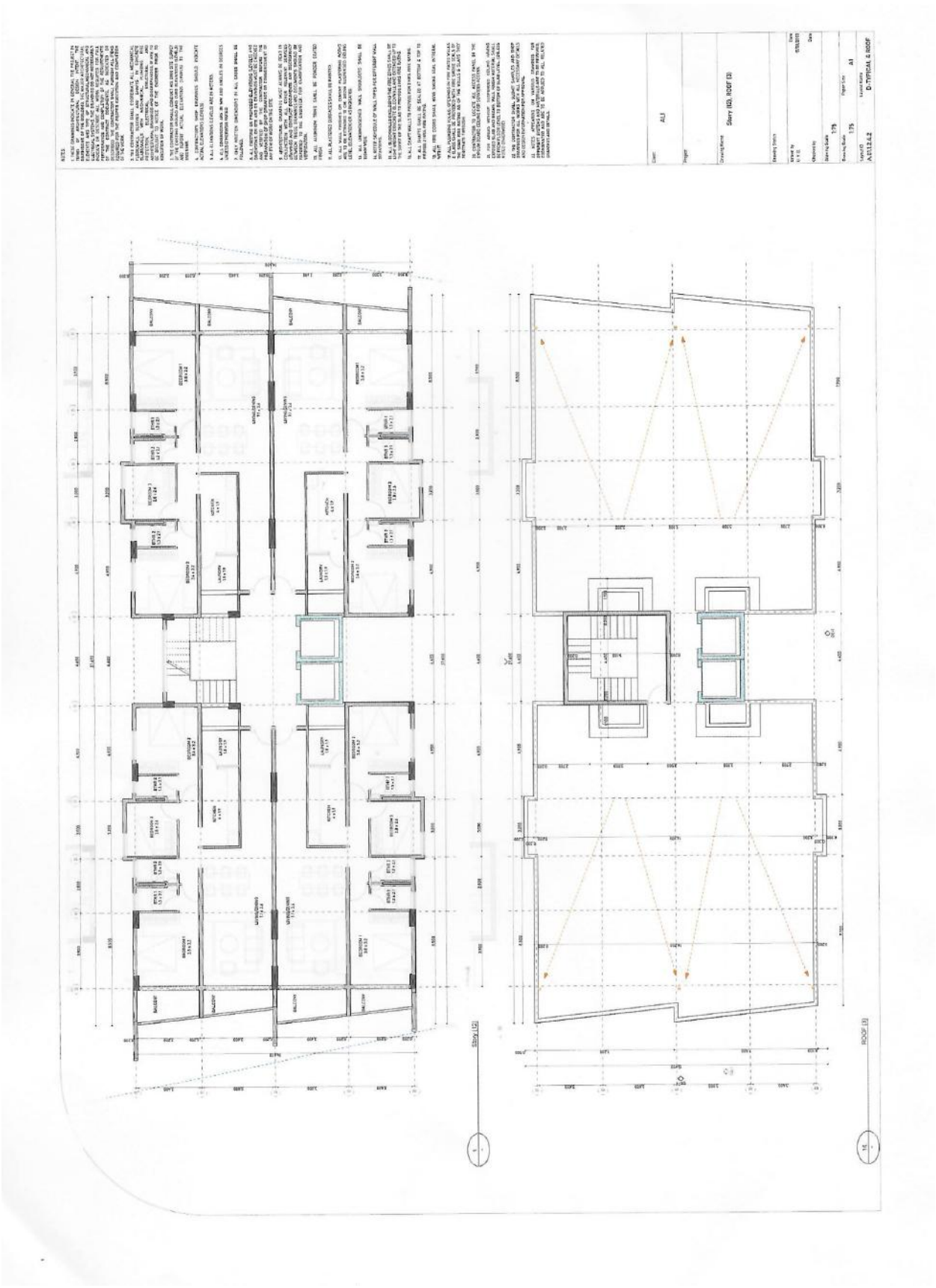


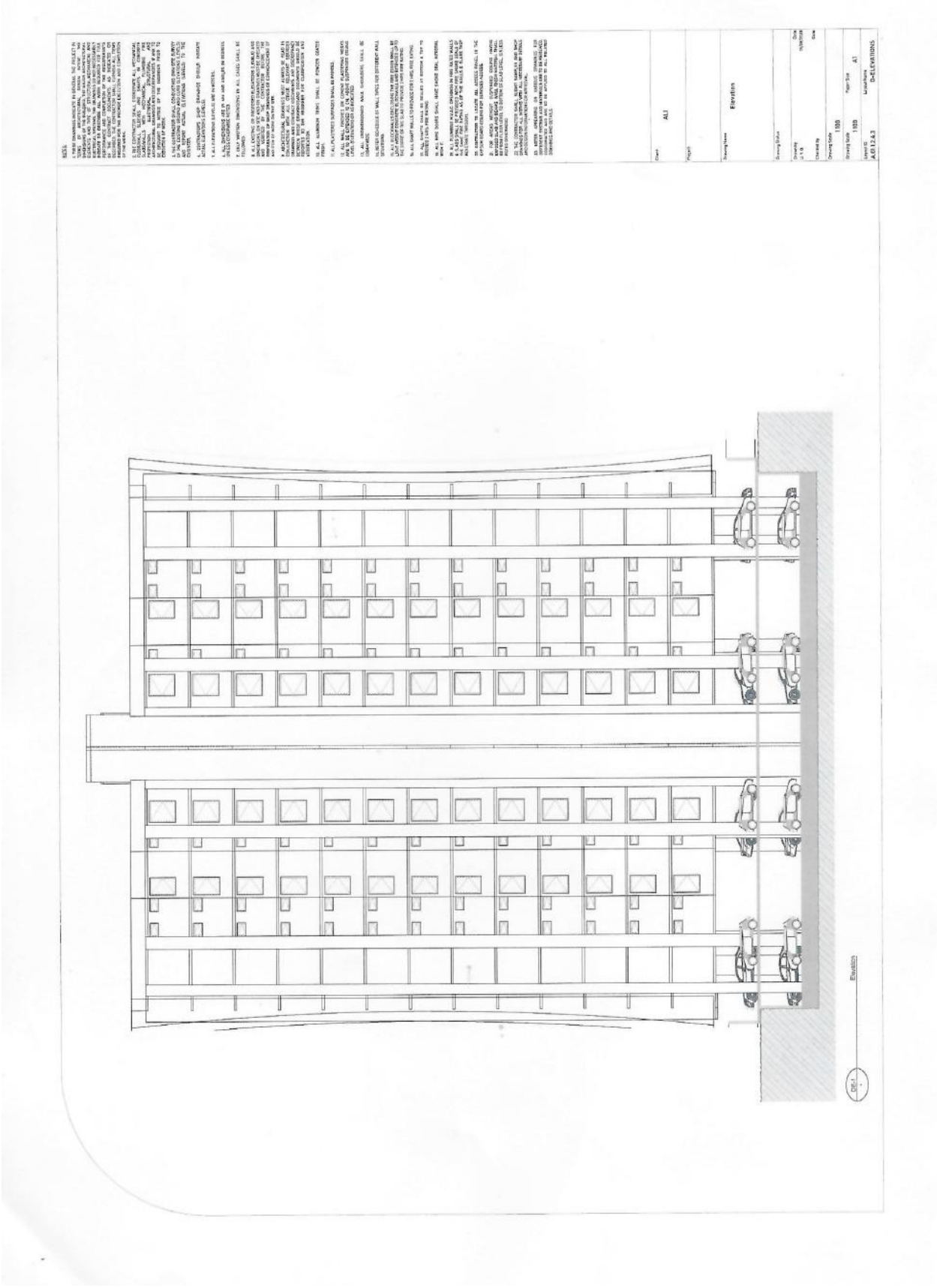


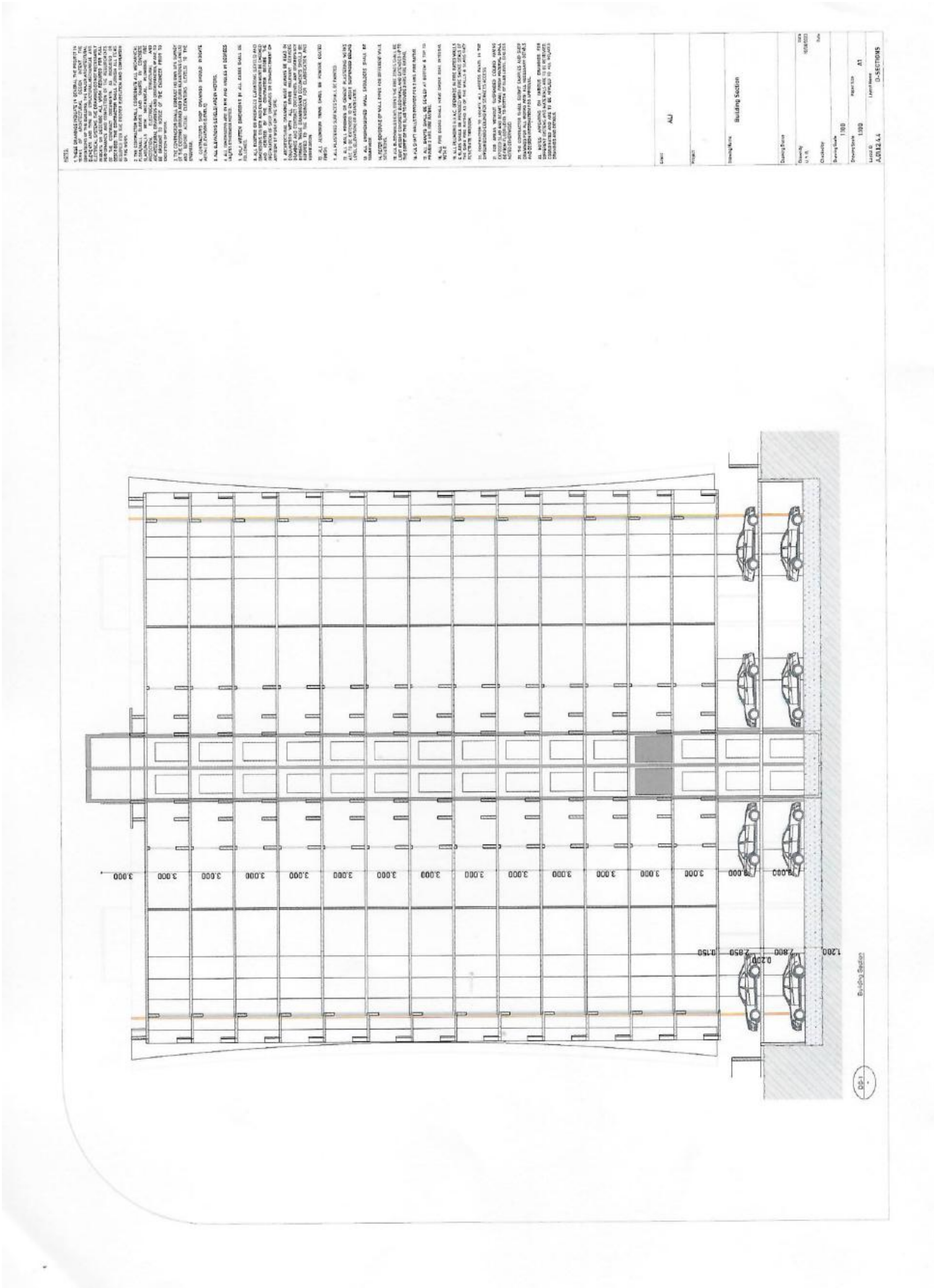


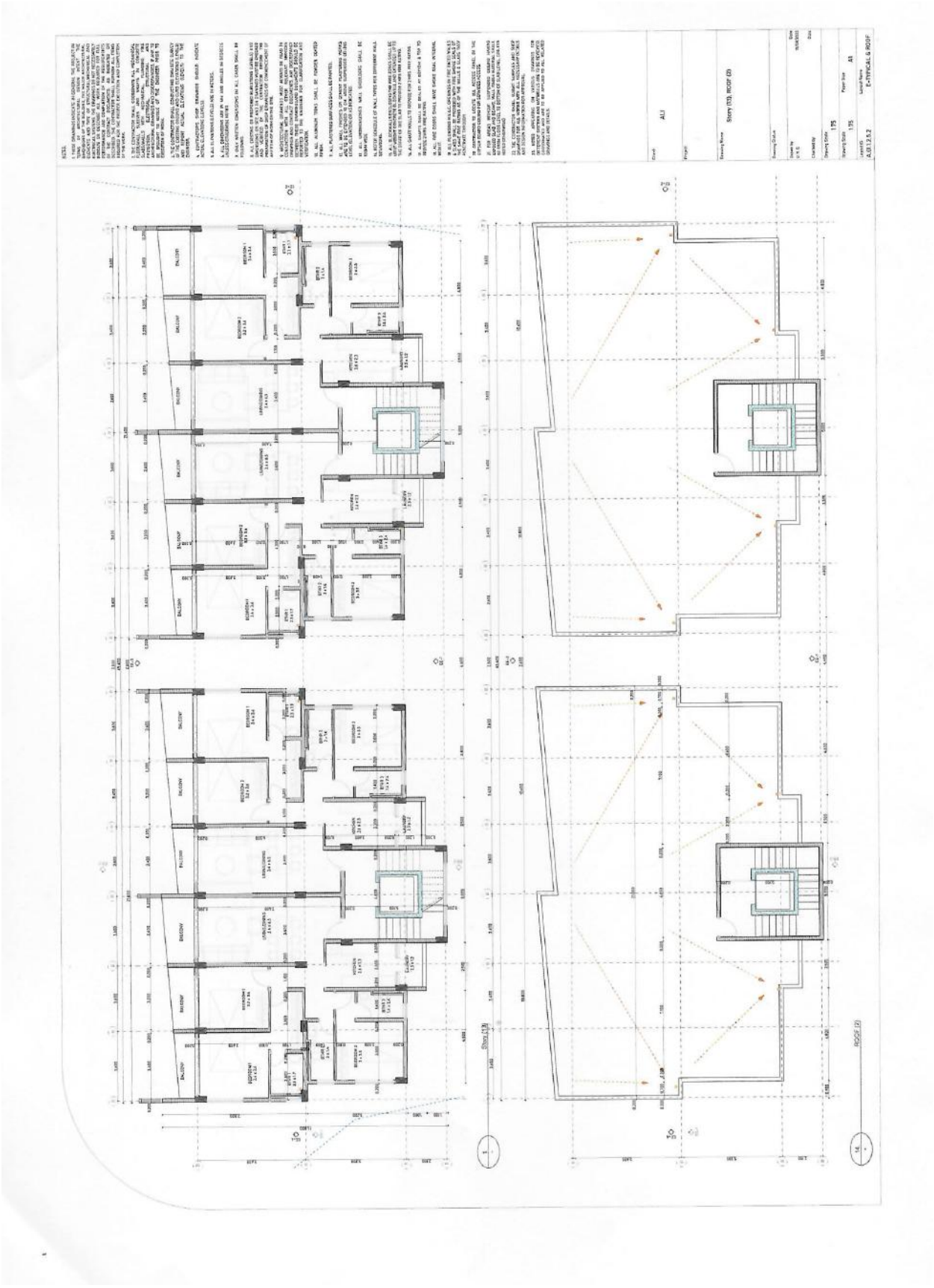

ROOF (4)
HASSAN

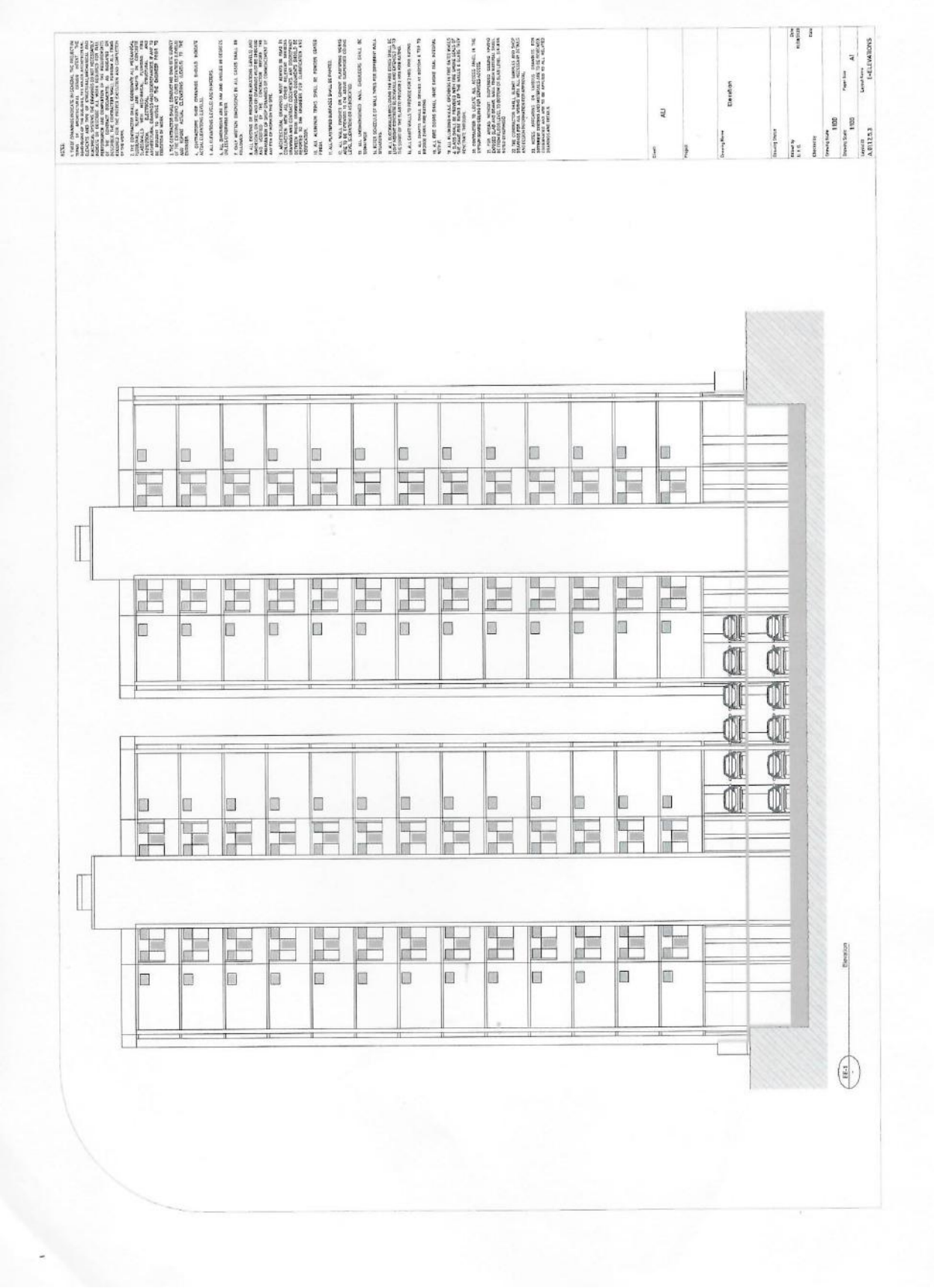

Elevation, Building Section
Building Section
Elevation

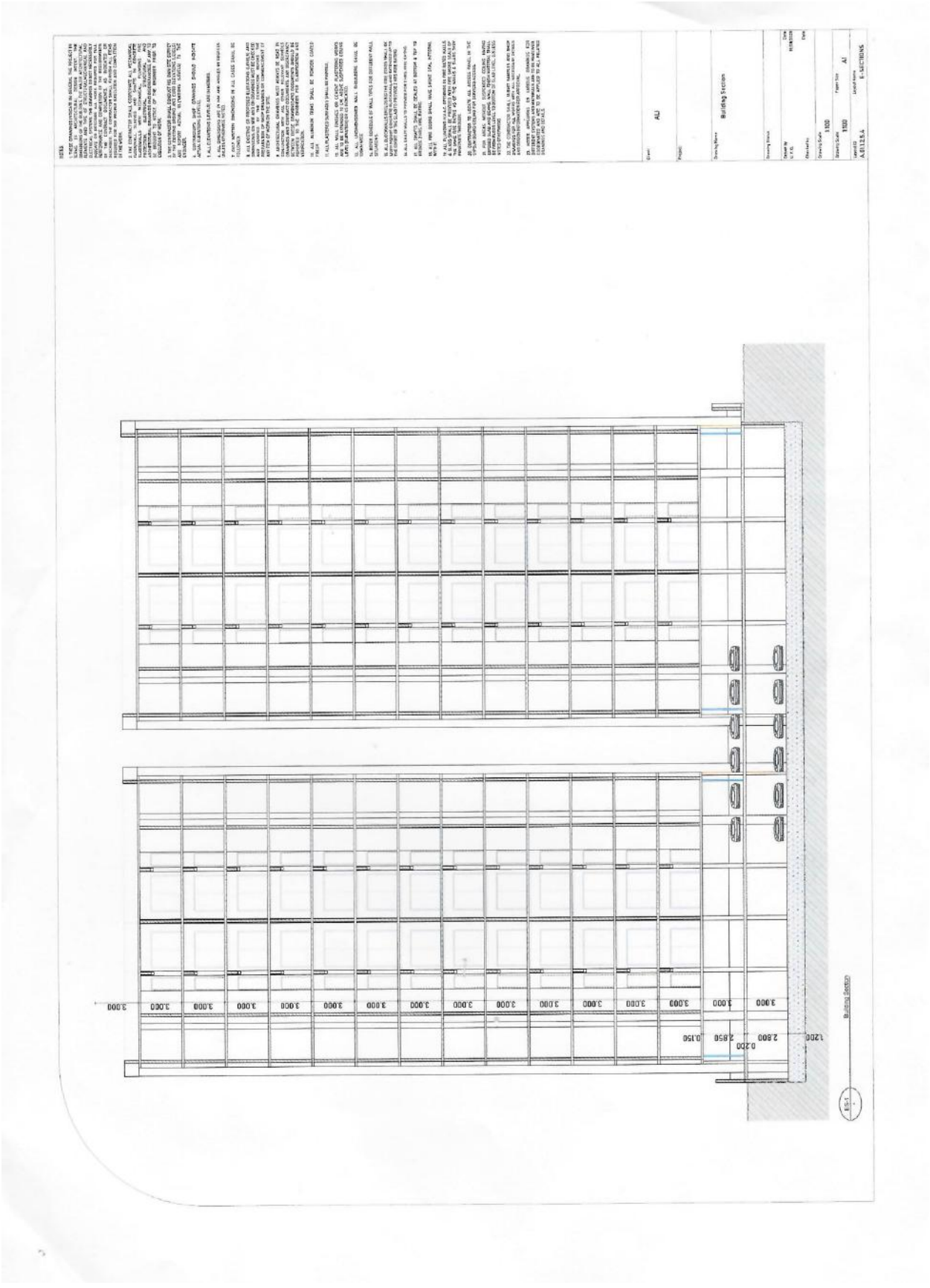



NOTES:
Client
ALI
Project
Drawing Name
Elevation
Drawing Status
Drawing No.
Date
Checked by
Drawing Scale
1:100
Paper Size
A1
Version No.
1:100
Location Name
A.01.1.2.&.3
D-ELEVATIONS
Elevation

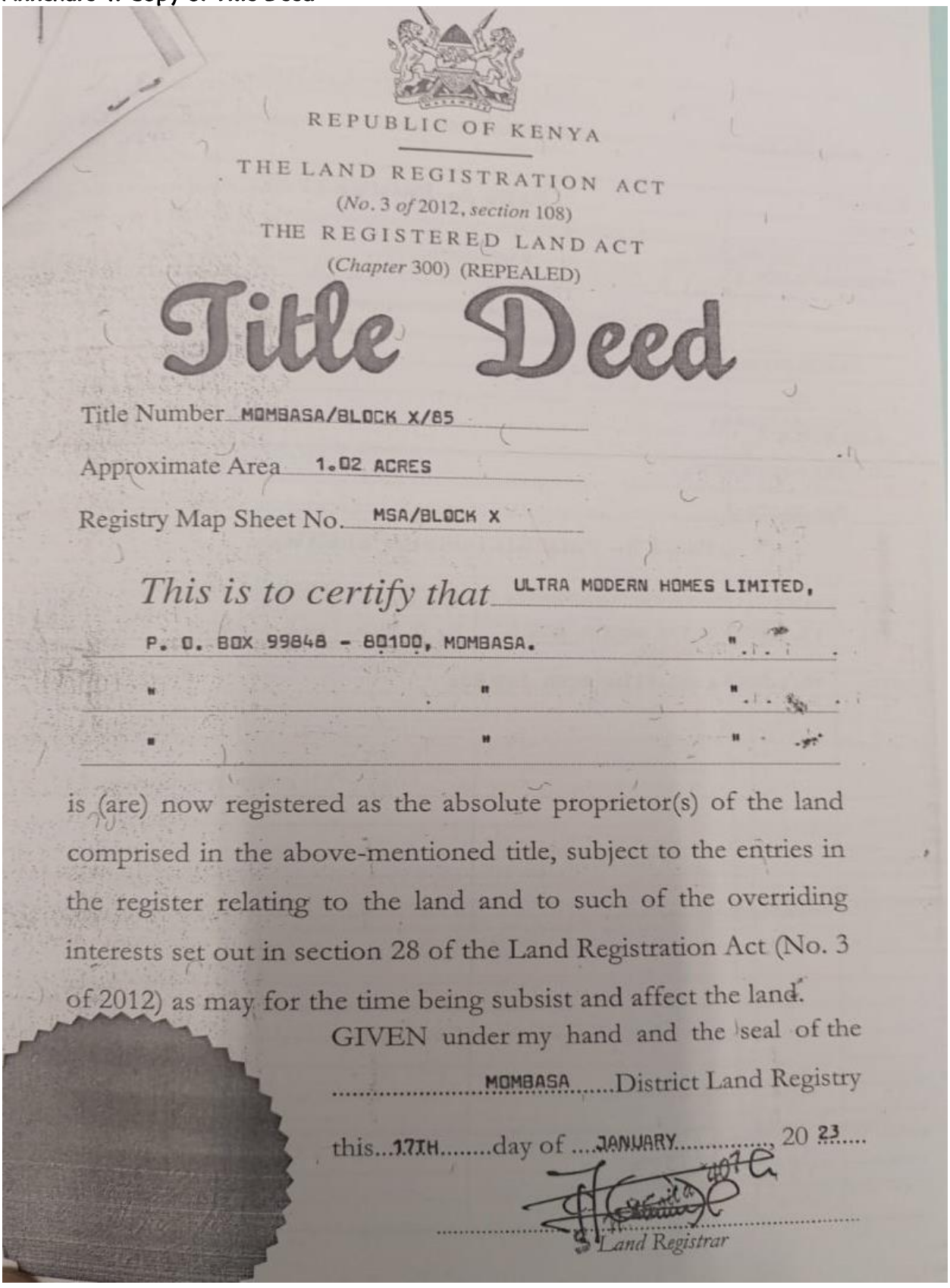







NOTES
Client
ALI
Project
Drawing Name
Building Section
Drawing Status
Drawing No
Scale
1:100
Paper Size
A1
Drawing Date
Date
Revision
Drawn by
Checked by
Location
E-SECTIONS
A.B1125.6
3,000
2,800
2,850
0.220
0.150
1200
Building Section
ES-1

Annexure 4: Copy of Title Deed



REPUBLIC OF KENYA

THE LAND REGISTRATION ACT

(*No.* 3 *of* 2012, *section* 108)

THE REGISTERED LAND ACT

(*Chapter* 300) (REPEALED)

Title Deed

Title Number MOMBASA/BLOCK X/85

Approximate Area 1.02 ACRES

Registry Map Sheet No. MSA/BLOCK X

This is to certify that ULTRA MODERN HOMES LIMITED,

P. O. BOX 99848 - 80100, MOMBASA.

" " "

" " "

is (are) now registered as the absolute proprietor(s) of the land comprised in the above-mentioned title, subject to the entries in the register relating to the land and to such of the overriding interests set out in section 28 of the Land Registration Act (No. 3 of 2012) as may for the time being subsist and affect the land.

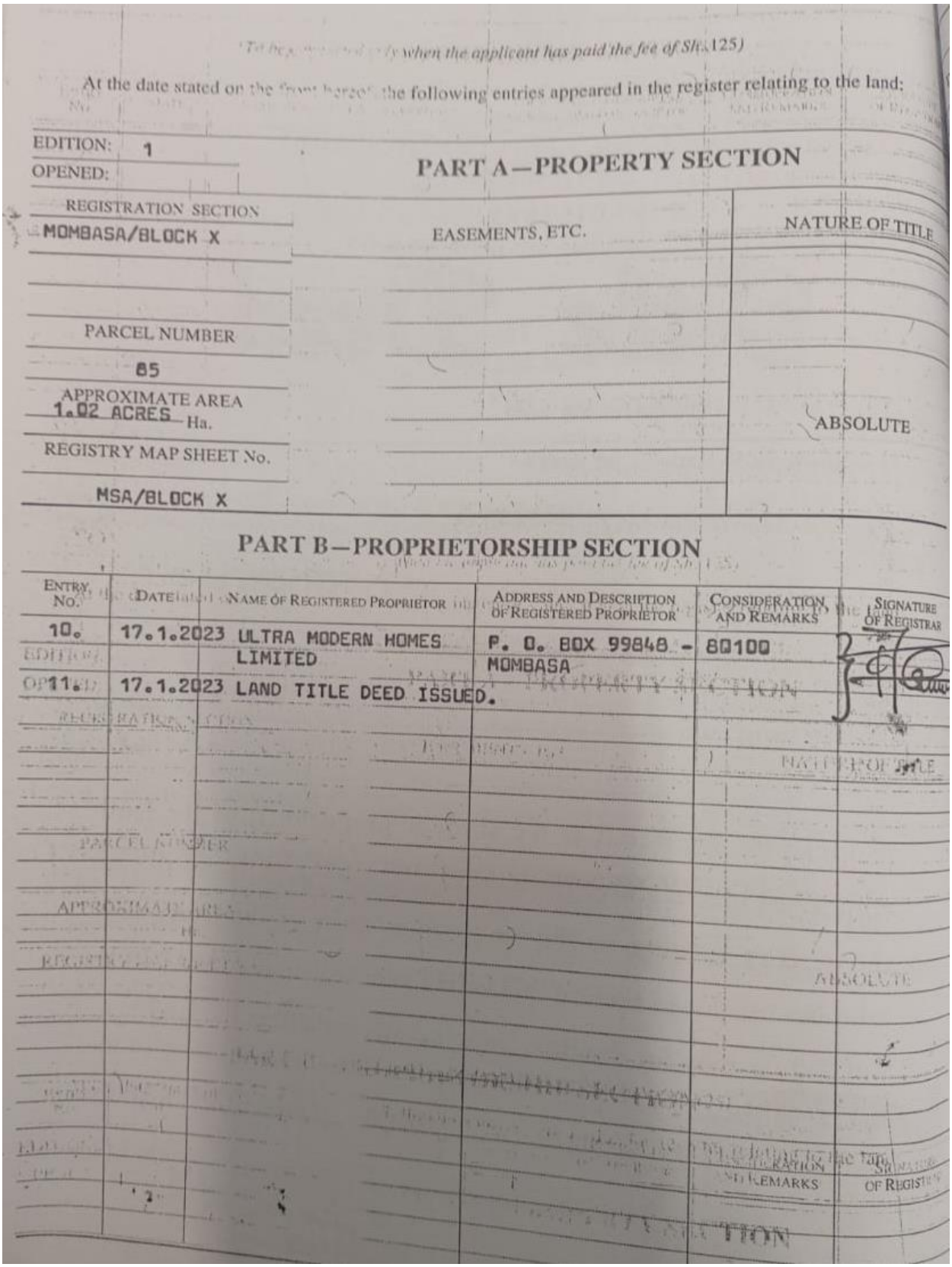
GIVEN under my hand and the seal of the

.....MOMBASA.....District Land Registry

this...17TH.....day of ....JANUARY....., 20 23....

.....

Land Registrar



when the applicant has paid the fee of Sh. 125)

At the date stated on the front hereof the following entries appeared in the register relating to the land:

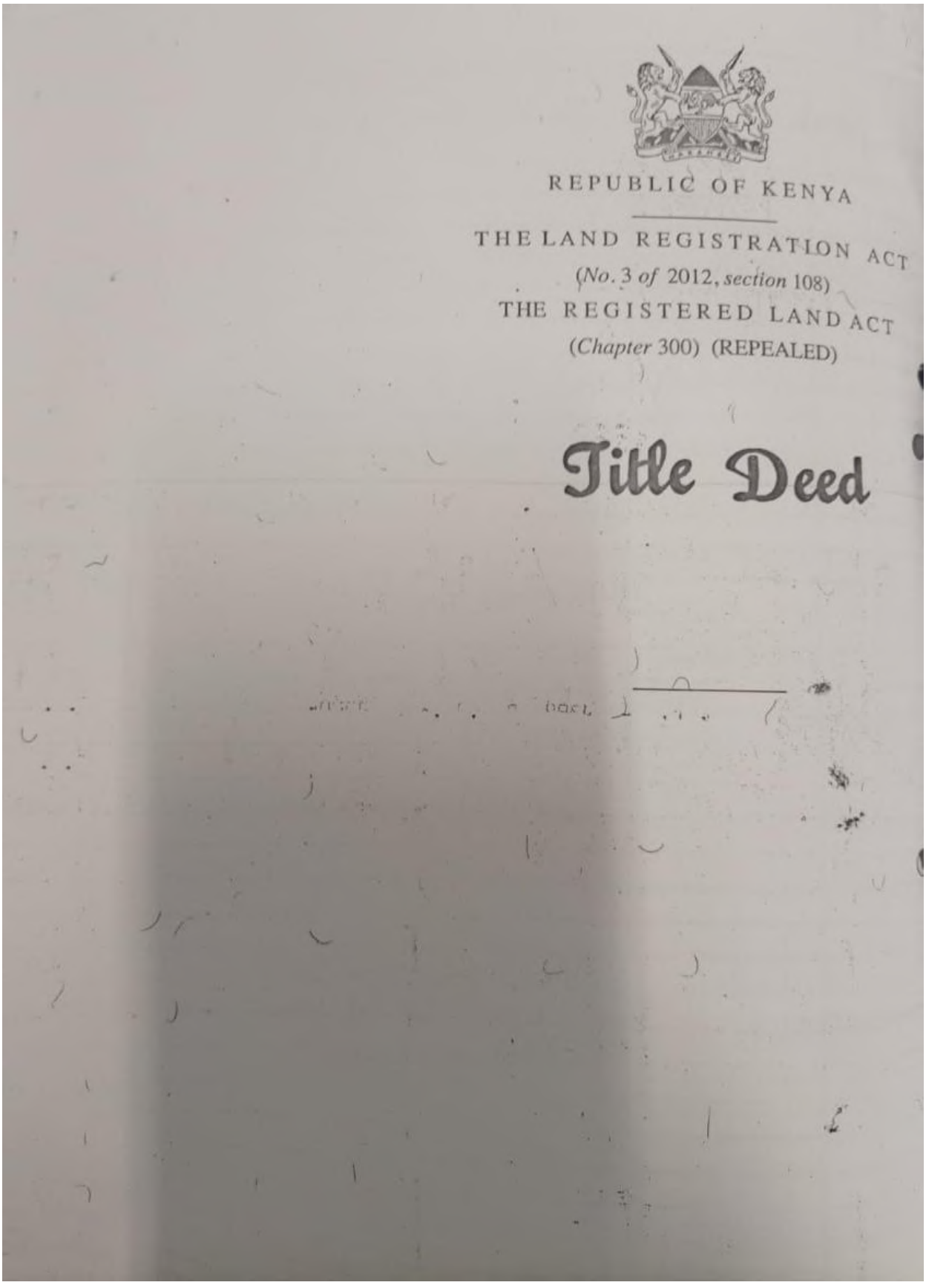
EDITION: 1
OPENED:

PART A—PROPERTY SECTION

REGISTRATION SECTION	EASEMENTS, ETC.	NATURE OF TITLE
MOMBASA/BLOCK X		
PARCEL NUMBER		
85		
APPROXIMATE AREA		
1.02 ACRES Ha.		ABSOLUTE
REGISTRY MAP SHEET No.		
MSA/BLOCK X		

PART B—PROPRIETORSHIP SECTION

ENTRY NO.	DATE	NAME OF REGISTERED PROPRIETOR	ADDRESS AND DESCRIPTION OF REGISTERED PROPRIETOR	CONSIDERATION AND REMARKS	SIGNATURE OF REGISTRAR
10.	17.1.2023	ULTRA MODERN HOMES LIMITED	P. O. BOX 99848 - MOMBASA	80100	
11.	17.1.2023	LAND TITLE DEED ISSUED.			



REPUBLIC OF KENYA

THE LAND REGISTRATION ACT
(*No.* 3 *of* 2012, *section* 108)
THE REGISTERED LAND ACT
(*Chapter* 300) (REPEALED)

Title Deed

Annexure 5: Copy of approval of the scoping report and Terms of Reference for the ESIA study

nema
mazingira yetu | uhai wetu | wajibu wetu

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

Telcom Wireless: 020-2183718, 020-2101370, 020-2103696
Mobile Line: 0724 253 398, 0723 363 010, 0735 013 046
Incident Line: 0786 101 100

P. O. Box 67839 - 00200
Popo Road, Nairobi, Kenya
Email: dgnema@nema.go.ke
Website: www.nema.go.ke

NEMA/TOR/5/2/611 **18th August, 2023**

Director,
Ultra Modern Homes Ltd,
P.O Box 99848-80100,
MOMBASA

RE: TERMS OF REFERENCE (TOR) FOR ENVIROMENTAL IMPACT ASSESSMENT FOR THE PROPOSED DEVELOPMENT ON PLOT L.R.NO.MOMBASA/BLOCK X/85 IN TUDOR AREA, MOMBASA COUNTY.

We acknowledge the receipt of your TOR for the above subject.

Pursuant to the Environmental Management and Coordination Act, 1999, the Environmental (Impact Assessment and Audit) Regulations 2003 and Legal notice 31 & 32 of 2019, your terms of reference for the Environmental and Social Impact Assessment (ESIA) for **PROPOSED DEVELOPMENT ON PLOT L.R.NO.MOMBASA/BLOCK X/85 IN TUDOR AREA, MOMBASA COUNTY** has been approved on condition that you shall develop and implement a comprehensive stakeholder engagement plan.

You shall submit ten (10) copies of the study report, upon payment of the applicable EIA processing and monitoring fees being 0.1% of the total project cost, a soft copy summarised ESMP in **WORD** format for preparation of public notice and one electronic copy of report prepared by the team of experts to the Authority.

JOSEPH MAKAU
For: DIRECTOR GENERAL

Annexure 6: Copies of the baseline monitoring reports for water and air quality, and noise level measurements

LAHVENS LIMITED
Lahvens House
P.O. BOX 34153 - 80118
Mombasa, Kenya

ECOLOGICAL FIELD SAMPLING DATA RECORD SHEET

Officer/s: VAO & OOV DATE: 19.08.2023

JOB NO.: 50123-0050 C SITE CODE: UMHL SITE NAME: ULTRA URBAN HOMES LTD

START TIME: 0630 HRS FINISH TIME: 0730 HRS

Field measurements

Parameter	Results Run 1	Results Run 2 (Replicate)	Averages
Depth (m)	7.62	7.62	7.62
Secchi depth (Perspective degree) (m)	2.1	2.5	2.3
Temperature (°C)	26.0	26.0	26.0
Dissolved oxygen (mg/L)	5.22	5.25	5.24
Electrical conductivity (¤S/cm)	44.25	44.28	44.27
Salinity (‰)	28.0	28.0	28.0
pH	8.03	8.03	8.03
Turbidity (NTU)	7.1	7.3	7.2
Total Suspended Solids (TSS) (mg/L)	15.3	16.7	16.0
Biological Oxygen Demand (BOD) (mg/L)	17.8	19.3	18.55
Chemical Oxygen Demand (COD) (mg/L)	29.7	32.5	31.1
Total Dissolved Solids (TDS) (mg/L)	24.3	24.3	24.3
Ammonia (NH+) (mg/L)	Not detected	Not detected	Not detected
MICRO-BIOLOGICAL TEST RESULTS			
Total Coliforms (cfu/100ml)	Not detected	Not detected	Not detected
Escherichia Coli (E-Coli / 100ml)	Not detected	Not detected	Not detected

Results were obtained from field measurement using a multi-parameter water meter and few lab parameters carried out by Bureau Veritus Kenya Limited, Mombasa Laboratory

DETAILS OF THE EQUIPMENT:

FIELD EQUIPMENT ID: Water Quality Analyzer (AP-800 / AM-200).

CALIBRATION STATUS: Valid.

P.O. BOX 34153 - 80118
Mombasa, Kenya
+254 110 093 237
+254 110 093 237
lahvens@lahvens.com
info@lahvens.com
www.lahvens.com

ENVIRONMENTAL BASELINE STUDY REPORT FOR AMBIENT AIR QUALITY MONITORING.

PROJECT: PROPOSED RESIDENTIAL DEVELOPMENT ON PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY.

PROPONENT: ULTRA MODERN HOMES LIMITED,
P.O BOX 99848-80100,
MOMBASA, KENYA.

REPORT REFERENCE NUMBER: 50123-0050 A

LAHVENS LIMITED

ENVIRONMENTAL BASELINE STUDY REPORT FOR AMBIENT AMOSPHERIC QUALITY MONITORING OF THE PROPOSED RESIDENTIAL DEVELOPMENT ON PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY.

FOR:

ULTRA MODERN HOMES LIMITED,
P.O BOX 99848-80100,
MOMBASA, KENYA.

CLIENT ADDRESS:

LAHVENS LIMITED
P.O BOX 34153, 80118
DESIGNATION LAB REF. NO. NEMA/21/2/LAB77/LLL
EMAIL: LAHVENS@LAHVENS.COM

ENVASSES ENVIRONMENTAL CONSULTANTS LTD
P. O BOX 2013 - 80100
RALLI HOUSE BUILDING, 1ST FLOOR,
MOMBASA, KENYA

ENVIRONMENTAL CONSULTANTS:

UMHL	**ENVIRONMENTAL BASELINE STUDY REPORT FOR AMBIENT AIR QUALITY MONITORING OF THE PROPOSED RESIDENTIAL DEVELOPMENT ON PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY.**	Report Ref No.: 50123-0050 A Report Tittle: EBSAAQMR-50 A DOI: 17TH AUGUST 2023 Page number Page | 2

TABLE 1: **DOCUMENT REVIEW PAGE**

This Technical report titled ENVIRONMENTAL BASELINE STUDY REPORT FOR AMBIENT AIR QUALITY MONITORING OF THE PROPOSED RESIDENTIAL DEVELOPMENT ON PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY was authored by Lahvens Limited in accordance to the EMC (Air Quality) Regulation 2014, Legal Notice No. 34.

REVISION HISTORY

03	04-09-2023	Issuance of Final Report		
02	29-08-2023	Re-submission to close the given comments and approvals		
01	26-08-2023	1st draft issue of the soft copy submitted for review		
REV	**DATE**	DESCRIPTION		
Accepted by				
Reviewed & Approved by		LOVANS ROBERT SPOO (ENVIRONMENTAL MANAGER) N.E.R. NO.: 7165		04/09/2023
Prepared by		VINCENT AGIN - FIELD ATTENDANT		04/SEP/2023
		VALENTINE AGUTU - FIELD ATTENDANT		04/09/2023
PROJECT		Name	Signature	Date
DOCUMENT No.:		50123-050 A		REVISION: 00 FINAL

TABLE 2: **DOCUMENT AND PROJECT INFORMATION**

REPORT NO. 50123-050 A	CONTRACT NO. AS PER EL / EECL TOR.	CLASSIFICATION: A - Unclassified (open report)
TEST FIRM CONTACT PERSON: LOVANS SPOO: (254 - 728716948)	PROJECT: THE PROPOSED RESIDENTIAL DEVELOPMENT ON PLOT L.R. NO. MOMBASA/BLOCK X/85.	NUMBER OF PAGES: 37
TITLE: ENVIRONMENTAL BASELINE STUDY REPORT FOR AMBIENT AIR QUALITY MONITORING OF THE PROPOSED RESIDENTIAL DEVELOPMENT ON PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY.		
AUTHOR(S): LOVANS ROBERT SPOO, VINCENT OKUMU, VALENTINE AGUTU		QUALITY CONTROLLER: SAMSON OBIYA
REPORT PREPARED FOR: ULTRA MODERN HOMES LIMITED - TUDOR, MOMBASA SITE.		DOCUMENT REF. NO. **50123-050 A-FED**
ABSTRACT: LAHVENS Ltd was commissioned by Envasses Environmental Consultants Limited to form the Project's Environmental Team (ET) in providing consulting services of environmental baseline study of the atmospheric quality concentrations prior to commencement of THE PROPOSED RESIDENTIAL DEVELOPMENT ON PLOT L.R. NO. MOMBASA/BLOCK X/85, Tudor, Mombasa county.		
ENGLISH TITTLE		
KEYWORDS		
EBS Ambient Air Quality monitoring and Consultant Reporting		
ABSTRACT (in ENGLISH)		
PUBLICATION TYPE: Digital document (pdf)		TESTING CONSULTANT: LAHVENS LIMITED P.O. BOX 34153-80118 MOMBASA KENYA TUDOR, TOM MBOYA STREET, H03 **DESIGNATION LAB REF. NO. NEMA/21/2/LAB77/LLL**

EXECUTIVE SUMMARY

Global construction activities have increased drastically in the last few decades. Construction activities are major contributors to dust and gaseous pollution. Apart from the usage of raw materials like sand, cement, concrete, etc., activities like excavation and drilling contribute to pollution. Bulk material transportation, loading/unloading, open-air storage, concrete and mortar making, cutting and filling, and the movement of equipment also have a fair share. If unattended, particulate and gaseous pollution may surpassingly increase, impacting laborers and workers at these sites as well as the nearby community.

Kenya has a deficit in housing provision. The proponent, Ultra-Modern Homes Limited, identified the investment gap and is in the process of setting up apartments and associated amenities on PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY. The proposed residential development will comprise of seven (7) residential blocks of basement, ground plus thirteen (13) floors with a total of 350 two-bedroom apartments. Each of the units will comprise of two bedrooms, living/dining, kitchen, laundry and balcony (Table 1 & Annexure 3). Other associated amenities will include parking areas, shops, underground water tanks, six bio-digesters, stand by generator, lift shaft and rooftop. The total built up area will be 41,878.001m^2.

Under the Second Schedule of the Environmental Management and Co-ordination Act (EMCA) No. 8 of 1999, the proposed project is listed as high risk projects which should undergo Environmental and Social Impact Assessment (ESIA) study process. Pursuant to Section 58 of the Act, the Client contracted consultancy services of Envasses Environmental Consultants Limited for the preparation of Environmental and Social Impact (ESIA) for the proposed residential development. As part of this authorization process, Lahvens Limited was commissioned by Envasses Environmental consultants to form the Project's Environmental Team (ET) to determine the baseline atmospheric environment before implementation of the proposed project.

Atmospheric Environmental Baseline Study is a significant component of monitoring programs for successful development activities. This Environmental Baseline Study is designed to characterize the environmental resources at the proposed project site prior to commencement of construction works for the proposed residential development. EBS will provide a benchmark and reference against which to compare the atmospheric conditions influenced by the construction and operation of the pier. The information will be used to assess the effectiveness of any proposed mitigation measures and to implement adaptive management, if needed.

This Baseline Report forms part of a Comprehensive Baseline Study (CBS) of the proposed development Project. The CBS is being prepared as part of an environmental Impact assessment (EIA) and approval process.

The objectives of this Baseline Report is to present the existing atmospheric environment in the proposed residential development and further assess compliance of results through comparisons against the EMC (Air quality) regulations 2014 framework. Atmospheric environment has been selected as a valued component because of their fundamental significance to the well-being of humans, flora and fauna.

Five categories of pollutants are measured at the monitoring networks at the proposed residential development. The monitored categories of pollutants are oxides of nitrogen (NO_x) (which includes nitric oxide (NO) and nitrogen dioxide (NO_2)); carbon monoxide (CO); Ozone (O_3), Total volatile organic compounds (TVOC); Sulfur dioxide (SO_2); particulate matter (PM) (which includes particles less or equal

to than 2.5 microns ($PM_{2.5}$), particles less than or equal to 10 microns (PM_{10}) and Total Suspended Particulate (TSP). The study includes monitoring over a 2-hour period for the pollutants

Ambient air quality survey for this study consists of four representative monitoring runs. Information for the report is presented based on air monitoring completed for 4-hour weighted average.

For the purpose of the baseline investigation, measurements were taken on site on the 17th day of August 2023 and thereafter the measurements were compared against the guidelines and standards while attention given to relevant referencing sites of similar nature.

Ambient air quality data were obtained from a validated and approved air quality monitoring program.

Mobile and active monitoring was done by use of real time gas detector-pump suction equipment which Sampling of gases was done using a 24-hour AQM-09 is a device which can monitor the air quality via the value of O3, SO2, NO2, CO, PM2.5, PM10, etc. The target value is converted into voltage signal by operational amplifier circuit, and then filtered through high-precision AD data acquisition system. Finally, the gas concentration is calculated by CPU. Particulates mainly use laser scattering method to produce different scattering light according to different particle diameters under laser scattering conditions. The scattered light intensity is collected by a response device, and the particle 4 concentration is obtained after amplification, filtering and AD acquisition. The obtained gas concentration and particulate matter concentration can be displayed on LCD screen in real time, and can also be transmitted to cloud platform or environmental protection platform through GPRS, 4G LTE and other network signals, so as to realize the monitoring of regional environmental quality. The gas meters were mounted at about 1 - 2 M above the ground surface. The laboratory results and sampling duration information were used to calculate the gaseous concentrations.

Temperature is measured by way of a highly accurate Air Chip 3000 while humidity is measured using a capacitive humidity sensor (accuracy < 0.8 % / 0.1 K). In order to keep the effects of external influences (e.g., solar radiation) as low as possible, these sensors are located in a ventilated housing with radiation protection. In contrast to conventional non-ventilated sensors, this allows significantly more accurate measurement during high radiation conditions.

The gas detector and particulate matter meters were mounted at about 1 - 2 M above the ground surface. The duration information was used to calculate the gas / pm concentrations

Results and Conclusions:
The main outcome of this study is that a comprehensive understanding of the background air quality now exists. Background concentrations of various pollutants measure will serve as emissions inventory.

It is confirmed that background levels at the proposed residential development did not exceed the permissible levels.

The ambient atmospheric quality data measured and the meteorological parameters collected around the proposed residential development were considered to be within a typical range of emissions for the neighborhood.

Gaseous parameters and environmental parameters recorded along the perimeter / boundaries of the proposed residential development were within the required permissible levels. Gaseous parameters

COMPLIED with the EMC (Air quality) regulations 2014 limits before the commencement of the proposed residential development.

Particulate parameters concentrations were measured and quantified. Particulate parameters recorded across the survey location were considered to be within a typical range of emissions for the neighborhood before the implementation of the proposed project.

It is also worth noting that normal site activities were ongoing at the time of the survey.

The main sources of gaseous and particulate parameters along the project boundaries included the exhaust emissions, abrasion emissions and evaporative emissions from motor vehicles / bikes.

From the analytical and quantifiable results, the state of atmospheric air quality environment of the proposed site before implementation of the project was graded as good / healthy.

The proponent will be required to maintain the air quality concentration levels to the baseline levels where possible or maintain the air quality to below the guideline limit levels at all costs.

There were no proposed mitigation measures at the time of the survey since the atmospheric concentration levels meet the required guideline limits.

Observations:

The neighborhood predominantly comprises of residential developments. It neighbors Creek View Homes and Citadel Royal School to the West, Marine Creek Apartments and Tudor Block Khoja Flats to the East, Tudor Creek to the North and Technical University of Mombasa to the South-West.

Baseline atmospheric measurements were taken for short term exposure levels. It should however be noted that this exercise is only applicable to the time period when sampling took place and does not take into account seasonal and other local variations that might occur during other months. However, it's still a good general overview of the existing air quality environment.

From the site visits the following sources been identified as potential fugitive pollution causes;

Exhaust emissions – the emissions produced primarily from the combustion of different petroleum products such as petrol, diesel, natural gas (NG) and liquefied petroleum gas (LPG).

Abrasion emissions – the emissions produced from the mechanical abrasion and corrosion of vehicle parts. Abrasion is only important for PM emissions and emissions of some heavy metals. Significant levels of PM emissions can be generated from the mechanical abrasion of the vehicle's tyres, brakes and clutch, the road surface wear or the corrosion of the chassis, bodywork and other vehicle components.

Evaporative emissions – the result of vapours escaping from the vehicle's fuel system. Evaporative emissions are important for only VOCs. Petrol fuel vapour contains a variety of different HCs, which can be emitted any time there is fuel in the tank, even when the vehicle is parked with its engine turned off.

TABLE OF CONTENTS

EXECUTIVE SUMMARY 4
1. INTRODUCTION 9
1.1. Project Description 10
1.2. Scope of work 10
1.3. Monitoring Locations and Climatic Features 11
1.4. Terms of Reference 12
1.5. Aims and Objectives 12
1.6. Assumptions 12
1.7. Data Validity and Acceptability 12
1.8. Definitions. 13
2. MONITORING NETWORKS 14
2.1. Oxides of Nitrogen (NOx) 14
2.2. Particulate Matter (PM) 15
2.3. Carbon Dioxide (CO_2) 15
2.4. Sulfur dioxide 16
2.5. Ozone 16
3. LEGISLATIVE AND ENVIRONMENTAL POLICY FRAMEWORK 17
3.1. Environmental Management Coordination (Air Quality) regulations 2014 17
4. MONITORING METHODOLOGY 18
4.1. Tools, Equipment and Materials used 18
4.2. Monitoring Frequency 20
4.3. Existing air quality environment 20
5. PRESENTATION, DISCUSSION & CONCLUSION OF THE AIR QUALITY SURVEY RESULTS 21
5.1. Presentation of resultant baseline Atmospheric environment 21
5.1.1. Summary of singular baseline atmospheric environment 21
5.1.2. Gaseous parameters 22
5.1.3. Particulate matter (PM10) 23
5.1.4. Environmental parameters 23
5.2. Discussions of Atmospheric quality survey results 24
5.2.1. Carbon dioxide 24
5.2.2. Nitrogen oxides (NO_2 + NO) 25
5.2.3. Sulfur dioxide 26

5.2.4. Total Suspended Particulate (TSP) 27
5.2.5. Particulate matter (PM_{10}) 28
5.2.6. Particulate matter ($PM_{2.5}$) 29
5.3. Air Quality Survey Conclusions 31
6. REFERENCES 32

List of Tables

TABLE 1: DOCUMENT REVIEW PAGE 2
TABLE 2: DOCUMENT AND PROJECT INFORMATION 3
Table 3: The built-up areas of the proposed residential development (Source: Ultra Modern Homes Limited, 2023). 10
Table 4: GPS coordinates of proposed residential development. 11
Table 5: List of acronyms 13
Table 6: Ambient Air Quality Tolerance Limits 17
Table 7: Summary results for atmospheric quality and environmental measurements 21
Table 8: Average results for gaseous parameters 22
Table 9: Average results for Particulate Matter (<10 microns) 23
Table 10: Average for Particulate matter (<2.5 microns) 23
Table 11: Average results for Total suspended particulate matter 23
Table 12: Results for Environmental parameters 23

1. INTRODUCTION

"Kenya has an annual housing demand of 250,000 units with an estimated supply of 50,000 units, culminating in a housing deficit of 2 million units, or 80% deficit. Housing affordability is a key challenge in Kenya with many people unable to afford to buy or build their own home. Only 2% of the formally constructed houses target lower-income families. About 6.4 million people, or of Kenya's urban population live in informal settlements. Many families are at high risk of diseases such as malaria, respiratory infections and/or parasitic jiggers' infestation.
Housing delivery is the responsibility of county governments, which often lack adequate resources. Also, 68% of Kenyans are without land documentation or tenure security." (Habitat for Humanity , n.d.)

The proponent, Ultra-Modern Homes Limited, identified the investment gap and is in the process of setting up apartments and associated amenities on PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY.
Global construction activities have increased drastically in the last few decades. Construction activities are major contributors to dust and gaseous pollution. Apart from the usage of raw materials like sand, cement, concrete, etc., activities like excavation and drilling contribute to pollution. Bulk material transportation, loading/unloading, open-air storage, concrete and mortar making, cutting and filling, and the movement of equipment also have a fair share. If unattended, particulate and gaseous pollution may surpassingly increase, impacting laborers and workers at these sites as well as the nearby community.

Under the Second Schedule of the Environmental Management and Co-ordination Act (EMCA) No. 8 of 1999, sub-section (2) Urban Development including:- a) designation of new townships; b) establishment of industrial estates; c) establishment or expansion of recreational areas; d) establishment or expansion of recreational townships in mountain areas, national parks and game reserves; e) shopping centres and complexes are listed as projects which should undergo Environmental and Social Impact Assessment (ESIA) study process. Pursuant to Section 58 of the Act, the Client contracted consultancy services of Envasses Environmental Consultants Limited for the preparation of Environmental and Social Impact (ESIA) for the proposed residential development as per the terms of reference as per Section 58 of the Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya and the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003. As part of this authorization process, Lahvens Limited was commissioned by Envasses Environmental consultants to form the Project's Environmental Team (ET) to determine the baseline atmospheric environment before implementation of the proposed project.

Atmospheric Environmental Baseline Study is a significant component of monitoring programs for successful development activities. Baseline monitoring commences at the reconnaissance phase and continues to incorporate in the feasibility study. This Environmental Baseline Study is designed to characterize the environmental resources at the proposed project site prior to commencement of construction works for the proposed residential development. EBS will provide a benchmark and reference against which to compare the atmospheric conditions influenced by the construction and operation of the pier. The information will be used to assess the effectiveness of any proposed mitigation measures and to implement adaptive management, if needed.
The environmental baseline study will collect, assess, and interpret enough atmospheric physical and chemical information to: (i) support the characterization of the resources at risk; (ii) enable

determination of possible impacts; (iii) help predict the significance of impacts and the effectiveness of any proposed mitigation; (iv) establish thresholds for indicators of ecosystem health; and (v) facilitate the design of monitoring programs.

Well-developed EBS often alleviate heightened perceived concerns within the community during the initial phases of any proposed development, before issues become a serious risk to the project. EBS also creates reassurance in the minds of the public and jurisdictional decision makers that key environmental issues have been identified and will be monitored and mitigated, during and after the project is approved. EBS monitoring can be looked at as an early warning system of impacts that could potentially affect the environment during the project operation phase and long after the project is decommissioned.

This Baseline Report forms part of a Comprehensive Baseline Study (CBS) of the proposed development Project. The CBS is being prepared as part of an environmental Impact assessment (EIA) and approval process.

The objective of this Baseline Report is to present the existing atmospheric environment in the proposed residential development on PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY. Atmospheric environment has been selected as a valued component because of their fundamental significance to the well-being of humans, flora and fauna.

1.1. Project Description

The proposed residential development will comprise of seven (7) residential blocks of basement, ground plus thirteen (13) floors with a total of 350 two-bedroom apartments. Each of the units will comprise of two bedrooms, living/dining, kitchen, laundry and balcony. Other associated amenities will include parking areas, shops, underground water tanks, six bio-digesters, stand by generator, lift shaft and rooftop. The total built up area will be 41,878.001m^2.

Table 3: The built-up areas of the proposed residential development (Source: Ultra Modern Homes Limited, 2023).

Built up areas		Description	No. of units	Total Area in M^2
Basement Floor		Parking area	-	3,603.000
Ground Floor		Parking area	-	3,603.000
Blocks	A	Two bedrooms, living/dining, kitchen, laundry and balcony	90	7333.300
	B		52	4064.255
	C1		52	4751.695
	C2		52	4749.615
	D		52	6795.308
	E1		26	3488.914
	E2		26	3488.914
Total			**350**	**41,878.001**

1.2. Scope of work

The scope of this baseline Report will be as follows:

- Study the available information relevant to the pre-development ambient air concentration in the environment;
- Identify the major existing air emission sources in the environment;
- Identify the existing sensitive pollution areas in the environment;
- Estimate by means of measurements and integration of the results with those of any relevant existing information the present ambient air quality.

1.3. Monitoring Locations and Climatic Features

The ongoing proposed project will be located at Tudor area, Mombasa County at Latitude Latitude 4°02'02.51''South and Longitude 39°40'08.72''East. During atmospheric quality assessment, the project site was divided in to four locations to take care of the boundary / borders, topography of the land and wind directions.

Table 4: GPS coordinates of proposed residential development.

Measurement Sites	Receivers	Description of monitoring Locations	Dates of sampling
PB1 S 4°02'03.912" E39°40'06.7404"	Residential homes, Creek view homes, Windsor Gardens, Technical University, Animal Clinic Tudor, Arif Restaurant	The proposed site is bordered by residential developments. It neighbors Creek View Homes and Citadel Royal School to the West, Marine Creek Apartments and Tudor Block Khoja Flats to the East, Tudor Creek to the North and Technical University of Mombasa to the South-West. It's characterized by a flat terrain which slowly slopping towards the ocean floor. Mangrove vegetation dominates the ocean shore. The neighborhood depicts urban settings but predominantly residentials, schools, mosques and trading activities.	17th August 2023
PB2 S 4°02'03.732" E 39°40'06.9384"			
PB3 S 4°02'03.7176" E 39°40'07.176"			
PB4 S 4°02'01.8168" E 39°40'08.8968"			

Project boundary sloping towards the ocean

1.4. Terms of Reference

As part of the Terms of Reference (ToR), air quality measurements were undertaken in compliance with the EMC (Air quality) regulations 2014 framework legal notice 34.
The following forms the scope of the air quality survey:

- Review of the legal context relating to air pollutants;
- Evaluation of site meteorology;
- Monitoring of background air quality:
  Particulate Matter (PM) - particulate matter with aerodynamic diameter less than 10 microns, 2.5 microns (PM_{10} and $PM_{2.5}$) and Total Suspended Particulate.
  Gases - Nitrogen dioxide (NO_x), Silfur dioxide (SO_2), Ozone (O_3) and carbon dioxide (CO_2).

1.5. Aims and Objectives

- The overall aim of this report is to quantify the quality of atmospheric environment of the proposed residential environment in Tudor.
- To assess compliance of results through comparisons against the EMC (Air quality) regulations 2014 framework.

1.6. Assumptions

- The short-term exposure levels of data collection for TSP, PM_{10}, $PM_{2.5}$, NO_x, CO_2, SO_2, and O_3 collected is considered sufficient to understand the state of atmospheric air quality environment before implementation of the proposed residential development in Tudor, Mombasa County.

1.7. Data Validity and Acceptability

All data recorded in the study was taken through data replications and quality assurance procedure to ensure that any anomalous readings or questionable data is not incorporated in the final results.

Elements of this procedure account for:

- Routine calibration and auditing of the analyzers
- Statistical rendering of outliers

1.8. Definitions.

Table 5: List of acronyms

AAQTL	Ambient Air Quality Threshold Limits
AQG	Air Quality Guidelines
CBS	Comprehensive Baseline Study
CO	Carbon monoxide
CO_2	Carbon dioxide
EA	Environmental Audits
EIA	Environmental Impact Assessment
EMC	Environmental Management and Coordination
EPA	Environmental Protection Authority
GPS	Geographic Positioning System
hpa	Hectopascal
km/hr	Kilometer per hour
l/min	Liters per minute
µg/m3	Microgram per cubic meter
mg/m3	Milligram per cubic meter
m/s	Meters per second
Mm/s	Millimeters per second
NEMA	National Environment Management Authority
NO_x	Oxides of Nitrogen
NO_2	Nitrogen dioxide
Pb	Lead
PM_{10}	Particulate matter (<10 microns)
$PM_{2.5}$	Particulate matter (<2.5 microns)
SO_2	Sulfur dioxide
QAQC	Quality Assurance / Quality Control
TSP	Total Suspended Particulate
TVOC	Total volatile Organic compounds
TWA	Time Weighted Average
WB	World bank
WHO	World Health Organization
µg/m^3	Micro gram per cubic meter
UMHL	Ultra-Modern Homes Limited
VOCs	Volatile organic compounds

2. MONITORING NETWORKS

Five categories of pollutants are measured at the monitoring networks at the proposed residential development. The monitored categories of pollutants are oxides of nitrogen (NO_x) (which includes nitric oxide (NO) and nitrogen dioxide (NO_2)); carbon monoxide (CO); Ozone (O_3), Total volatile organic compounds (TVOC); Sulfur dioxide (SO_2); particulate matter (PM) (which includes particles less or equal to than 2.5 microns ($PM_{2.5}$), particles less than or equal to 10 microns (PM_{10}) and Total Suspended Particulate (TSP). The study includes monitoring over a 2-hour period for the pollutants.

2.1. Oxides of Nitrogen (NOx)

Some nitrogen dioxide is formed naturally in the atmosphere by lightning, while some are produced by plants, soil & water. However, only about 1% of the total amount of NO_2 found in air is formed this way. In a combustion process, NOx is produced through three mechanisms, namely thermal NOx, fuel NOx and prompt NOx. Thermal NOx is the primary source of NOx and is formed as a high temperature dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2). It is produced in the hottest part of the flame and its formation increases exponentially with the flame temperature. The control of thermal NOx is generally achieved through reducing the flame temperature, reducing the residence time, or by operating under fuel rich conditions. Fuel NOx is formed by the reaction of nitrogen compounds chemically bound in liquid or solid fuels with oxygen in the combustion air. In the combustion of such fuels, fuel NOx can account for up to 50% of the total NOx emissions. Prompt NOx is formed from the rapid reaction of atmospheric nitrogen with hydrocarbon radicals, and typically under partially fuel-rich conditions. It can be reduced through combustion staging or by operating under highly oxidizing combustion conditions.

Combustion of fossil fuels from vehicles, power plants and industrial activity produces oxides of nitrogen (NO_x). NO_x is primarily made up of nitric oxide (NO) and nitrogen dioxide (NO_2). NO_2 is of most concern due to its impact on health. However, NO easily converts to NO_2 in the air - so to reduce concentrations of NO_2 it is essential to control emissions of NO_x. The EMC (air quality) standards set ambient NO_2 as a criteria pollutant and indicator of the larger group of nitrogen oxides.
Construction and demolition sites generate NO_2 from diesel or gasoline fuelled engines in industrial trucks, excavators, loaders, bulldozers, mobile cranes, off-road machinery and static engines such as pumps and electricity generators. Idling engines are a significant contributor to NRMM emissions and personal exposure to NO_2.

The rate of NO_2 formation varies with time of day, season, temperature, wind speed, solar radiation and the availability of oxidants to help drive the chemical reactions.
NO2 is a reddish-brown gas with a pungent odour, which upon reaction with other atmospheric compounds, becomes a major contributor to smog, acid rain, inhalable particulates and reduced visibility. At significant levels and exposure, inhalation may result in irritation and burning to the skin and eyes, nose and throat. Prolonged exposure may result in permanent lung damage.

Scientific evidence links short-term NO_2 exposures with adverse respiratory effects including airway inflammation in healthy people and increased respiratory symptoms in people with asthma. Studies also show a connection between short-term exposure and increased hospital admissions for respiratory illnesses. In addition to contributing to ground-level ozone effects on the respiratory system, NO_x reacts with ammonia, moisture, and other compounds to form small particles. These small particles can penetrate deeply into sensitive parts of the lungs.

2.2. Particulate Matter (PM)

Particle pollution or particulate matter (PM) covers all particles suspended in the air, and is a complex mixture of extremely small particles and liquid droplets. In the context of construction sites, the two PM-related concerns of key interest are $PM_{2.5}$ and PM_{10} (another way to define particle size is by measuring respirable vs inhalable dust.) The exhaust from diesel-powered construction equipment includes fine particles, virtually all of which are $PM_{2.5}$ (2.5 micrometres or smaller in diameter); exhaust particulate is sometimes called primary $PM_{2.5}$. Fine particles such as $PM_{2.5}$ are also chemically formed in the atmosphere from various pollutants, some of which are emitted by diesel-powered equipment, and these particles are referred to as secondary $PM_{2.5}$.

Construction-related dust includes larger size or coarse particles also known as PM_{10} (between 2.5 and 10 micrometres). PM_{10} is generated from bulk material operations on construction sites, such as earthworks, demolition, crushing and grinding operations, soil and aggregate stockpiling, and from smaller activities such as cutting building materials. These operations contribute to windblown dust problems—sometimes called fugitive dust—and the movement of dirt from the construction or demolition site onto nearby roadways. Once dirt or dust from a site has been 'tracked out' onto a road, passing vehicles can cause the dirt to become suspended in the air as re-entrained road dust. Fugitive and re-entrained dust particles can remain in the air for days or even weeks.

Particle pollution is linked to a number of health problems, including coughing, wheezing, reduced lung function, asthma attacks, heart attacks and strokes. It also is linked to early death. The fine particulate matter ($PM_{2.5}$) in diesel engine exhaust is classed as being carcinogenic to humans and in 2004 the World Health Organisation (WHO) advised that there is no evidence of a safe level of PM exposure or a threshold below which no adverse health effects could occur.

Other environmental effects include the soiling of exposed surfaces, impairment of visibility, potential modification of climate and contribution to acid deposition.

2.3. Carbon Dioxide (CO_2)

Carbon dioxide is odorless, colorless, and tasteless and has a specific gravity of 1.53. It is a basic by-product of respiration and combustion. With a specific gravity heavier than air, the gas will stratify in a non-ventilated, confined area with highest concentrations at the base of a structure. CO_2 is not toxic to humans but in elevated concentrations, it can displace O_2 and result in asphyxiation (lack of oxygen).
CO is a colorless, odorless, and tasteless gas with a specific gravity of 0.97 (compared to air). Its presence is due to incomplete oxidation or combustion of carbon. Very few natural CO sources exist. The most common source is automobile exhaust. Appliances, including gas cook tops, gas heaters, furnaces, and wood stoves can also contribute CO. Inadequate maintenance, broken parts, or back drafting due to the design and construction of a house can make these devices dangerous. CO binds strongly with hemoglobin (carrier of oxygen from the lungs to the organs) in the blood. The CO-hemoglobin bond is 200 times stronger than O_2-hemoglobin. It is not easily respired out of the human body. Thus, the blood cannot carry enough O_2 to sustain bodily functions. Carbon monoxide reduces the delivery of oxygen to the body's organs. For those with heart disease, exposure to low doses can result in chest pain. For healthier people, exposure to higher levels affects the central nervous system.
Incomplete oxidation of fuel results in the formation of CO. In simplified terms, the generic stoichiometric combustion equation for complete combustion is:

$$HC + O_2 \rightarrow CO_2 + H2O$$

However, if sufficient oxygen (O_2) is not present to complete the combustion of the hydrocarbon fuel (HC), then the oxidation to carbon dioxide (CO_2) and water (H_2O) is not completed and hence CO is emitted.

2.4. Sulfur dioxide

Levels of sulphur dioxide (SO_2) in ambient air are directly related to the concentration of sulphur in fuel and the quantity of fuel being combusted. Upon combustion, approximately 98% of the sulphur in the fuel will oxidize to form SO_2, with the remaining 2% producing sulphur trioxide (SO_3). The emitted SO_2 can also further oxidize to SO_3 and react with water to produce acid rain in the form of sulphuric acid (H_2SO_4).

Short-term exposures to SO_2, have shown adverse respiratory effects including bronchoconstriction and increased asthma symptoms.

2.5. Ozone

Ground-level ozone is not directly emitted into the air, but rather is formed by chemical reactions between NOx and volatile organic compounds (VOCs) in the presence of ultraviolet (UV) radiation. Ozone is a primary component of smog.

Breathing ozone can trigger a variety of health problems including chest pain, coughing, throat irritation, and congestion. It can also worsen bronchitis, emphysema, and asthma as well as reduce lung function and inflame the linings of the lungs, permanently scarring lung tissue under repeated exposure.

3. LEGISLATIVE AND ENVIRONMENTAL POLICY FRAMEWORK

3.1. Environmental Management Coordination (Air Quality) regulations 2014

The Kenya Air Quality Regulations 2014 impose limit values as detailed in the SPECIAL ISSUE Kenya Gazette Supplement No.41, Legislative Supplement No.15, Legal Notice No. 34, compliance with the objectives (prevention, control and abatement of air pollution to ensure clean and healthy ambient air) is a legal requirement in Kenya.

Part 65 and 66 details the requirements on monitoring and assessment of ambient air quality, part 85 shows the need for establishment of baseline levels of priority air pollutants listed in the first schedule of the guideline and included PM_{10}, $PM_{2.5}$, TSP, NO_2, SO2, 03 and CO_2. Statutory requirements relevant to this study FIRST SCHEDULE are detailed in Table 3 below:

Table 6: Ambient Air Quality Tolerance Limits

	Pollutant	Time weighted Average			
			Industrial area	Residential, Rural & Other area	Controlled areas***
1.	Respirable particulate matter (<10 µg/m^3) (RPM)	24 hours**	150µg/Nm^3	100µg/Nm^3	75µg/Nm^3
2.	$PM_{2.5}$	24 hours	75 µg/m^3		
3.	Sulphur dioxide	Instant Peak	500 µg/m^3		
4.		Instant peak (10min)	0.191 ppm		
5.	Non-methane hydrocarbons	instant Peak	700ppb		
6.	Total VOC	24 hours**	600 µg/m^3		
7.	Nitrogen dioxide	24 hours	100 µg/m^3	0.1 PPM	
8.		1-hour		0.2 PPM	
9.	Carbon monoxide / carbon dioxide	One Hour	10 mg/m^3	4 mg/m^3	2 mg/m^3
10.	Ozone	1-Hour	200 µg/m3	0.12 PPM	

Extract from the Ambient EMC Air Quality regulations, 2014 (Tolerance Limits)

4. MONITORING METHODOLOGY

It is important to accurately determine prevailing air quality conditions against which predicted effects can be gauged and assessed for any environmental effects' assessment.
Ambient air quality survey for this study consists of four representative monitoring runs. Information for the report is presented based on air monitoring completed for 4-hour weighted average.
For the purpose of the baseline investigation, measurements were taken on site on the 17th day of August 2023 and thereafter the measurements were compared against the guidelines and standards while attention given to relevant referencing sites of similar nature.
Ambient air quality data were obtained from a validated and approved air quality monitoring program.

Mobile and active monitoring was done by use of real time gas detector-pump suction equipment which Sampling of gases was done using a 24-hour AQM-09 is a device which can monitor the air quality via the value of O3, SO2, NO2, CO, PM2.5, PM10, etc. The target value is converted into voltage signal by operational amplifier circuit, and then filtered through high-precision AD data acquisition system. Finally, the gas concentration is calculated by CPU. Particulates mainly use laser scattering method to produce different scattering light according to different particle diameters under laser scattering conditions. The scattered light intensity is collected by a response device, and the particle 4 concentration is obtained after amplification, filtering and AD acquisition. The obtained gas concentration and particulate matter concentration can be displayed on LCD screen in real time, and can also be transmitted to cloud platform or environmental protection platform through GPRS, 4G LTE and other network signals, so as to realize the monitoring of regional environmental quality. The gas meters were mounted at about 1 - 2 M above the ground surface. The laboratory results and sampling duration information were used to calculate the gaseous concentrations.

Meteorological parameters
Temperature is measured by way of a highly accurate Air Chip 3000 while humidity is measured using a capacitive humidity sensor (accuracy < 0.8 % / 0.1 K). In order to keep the effects of external influences (e.g., solar radiation) as low as possible, these sensors are located in a ventilated housing with radiation protection. In contrast to conventional non-ventilated sensors, this allows significantly more accurate measurement during high radiation conditions.

The gas detector and particulate matter meters were mounted at about 1 - 2 M above the ground surface. The duration information was used to calculate the gas / pm concentrations.

4.1. Tools, Equipment and Materials used

Below is the equipment used during air monitoring survey:

- Air Quality Monitor System AQM 09
- Geographic Positioning System (GPS)
- Digital camera
- Calibration certificates
- Standard Reference materials & Standard operating procedures
- Equipment manuals.
- Terms of Reference & Maps of the project area

Ongoing measurements along the project boundaries PB (source: Fieldwork August, 2023)

Ongoing measurements along the project boundaries PB (source: Fieldwork August, 2023)

4.2. Monitoring Frequency

Monitoring of air quality test parameters was done with a frequency of 4 hr / day.

4.3. Existing air quality environment

The proposed site is bordered by residential developments. It neighbors Creek View Homes and Citadel Royal School to the West, Marine Creek Apartments and Tudor Block Khoja Flats to the East, Tudor Creek to the North and Technical University of Mombasa to the South-West. The vehicles and motor bikes accessing the above mentioned residential development lead to the buildup of gaseous and particulate emissions. The current site is characterized by a flat terrain which slowly slopping towards the ocean floor. Mangrove vegetation dominates the ocean shore.

5. PRESENTATION, DISCUSSION & CONCLUSION OF THE AIR QUALITY SURVEY RESULTS

5.1. Presentation of resultant baseline Atmospheric environment

5.1.1. Summary of singular baseline atmospheric environment

Table 7: Summary results for atmospheric quality and environmental measurements

Monitoring Locations	Date	Temp. °C	Humidity %RH	CO (mg/ m³)	NO_2 (ppm)	NO (ppm)	NO_x (ppm)	SO_2 (ppm)	O_3 (ppm)	TVOC (µg/ m3)	$PM_{2.5}$ (µg/ m3)	PM_{10} (µg/ m3)	TSP (µg/ m³)
PB1: S 4°02'03.912" E 39°4006.7404"	17th August 2023	29.75	48.97	0.003	0.0473	0.00672	0.0539	0.064	0.0508	16	2.53	19.67	36.20
PB2: S 4°02'03.732" E 39°4006.9384"	17th August 2023	29.75	48.97	0.005	0.0696	0.00226	0.0718	0.0639	0.0451	15	1.90	15.13	28.00
PB3: S 4°02'03.7176" E 39°4007.176"	17th August 2023	29.75	48.97	0.004	0.0684	0.00194	0.0704	0.0628	0.0431	14	1.20	7.57	13.97
PB4: S 4°02'01.8168" E 39°4008.8968"	17th August 2023	29.75	48.97	0.004	0.0689	0.00183	0.0708	0.0632	0.0430	14	1.28	7.22	13.09
Average Concentration in the proposed project site		**29.75**	**48.97**	**0.004**	**0.0635**	**0.00319**	**0.0667**	**0.0635**	**0.0455**	**15**	**1.73**	**12.40**	**22.82**

(Source: Lahvens Limited during site monitoring in August 2023).

5.1.2. Gaseous parameters

Table 8: Average results for gaseous parameters

Monitoring locations	NO_X		SO_2		CO		TVOC		O_3	
	Conc. (ppm)	EMC AQR guide 2014 (ppm)	Conc. (ppm)	EMC AQR guide 2014 (ppm)	Conc. (mg/m^3)	EMC AQR guide 2014 (mg/m^3)	Conc. ($\mu g/m^3$)	EMC AQR guide 2014 ($\mu g/m^3$)	Conc. (ppm)	EMC AQR guide 2014 (ppm)
PB1: S 4°02'03.912" E 39°40'06.7404"	0.0539	0.8	0.064	0.191	0.003	4.0	16	600	0.0508	0.12
PB2: S 4°02'03.732" E 39°40'06.9384"	0.0718	0.8	0.0639	0.191	0.005	4.0	15	600	0.0451	0.12
PB3: S 4°02'03.7176" E 39°40'07.176"	0.0704	0.8	0.0628	0.191	0.004	4.0	14	600	0.0431	0.12
PB4: S 4°02'01.8168" E 39°40'08.8968"	0.0708	0.8	0.0632	0.191	0.004	4.0	14	600	0.0430	0.12
Average Concentration of the proposed project site	**0.0667**	**0.8**	**0.0635**	**0.191**	**0.004**	**4.0**	**15**	**600**	**0.0455**	**0.12**
Remarks		**Complies**		**Complies**		**Complies**		**Complies**		**Complies**

5.1.3. Particulate matter (PM10)

Table 9: Average results for Particulate Matter (<10 microns)

Monitoring Locations	*PARTICULATE MATTER ≤10 (PM_{10})*			
	Sampling time	Concentration ($\mu g/m^3$)	Guideline ($\mu g/m^3$)	Remarks
PB1	60 min	19.67	-	No guideline for short term emissions
PB2	60 min	15.13	-	No guideline for short term emissions
PB3	60 min	7.57	-	No guideline for short term emissions
PB4	60 min	7.22	-	No guideline for short term emissions
Average Concentration of the proposed project site	60 min	**12.40**	-	No guideline for short term emissions

Table 10: Average for Particulate matter (<2.5 microns)

Monitoring Locations	*PARTICULATE MATTER ≤2.5 ($PM_{2.5}$)*			
	Sampling time	Concentration ($\mu g/m^3$)	Guideline ($\mu g/m^3$)	Remarks
PB1	60 min	2.53	-	No guideline for short term emissions
PB2	60 min	1.90	-	No guideline for short term emissions
PB3	60 min	1.20	-	No guideline for short term emissions
PB4	60 min	1.28	-	No guideline for short term emissions
Average Concentration of the proposed project site	60 min	**1.73**	-	No guideline for short term emissions

Table 11: Average results for Total suspended particulate matter

Monitoring Locations	*TSP*			
	Sampling time	Concentration ($\mu g/m^3$)	Guideline ($\mu g/m^3$)	Remarks
PB1	60 min	36.20	-	No guideline for short term emissions
PB2	60 min	28.00	-	No guideline for short term emissions
PB3	60 min	13.97	-	No guideline for short term emissions
PB4	60 min	13.09	-	No guideline for short term emissions
Average Concentration of the proposed project site	60 min	**22.82**	-	No guideline for short term emissions

5.1.4. Environmental parameters

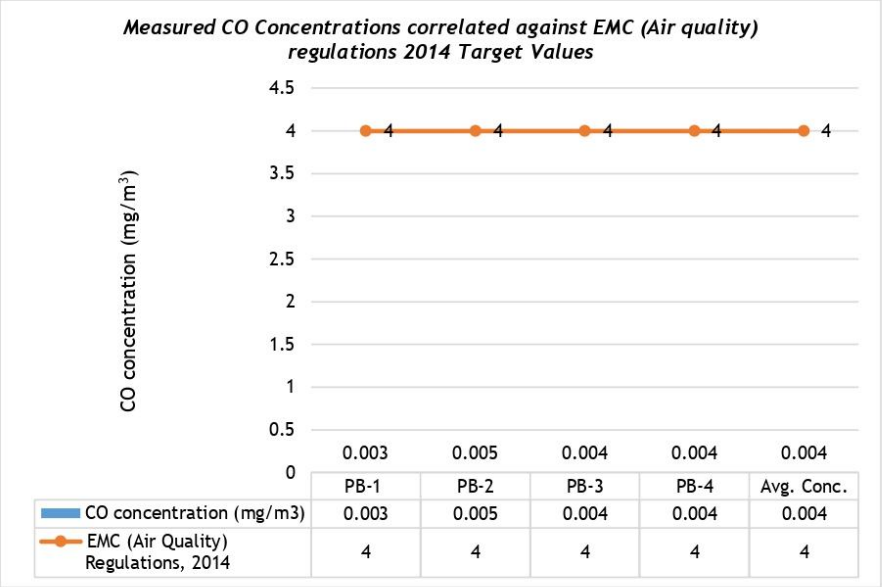
Table 12: Results for Environmental parameters

Monitoring Locations	Environmental parameters				*Remarks*
	Air temps °C	Pressure hPa	Humidity %	Wind Speed km/hr	
Average Concentration of the proposed project site	29.76 ± 0.66	1014.0 ± 0.0	48.92 ± 3.86	4.42 ± 0.32 m/S South winds	Ambient conditions present

5.2. Discussions of Atmospheric quality survey results

Air quality survey was completed for short term exposure levels as the preferred time weighted averages in order to measure and quantify the air pollutant levels so as to determine the current existing conditions. Results of the gaseous concentrations and particulate parameters were thereafter correlated against the Environmental Management Coordination (Air quality) regulations of 2014 as follows:

5.2.1. Carbon dioxide



	PB-1	PB-2	PB-3	PB-4	Avg. Conc.
CO concentration (mg/m3)	0.003	0.005	0.004	0.004	0.004
EMC (Air Quality) Regulations, 2014	4	4	4	4	4

The above combined graph was drawn from statistical analysis for 1-hr per station monitoring of atmospheric carbon monoxide environment as per the requirement of TOR.

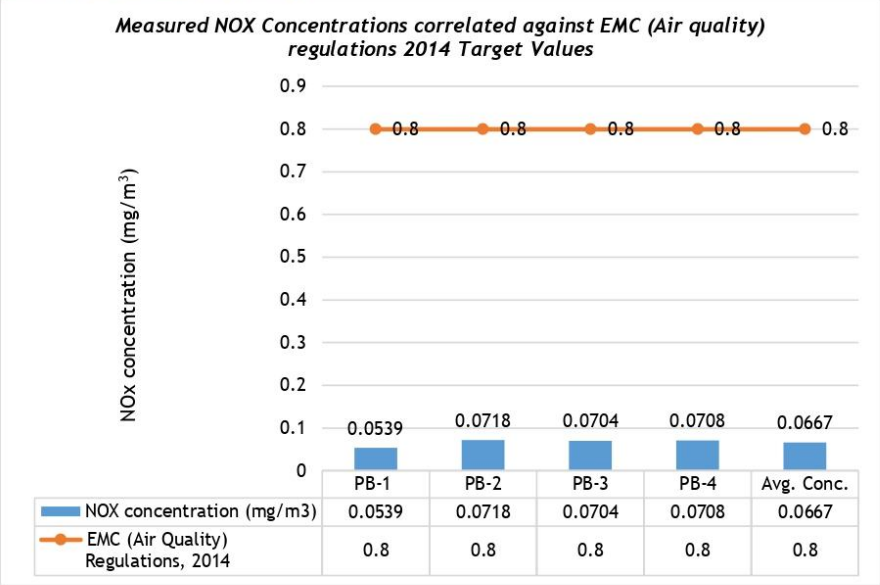
The maximum average 1-hour CO concentration extended to levels of 0.005 mg/m^3 at PB-2 while the minimum average 1-hour CO concentration extended to levels of 0.003 mg/m^3 at PB-1.

The resultant concentrations of carbon monoxide across all monitoring locations complied with the EMC (Air quality) regulations 2014 limits of 4.0 mg/m^3.

The most probable source of carbon monoxide are fugitive emissions from automobile which is the main product of fuel combustion in vehicle engines, along with water. CO2 is the most significant GHG influencing climate change, posing a threat to public health and the environment.

The results further showed some consistency of CO concentrations across the survey locations. The consistency of concentrations signifies lack of influence from any obvious outliers.

5.2.2. Nitrogen oxides (NO_2 + NO)



The statistical analysis for 1-hr per location monitoring of NO_X as outlined in the TOR was completed for four perimeter boundary.

The maximum 1-hour NO_X concentration extended to levels of 0.0718 ppm at PB-2 while the minimum 1-hour NO_x concentration extended to levels of 0.0539 ppm at PB-1. The average Nitrogen oxide concentrations extended to levels of 0.067 ±0.0085 ppm.

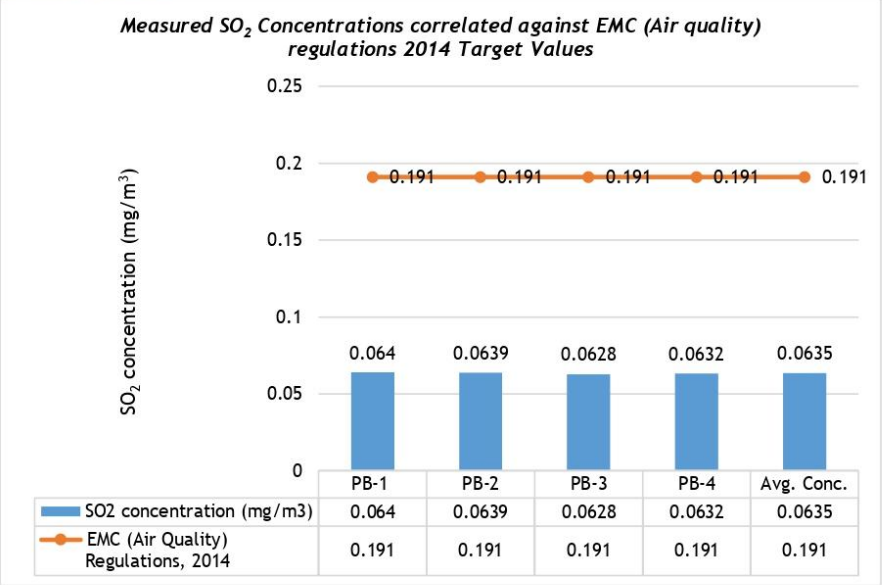
The concentration levels of all recorded nitrogen oxide gas within the four-hour survey time slightly exceeded the ambient levels (0.05ppm).

There were no 1-hour exceedance of the AAQTL of 0.8 ppm thus the frequency of exceedance was zero. The concentration of NO_x at the survey location was 100.00% in compliance of the EMC (Air quality) regulations 2014 maximum limits before implementation of the proposed residential development.

The results for the nitrogen oxide (NO_X) concentrations measured below the air quality guidelines.

The small standard deviation of nitrogen oxides recorded during the survey indicated that there were no signs of outlier results or outlier influence on the concentrations of NOx i.e. the sources of nitrogen oxides were considered similar. Combustion of fossil fuels from vehicles produced oxides of nitrogen (NO_x).

5.2.3. Sulfur dioxide



The above combined graph was drawn from statistical analysis for 1-hr monitoring per location of atmospheric sulfur dioxide environment as per the requirement of TOR.

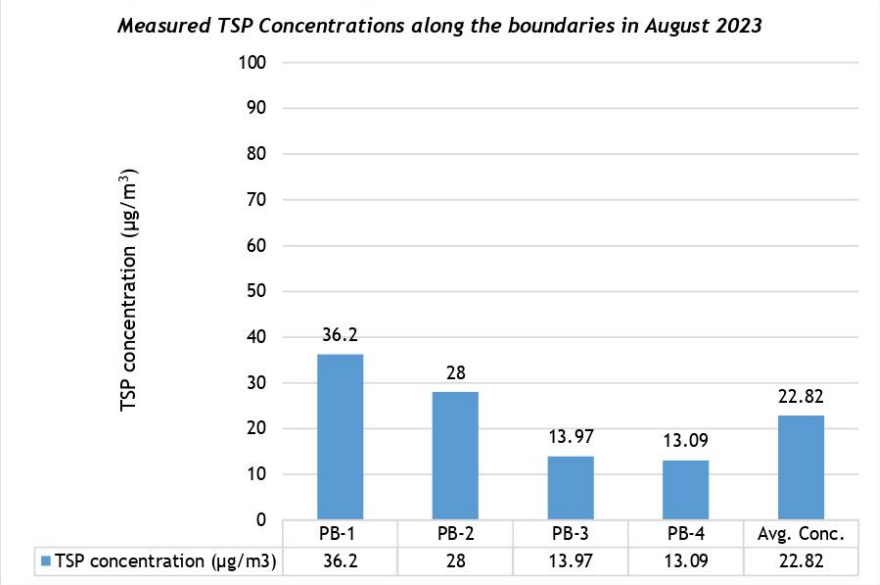
It is evident that the maximum 1-hour SO_2 average concentration extended to levels 0.0640 ppm at location PB-1 while the minimum 1-hour SO_2 average concentration extended to levels of 0.0628 ppm at the PB-3. The average sulfur dioxide concentrations extended to levels of 0.0635 ± 0.00055 ppm. The average sulfur dioxide concentrations recorded across all survey locations had concentrations above the ambient levels (0.02ppm).

The resultant sulfur dioxide concentrations were correlated with the limit value (EMC (Air quality) regulations 2014 maximum limits) for short term exposures. Results showed 100% compliance with the limit values before project implementation.

There was no instant peak exceedance of the AAQTL of 0.191 ppm along the four project boundaries (PB) thus the frequency of exceedance was 0%.

Locomotives such as motor vehicles and bikes accessing the nearest developed areas create SO_2 emissions by burning sulfur-containing fuels, especially diesel. Sulfur dioxide reacts in the atmosphere to form fine particles and, as other air pollutants, poses the largest health risk to vulnerable people.

5.2.4. Total Suspended Particulate (TSP)



The statistical analysis for a combined 4-hr monitoring of TSP as outlined in the TOR was completed.

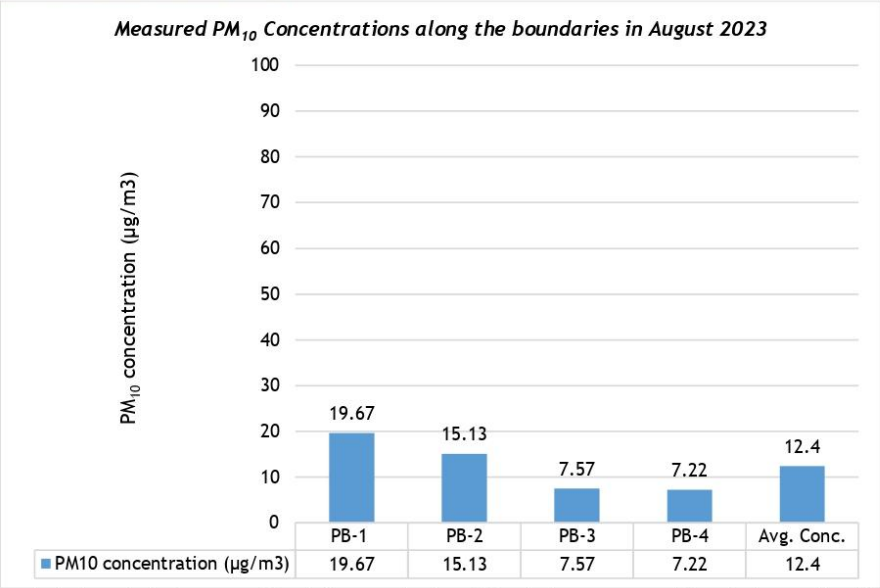
The maximum TSP concentration along PB-1 extended to levels of 36.2 ug/m^3 while the minimum TSP concentration along PB-4 extended to levels 13.09 ug/m^3.

The average TSP concentrations extended to levels of 22.82 ± 11.23 ug/m^3. The standard deviation recorded demonstrates that the replicate TSP data sets were spread around the mean. During the four-hour monitoring, there may be presence of an outlier activity (source) that affected the uniformity of TSP data recorded along the boundaries.

There are no short term guidelines given under the EMC (Air quality) regulations 2014 for comparison of results. No comparisons were made against the regulation. However, the concentration values of TSP recorded were within the typical range of emissions for the neighborhood.

The main sources of TSP at the proposed site were fugitive emissions from motor vehicles, motorbikes through Exhaust emissions, Abrasion emissions and Evaporative emissions.

5.2.5. Particulate matter (PM_{10})



The statistical analysis for a combined 4-hr monitoring of Particulate matter <10 ug/m^3 as outlined in the TOR was completed.

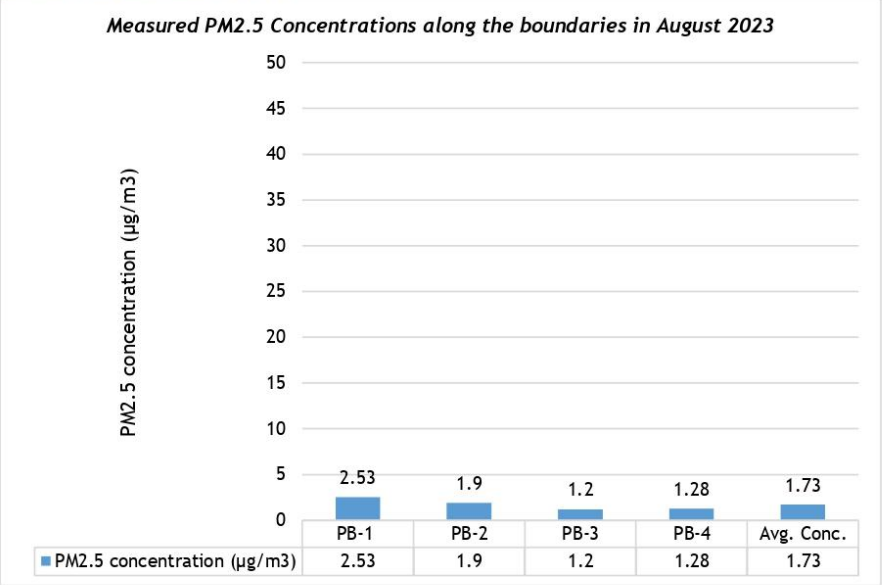
The maximum PM_{10} concentration along PB-1 extended to levels of 19.67 ug/m^3 while the minimum concentration along PB-4 extended to levels of 7.22 ug/m^3.

The average PM_{10} concentrations extended to levels of 12.4 ± 6.07 ug/m^3. The standard deviation recorded demonstrates that the replicate PM_{10} data sets were spread around the mean. During the four-hour monitoring, there may be presence of an outlier activity (source) that affected the uniformity of PM_{10} data recorded along the boundaries (PB-1 and PB-2).

There are no short term guidelines given under the EMC (Air quality) regulations 2014 for comparison of results. No comparisons were made against the regulation. However, the concentration values of $PM_{1.0}$ recorded were within the typical range of emissions for the neighborhood.

The main sources of PM_{10} at the proposed site were fugitive emissions from motor vehicles, motorbikes resulting from Exhaust emissions, Abrasion emissions and Evaporative emissions.

5.2.6. Particulate matter ($PM_{2.5}$)



The statistical analysis for a combined 4-hr monitoring of Particulate matter <2.5 ug/m^3 as outlined in the TOR was completed.

The maximum $PM_{2.5}$ concentrations along PB-1 extended to levels of 2.53 ug/m^3 while the minimum $PM_{2.5}$ concentrations along PB-3 extended to levels of 1.2 ug/m^3.

The average $PM_{2.5}$ concentrations extended to levels of 1.73 ± 0.62 ug/m^3. The standard deviation recorded demonstrates that the replicate $PM_{2.5}$ data sets were clustered around the mean.

There are no short term guidelines given under the EMC (Air quality) regulations 2014 for comparison of results. No comparisons were made against the regulation. However, the concentration values of $PM_{2.5}$ recorded were within the typical range of emissions for the neighborhood.

The main sources of $PM_{2.5}$ at the proposed site were fugitive emissions from motor vehicles, motorbikes resulting from Exhaust emissions, Abrasion emissions and Evaporative emissions.

NOTES:

Sensitive receptors

The neighborhood predominantly comprises of residential developments. It neighbors Creek View Homes and Citadel Royal School to the West, Marine Creek Apartments and Tudor Block Khoja Flats to the East, Tudor Creek to the North and Technical University of Mombasa to the South-West.

Baseline atmospheric measurements were taken for short term exposure levels. It should however be noted that this exercise is only applicable to the time period when sampling took place and does not take into account seasonal and other local variations that might occur during other months. However, it's still a good general overview of the existing air quality environment.

From the site visits the following sources been identified as potential fugitive pollution causes;

- **Exhaust emissions** – the emissions produced primarily from the combustion of different petroleum products such as petrol, diesel, natural gas (NG) and liquefied petroleum gas (LPG).
- **Abrasion emissions** – the emissions produced from the mechanical abrasion and corrosion of vehicle parts. Abrasion is only important for PM emissions and emissions of some heavy metals. Significant levels of PM emissions can be generated from the mechanical abrasion of the vehicle's tyres, brakes and clutch, the road surface wear or the corrosion of the chassis, bodywork and other vehicle components.
- **Evaporative emissions** – the result of vapours escaping from the vehicle's fuel system. Evaporative emissions are important for only VOCs. Petrol fuel vapour contains a variety of different HCs, which can be emitted any time there is fuel in the tank, even when the vehicle is parked with its engine turned off.

5.3. Air Quality Survey Conclusions

- The main outcome of this study is that a comprehensive understanding of the background air quality now exists. Background concentrations of various pollutants measure will serve as emissions inventory.
- It is confirmed that background levels at the proposed residential development did not exceed the permissible levels.
- The ambient atmospheric quality data measured and the meteorological parameters collected around the proposed residential development were considered to be within a typical range of emissions for the neighborhood.
- Gaseous parameters and environmental parameters recorded along the perimeter / boundaries of the proposed residential development were within the required permissible levels. Gaseous parameters COMPLIED with the EMC (Air quality) regulations 2014 limits before the commencement of the proposed residential development.
- Particulate parameters concentrations were measured and quantified. Particulate parameters recorded across the survey location were considered to be within a typical range of emissions for the neighborhood before the implementation of the proposed project.
- It is also worth noting that normal site activities were ongoing at the time of the survey.
- The main sources of gaseous and particulate parameters along the project boundaries included the exhaust emissions, abrasion emissions and evaporative emissions from motor vehicles / bikes.
- From the analytical and quantifiable results, the state of atmospheric air quality environment of the proposed site before implementation of the project was graded as good / healthy.
- The proponent will be required to maintain the air quality concentration levels to the baseline levels where possible or maintain the air quality to below the guideline limit levels at all costs.
- There were no proposed mitigation measures at the time of the survey since the atmospheric concentration levels meet the required guideline limits.

6. REFERENCES

1) Environmental Management and Coordination Act (EMCA) 1999 (amended 2015).
2) Environmental Management Coordination (Air Quality) Regulations 2014 (Legal Notice No.34).
3) Environmental Protection Agency. (1976) Quality Assurance Handbook for Air Pollution Measurement Systems - Volume 1 Principles. EPA-600/9-76-005, Research Triangle Park, NC.
4) Quality Assurance and Quality Control (QA/QC) Procedures for UK Air Quality Monitoring under 2008/50/EC and 2004/107/EC
5) U.S. Environmental Protection Agency (2000) Guidance for Data Quality Assessment - Practical Methods for Data Analysis, EPA Report QA G-9 QA00 Update, Washington DC, July 2000. This document can be downloaded from website: http://www.epa.gov/quality/qs-docs/g9-final.pdf
6) U.S. Environmental Protection Agency. (1998) EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, Report EPA/600/R-98/018, EPA Office or Research and Development, Washington DC. This document can be downloaded from website: http://www.epa.gov/swerust1/cat/epaqag5.pdf.
7) U.S. Environmental Protection Agency. (2022) Nitrogen Dioxide (NO2) Pollution basic information" https://www.epa.gov/no2-pollution/basic-information-about-NO_2 (August 2022)
8) World Health Organization. 2000, WHO *Air Quality Guidelines for Europe*, 2nd edition, WHO Regional Office for Europe, Copenhagen, Denmark (WHO Regional Publications, European Series, No 91).

LIST OF APPENDICES:

APPENDIX A:
EQUIPMENT CALIBRATION CERTIFICATES

APPENDIX B:
LABORATORY DESIGNATION CERTIFICATES

APPENDIX A: EQUIPMENT CALIBRATION CERTIFICATES

CERTIFICATE OF CALIBRATION AND TESTING

TSI Instruments Ltd, Stirling Road, Cressex Business Park
High Wycombe Bucks HP12 3ST England
Tel: (Int +44) (UK 0) 1494 459200 Fax: (Int +44) (UK 0) 1494 459700 http://www.tsiinc.co.uk

ENVIRONMENT CONDITIONS		
TEMPERATURE	20.9	°C
RELATIVE HUMIDITY	45.73	%RH
BAROMETRIC PRESSURE	994.6	hPa

MODEL	7545
SERIAL NUMBER	T75450934010

☒ AS LEFT ☐ AS FOUND
☒ IN TOLERANCE ☐ OUT OF TOLERANCE

– CALIBRATION VERIFICATION RESULTS –

TEMPERATURE VERIFICATION — SYSTEM T-201 — *Unit: °C*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	0.0	-0.1	-0.6~0.6	2	60.0	60.2	59.4~60.6

HUMIDITY VERIFICATION — SYSTEM H-201 — *Unit: %RH*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	10.0	8.7	7.8~12.2	4	70.0	70.1	67.8~72.2
2	30.0	30.1	27.8~32.2	5	90.0	88.8	87.8~92.2
3	50.0	50.6	47.8~52.2				

CO2 GAS VERIFICATION — SYSTEM G-200 — *Unit: ppm*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	0	0	0~50	4	3008	2982	2917~3098
2	518	508	468~568	5	5000	4999	4850~5150
3	1015	1011	965~1065				

CO GAS VERIFICATION — SYSTEM G-200 — *Unit: ppm*

#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	36	37	33~39	2	100	100	97~103

TSI does hereby certify that the above described instrument conforms to the original manufacturer's specification (not applicable to As Found data) and has been calibrated using standards whose accuracies are traceable to members of the European co-operation for Accreditation (EA) (for example: UKAS, SWEDAC, DAkkS) or has been verified with respect to instrumentation whose accuracy is traceable to some member of EA, or is derived from accepted values of physical constants. TSI's calibration system is registered to ISO-9001:2015.

Measurement Variable	System ID	Last Cal.	Cal. Due	Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E006116	02-12-22	02-12-23	Temperature	E006115	02-12-22	02-12-23
Humidity	E006126	01-12-22	01-12-23	200 CO	3705A	02-12-22	02-12-23
5000 CO2	5902749	22-03-22	22-03-24	Air	VC6273425	12-08-22	12-09-24
N2	VC6894330	06-11-22	06-11-24	20 C4H8	3743B	02-12-22	02-12-23
Flow	E006015	27-02-22	27-02-24	Flow	E006016	10-08-22	10-08-23
Flow	E006143	27-02-22	27-02-24	Flow	E006113	21-09-22	21-09-24

CALIBRATED — 10 December, 2022 — DATE

Doc. ID CERT_GEN_WCC

Calibrate report

Product	Air Quality Monitor System	Model	AQM-09
Quantity	1pcs	Cali date	June ,25, 2022
Product No.	OC20210624615600		
Appearance	☑Clean ☑Non corrosive ☑No damage		
Gas type	H2S: ppm SO_2:ppb NO_2:ppb O3:ppb TVOC:ppm PM2.5:ug/m³ PM10:ug/m³ TSP:ug/m³ Temperature and humidity: ℃/%RH		
Accuracy	±3%F.S		
resolution	0.1ppm 1ppb 1ug/m³		
Response time	≤30S		
Survey range	H2S:0-100ppm O3:0-2000ppb PM2.5:0-1000ug/m³ Temperature: -10-50℃	NO_2:0-2000ppb TVOC:0-50ppm PM10:0-1000ug/m³ Humidity:0%-100%RH	SO_2:0-2000ppb TSP:0-1000ug/m³
Signal output mode	4G LTE		
Power supply voltage	AC 240V/50Hz		
Power dissipation	≤ 30W		
[illegible]	-20℃-50℃ / 0%RH-100%RH		
Testing condition indoor	Temperature: 25℃ Humidity: 60%RH		
Calibration gas	NO_2 SO_2 O3 TVOC H2S		
Cali gas test	1.H2S: Cali gas concentration: 100 ppm 2.NO_2: Cali gas concentration: 1000 ppb 3.SO_2: Cali gas concentration: 1000 ppb 4.O3: Cali gas concentration: 1000 ppb 5.TVOC: Cali gas concentration: 50 ppm 6.PM2.5:Measured value: 42 ug/m³ TSP:Measured value: 52 ug/m³ 7.Temperature: Measured value: 25.4℃	Inspect concentration: 98.2 ppm Inspect concentration: 997 ppb Inspect concentration: 998 ppb Inspect concentration: 996 ppb Inspect concentration: 49.3 ppm PM10:Measured value: 47 ug/m³ Humidity:Measured value: 51 %RH	
Test result	Qualified		
Remark			

Check: _____ Approval: _____ Tester: QC PASS

Company: Henan Oceanus Import & Export Co., Ltd.

Date: June,25, 2022

APPENDIX B: LABORATORY DESIGNATION CERTIFICATES

nema

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

Mobile Lines: 0724-253 398, 0723-363 010, 0735-013 046
Telkom Wireless: 020-2101370, 020-2183718
Incident Lines: 0786-101100, 0741-101100

P.O. Box 67839, 00200
Popo Road, Nairobi, Kenya
E-mail: dgnema@nema.go.ke
Website: www.nema.go.ke

NEMA/21/2/LAB 77/LLL **20th April, 2023**

Lahvens Limited Laboratory
Lahvens House,
P.O. Box 34153-80118
MOMBASA.

RE: LABORATORY DESIGNATION BY NEMA.

Pursuant to your application for designation, your laboratory was inspected and evaluated based on ISO 17025 for laboratory competence to carry out tests and samplings.

The Lahvens Limited Laboratory qualified and has in principle been designated to undertake **Air Quality Analysis (Stack Emission and Ambient Air) and Noise Level Measurements** subject to the attached terms and conditions.

However, pursuant to section 119 of EMCA 1999 the Gazettement will take effect once the Authority places a notice in the Kenya Gazette.

DAVID ONGARE
For: DIRECTOR GENERAL

Our Environment, Our Life, Our Responsibility

ISO 9001:2015 Certified

ENVIRONMENTAL BASELINE STUDY REPORT FOR AMBIENT ACOUSTIC EMISSIONS LEVELS MONITORING.

PROPOSED RESIDENTIAL DEVELOPMENT ON PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY.

PROPONENT: ULTRA MODERN HOMES LIMITED,
P.O BOX 99848-80100,
MOMBASA, KENYA.

REPORT REFERENCE NUMBER: 50123-0050 B

LAHVENS LIMITED

ENVIRONMENTAL BASELINE STUDY REPORT FOR AMBIENT ACOUSTIC EMISSIONS LEVELS MONITORING OF THE PROPOSED RESIDENTIAL DEVELOPMENT ON PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY.

FOR:

ULTRA MODERN HOMES LIMITED,
P.O BOX 99848-80100,
MOMBASA, KENYA.

CLIENT ADDRESS:

LAHVENS LIMITED
P.O BOX 34153, 80118
DESIGNATION LAB REF. NO. NEMA/21/2/LAB77/LLL
EMAIL: LAHVENS@LAHVENS.COM

ENVASSES ENVIRONMENTAL CONSULTANTS LTD
P. O BOX 2013 - 80100
RALLI HOUSE BUILDING, 1ST FLOOR,
MOMBASA, KENYA

ENVIRONMENTAL CONSULTANTS:

UMHL	**ENVIRONMENTAL BASELINE STUDY REPORT FOR AMBIENT ACOUSTIC EMISSIONS LEVELS MONITORING OF THE PROPOSED RESIDENTIAL DEVELOPMENT ON PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY.**	Report Ref No.: 50123-0050 B Report Tittle: EBSAAQMR-50 B DOI: 17TH AUGUST 2023 Page number Page | 3

TABLE 1: **DOCUMENT REVIEW PAGE**

This Technical report titled ENVIRONMENTAL BASELINE STUDY REPORT FOR AMBIENT ACOUSTIC EMISSIONS LEVELS MONITORING OF THE PROPOSED RESIDENTIAL DEVELOPMENT ON PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY was authored by Lahvens Limited in accordance to the EMC (Noise And Excessive Vibration pollution) (control) Regulations, 2009 Legal Notice 61.

REVISION HISTORY				
03	04-09-2023	Issuance of Final Report		
02	29-08-2023	Re-submission to close the given comments and approvals		
01	26-08-2023	1st draft issue of the soft copy submitted for review		
REV	**DATE**	DESCRIPTION		
Accepted by				
Reviewed & Approved by		LOVANS ROBERT SPOO (ENVIRONMENTAL MANAGER) N.E.R. NO.: 7165		04/09/2023
Prepared by		VINCENT AGIN - FIELD ATTENDANT		04/SEP/2023.
		VALENTINE AGUTU - FIELD ATTENDANT		04/09/2023
PROJECT		Name	Signature	Date
DOCUMENT No.:		50123-0050 B		REVISION: 00 FINAL

UMHL	ENVIRONMENTAL BASELINE STUDY REPORT FOR AMBIENT ACOUSTIC EMISSIONS LEVELS MONITORING OF THE PROPOSED RESIDENTIAL DEVELOPMENT ON PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY.	Report Ref No.: 50123-0050 B Report Tittle: EBSAAQMR-50 B DOI: 17TH AUGUST 2023 Page number Page | 4

TABLE 2: **DOCUMENT AND PROJECT INFORMATION**

REPORT NO. 50123-050 B	CONTRACT NO. AS PER EL / EECL TOR.	CLASSIFICATION: A - Unclassified (open report)
TEST FIRM CONTACT PERSON: LOVANS SPOO: (254 - 728716948)	PROJECT: THE PROPOSED RESIDENTIAL DEVELOPMENT ON PLOT L.R. NO. MOMBASA/BLOCK X/85.	NUMBER OF PAGES: 27
TITLE: ENVIRONMENTAL BASELINE STUDY REPORT FOR AMBIENT ACOUSTIC EMISSIONS LEVELS MONITORING OF THE PROPOSED RESIDENTIAL DEVELOPMENT ON PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY.		
AUTHOR(S): LOVANS ROBERT SPOO, VINCENT OKUMU, VALENTINE AGUTU		QUALITY CONTROLLER: SAMSON OBIYA
REPORT PREPARED FOR: ULTRA MODERN HOMES LIMITED - TUDOR, MOMBASA SITE.		DOCUMENT REF. NO. **50123-050 B-FED**
ABSTRACT: LAHVENS Ltd was commissioned by Envasses Environmental Consultants Limited to form the Project's Environmental Team (ET) in providing testing services of environmental baseline acoustic emissions Levels prior to the proposed residential development, Mombasa County.		
ENGLISH TITTLE		
KEYWORDS		
EBS ACOUSTIC EMISSIONS LEVELS MONITORING AND CONSULTANT REPORTING.		
ABSTRACT (in ENGLISH)		
PUBLICATION TYPE: Digital document (pdf)		TESTING CONSULTANT: LAHVENS LIMITED P.O. BOX 34153-80118 MOMBASA KENYA TUDOR, TOM MBOYA STREET, H03 **DESIGNATION LAB REF. NO.** **NEMA/21/2/LAB77/LLL**

EXECUTIVE SUMMARY

Kenya has an annual housing demand of 250,000 units with an estimated supply of 50,000 units, culminating in a housing deficit of 2 million units, or 80% deficit. Housing affordability is a key challenge in Kenya with many people unable to afford to buy or build their own home. Only 2% of the formally constructed houses target lower-income families. About 6.4 million people, or of Kenya's urban population live in informal settlements. Many families are at high risk of diseases such as malaria, respiratory infections and/or parasitic jiggers' infestation.

Housing delivery is the responsibility of county governments, which often lack adequate resources. Also, 68% of Kenyans are without land documentation or tenure security." (Habitat for Humanity, n.d.)

The proponent, Ultra-Modern Homes Limited, identified the investment gap and is in the process of setting up apartments and associated amenities on PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY.

The impact of construction activities on the environment has recently been recognized the world over, and the evaluation of the environmental impacts of construction activities is currently required by law in many countries.

Noise during construction may be more difficult to control and more difficult to ensure that hearing protectors are being used properly because of constant changes in location, the size of the construction site and the transience of the workforce. These situations make construction noise just as hazardous as any other type of noisy environment, but far more challenging to remediate.

Under the Second Schedule of the Environmental Management and Co-ordination Act (EMCA) No. 8 of 1999, the pproposed project is listed as high risk projects which should undergo Environmental and Social Impact Assessment (ESIA) study process. Pursuant to Section 58 of the Act, the Client contracted consultancy services of Envasses Environmental Consultants Limited for the preparation of Environmental and Social Impact (ESIA) for the proposed residential development as per the terms of reference as per Section 58 of the Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya and the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003.

As part of this authorization process, Lahvens Limited was commissioned by Envasses Environmental consultants to form the Project's Environmental Team (ET) to determine the baseline ambient acoustic environment before implementation of the proposed residential development.

Acoustic Environmental Baseline Study is a significant component of monitoring programs for successful development activities. Baseline monitoring commences at the reconnaissance phase and continues to incorporate in the feasibility study. This Environmental Baseline Study is designed to characterize the environmental resources at the proposed project site prior to commencement of construction works for the proposed residential development.

This Baseline Report will form part of a Comprehensive Baseline Study (CBS) of the proposed Project. The CBS was prepared as part of an environmental Impact assessment (EIA) and approval process.

The objective of this Baseline Report is to present the existing acoustic environment of the proposed project site. EBS will provide a benchmark and reference against which to compare the environmental

conditions influenced by the construction, operation and closure phases of the project. The information will be used to assess the effectiveness of any proposed mitigation measures and to implement adaptive management, if needed.

Lahvens Limited operated four mobile stations along the project boundary walls as part of its noise levels monitoring networks on the 17th August 2023.

Noise emission survey was achieved via initial examination of existing noise sources of significance. Noise levels was evaluated using a Sound Level Meter Model UT - 351, C150107874 class 2 was mounted on at 2.0m above ground level and at least 3.5m away from any sound reflecting surfaces at a boundary position and measurements taken at timed intervals of 20 minutes every one-hour period and stored in SLM's memory. The sound level meter was placed on the microphone to reduce any wind interference during measurements. The sound level meters, were within its calibration period, at the time of monitoring.
In addition, the equivalent noise level (Leq), the maximum sound pressure level (Lmax) and the minimum sound pressure level (Lmin) during that measurement period were recorded.
Factors such as time, duration and predictability of the noise emission, amplitude and frequency of the noise emission, nature of the source, location of noise sensitive receptors, ambient and background noise level, nature and character of the locality, presence of special acoustic characteristics and the incongruity or familiarity of the noise during noise survey and site placement were put into consideration.

Results and observations:
The quantity of noise measured and recorded along the project boundaries complied with the EMC noise and vibration regulations 2009 maximum Noise Level Permitted (Leq) during the day.
Baseline results obtained along the project boundaries show that the survey location was a noise insignificant area hence the levels do not pose threat to the sensitive receptors before implementation of proposed residential development.
Ambient conditions existed at the time of the diurnal survey.
Wind breeze and noise emissions from motor vehicles / bikes were the main sources of noise emissions.
Noise from human interaction also formed part of the noise levels recorded.

TABLE OF CONTENTS

EXECUTIVE SUMMARY 5
TABLE OF CONTENTS 7
1. INTRODUCTION 9
1.1. Project Description 10
1.2. Scope of work 11
1.3. Monitoring Locations 11
1.4. Existing Acoustic environment 12
1.5. Terms of Reference 12
1.6. Acoustic Survey Objectives 13
1.7. Assumptions 13
1.8. Data Validity and Acceptability of noise survey 13
1.9. Definitions. 13
2. ACOUSTIC EMISSIONS OVERVIEW AND NETWORKS 14
3. NOISE LEGISLATIVE POLICY AND FRAMEWORK 16
3.1. EMC (Excessive Noise and Vibration Regulations) (control) 2009 16
4. ACOUSTIC SURVEY METHODOLOGY 17
4.1. Tools and Equipment 17
4.2. Equipment Placement 17
4.3. Acoustic analysis 18
4.3.1. Parameters and score criteria 18
4.3.2. Procedure of significance evaluation 18
5. RESULTS PRESENTATION, DISCUSSIONS AND CONCLUSION. 19
5.1. PRESENTATION OF RESULTS 19
5.1.1. Summary of singular noise measurements 19
5.1.2. Summary of average diurnal noise equivalents (Leq) 20
5.1.3. Tabular presentation of test of significance 20
5.2. DISCUSSIONS OF RESULTS 21
5.2.1. Presentation of singular noise results 21
5.2.2. Correlation of average noise monitoring results against the noise regulations 21
5.2.3. Determination of significance 22

5.3. CONCLUSION. 22
6. REFERENCES 23

List of Tables

TABLE 1: DOCUMENT REVIEW PAGE 3
TABLE 2: DOCUMENT AND PROJECT INFORMATION 4
Table 3: GPS coordinates of the project boundary survey locations 11
Table 4: List of acronyms 13
Table 5: EMC (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009. 16
Table 6: Parameters and score criteria 18
Table 7: Results for Diurnal singular noise measurements 19
Table 8: Summary results for diurnal noise equivalents 20
Table 9:Determination of diurnal noise significance of results 20

1. INTRODUCTION

"Kenya has an annual housing demand of 250,000 units with an estimated supply of 50,000 units, culminating in a housing deficit of 2 million units, or 80% deficit. Housing affordability is a key challenge in Kenya with many people unable to afford to buy or build their own home. Only 2% of the formally constructed houses target lower-income families. About 6.4 million people, or of Kenya's urban population live in informal settlements. Many families are at high risk of diseases such as malaria, respiratory infections and/or parasitic jiggers' infestation.

Housing delivery is the responsibility of county governments, which often lack adequate resources. Also, 68% of Kenyans are without land documentation or tenure security." (Habitat for Humanity, n.d.)

The proponent, Ultra-Modern Homes Limited, identified the investment gap and is in the process of setting up apartments and associated amenities on PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY.

The impact of construction activities on the environment has recently been recognized the world over, and the evaluation of the environmental impacts of construction activities is currently required by law in many countries (Tam et al., 2006; Teixeira, 2005; Cole, 2000; Ofori et al., 1999).

Construction sites may cause damage to the environment, and also interfere in the daily lives of local residents. Inconveniences caused by construction activities include dust and noise generation, waste materials deposition in public spaces, soil and water contamination, damage to public drainage systems, destruction of plants, birds and terrestrial fauna etc (Esin and Cosgun, 2007; Tam et al., 2006; Teixeira, 2005; Cole, 2000; Ofori, et al., 1999).

Construction sites can have hazardous noise levels, and they often are transient situations where different trades come to the site for short periods of time to perform their work. The activities and job functions at a construction site are constantly changing as the job progresses. For example, when a new building is being constructed, carpenters may build forms for the cement workers to then pour the foundation; steel workers may erect steel structures and do welding; then the building is enclosed by other workers including stucco workers, roofers and brick masons. Once the building is enclosed, carpenters, ventilation installers, electricians and plumbers begin their work, followed by drywallers, carpenters, painters and floor and ceiling workers.

Noise during construction may be more difficult to control and more difficult to ensure that hearing protectors are being used properly because of constant changes in location, the size of the construction site and the transience of the workforce. These situations make construction noise just as hazardous as any other type of noisy environment, but far more challenging to remediate.

Noisy activities on construction sites include the use of jackhammers, dump trucks, cement mixers, cement cutters, electric saws, tamping machines and welding machines as well as noise generated from hand tools such as sledgehammers and drills. The noise generated from these activities easily can exceed the EMC & OSHA limit of 55dBA & 90 dBA respectively and require the use of hearing protection devices (HPDs). The noises may be continuous or they may be impulse noise where the noise created is of high intensity, but for a short duration.

Under the Second Schedule of the Environmental Management and Co-ordination Act (EMCA) No. 8 of 1999, sub-section (2) Urban Development including:- a) designation of new townships; b) establishment of industrial estates; c) establishment or expansion of recreational areas; d) establishment or expansion of recreational townships in mountain areas, national parks and game reserves; e) shopping centres and complexes are listed as projects which should undergo Environmental and Social Impact Assessment (ESIA) study process. Pursuant to Section 58 of the Act, the Client contracted consultancy services of Envasses Environmental Consultants Limited for the preparation of Environmental and Social Impact (ESIA) for the proposed residential development as per the terms of reference as per Section 58 of the Environmental Management and Coordination Act Cap. 387 of the Laws of Kenya and the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003.

As part of this authorization process, Lahvens Limited was commissioned by Envasses Environmental consultants to form the Project's Environmental Team (ET) to determine the baseline ambient acoustic environment before implementation of the proposed residential development.

Acoustic Environmental Baseline Study is a significant component of monitoring programs for successful development activities. Baseline monitoring commences at the reconnaissance phase and continues to incorporate in the feasibility study. This Environmental Baseline Study is designed to characterize the environmental resources at the proposed project site prior to commencement of construction works for the proposed residential development. EBS will provide a benchmark and reference against which to compare the acoustic conditions influenced by the construction and operation of the residential development. The information will be used to assess the effectiveness of any proposed mitigation measures and to implement adaptive management, if needed.

Well-developed EBS often alleviate heightened perceived concerns within the community during the initial phases of any proposed development, before issues become a serious risk to the project. EBS also creates reassurance in the minds of the public and jurisdictional decision makers that key environmental issues have been identified and will be monitored and mitigated, during and after the project is approved. EBS monitoring can be looked at as an early warning system of impacts that could potentially affect the environment during the project operation phase and long after the project is decommissioned.

This Baseline Report forms part of a Comprehensive Baseline Study (CBS) of the proposed development Project. The CBS is being prepared as part of an environmental Impact assessment (EIA) and approval process.

The objective of this Baseline Report is to present the existing ambient acoustic environment in the proposed residential development on PLOT L.R. NO. MOMBASA/BLOCK X/85, TUDOR, MOMBASA COUNTY.

1.1. Project Description

The proposed residential development will comprise of seven (7) residential blocks of basement, ground plus thirteen (13) floors with a total of 350 two-bedroom apartments. Each of the units will comprise of two bedrooms, living/dining, kitchen, laundry and balcony. Other associated amenities will include parking areas, shops, underground water tanks, six bio-digesters, stand by generator, lift shaft and rooftop. The total built up area will be 41,878.001m^2.

1.2. Scope of work

The scope of this baseline Report will be as follows:

- Study the available information relevant to the pre-development acoustic levels in the environment;
- Identify the major existing acoustic emission sources in the environment;
- Identify the existing sensitive pollution areas in the environment;
- Estimate by means of measurements and integration of the results with those of any relevant existing information of the present noise levels.

1.3. Monitoring Locations

The ongoing proposed project will be located at Tudor area, Mombasa County at Latitude Latitude 4°02'02.51"South and Longitude 39°40'08.72"East. During acoustic emissions survey, the project site was divided in to four locations to take care of the boundary / borders, topography of the land and wind directions.

Table 3: GPS coordinates of the project boundary survey locations

Measurement Sites	Receivers	Description of monitoring Locations	Dates of sampling
PB1 S 4°02'03.912" E39°40'06.7404"	Residential homes, Creek view homes, Windsor Gardens, Technical University, Animal Clinic Tudor, Arif Restaurant	The proposed site is bordered by residential developments. It neighbors Creek View Homes and Citadel Royal School to the West, Marine Creek Apartments and Tudor Block Khoja Flats to the East, Tudor Creek to the North and Technical University of Mombasa to the South-West. It's characterized by a flat terrain which slowly slopping towards the ocean floor. Mangrove vegetation dominates the ocean shore. The neighborhood depicts urban settings but predominantly residentials, schools, mosques and trading activities.	17th August 2023
PB2 S 4°02'03.732" E 39°40'06.9384"			
PB3 S 4°02'03.7176" E 39°40'07.176"			
PB4 S 4°02'01.8168" E 39°40'08.8968"			

Project boundary sloping towards the ocean

1.4. Existing Acoustic environment

The proposed site is bordered by residential developments. It neighbors Creek View Homes and Citadel Royal School to the West, Marine Creek Apartments and Tudor Block Khoja Flats to the East, Tudor Creek to the North and Technical University of Mombasa to the South-West. It's characterized by a flat terrain which slowly slopping towards the ocean floor. Mangrove vegetation dominates the ocean shore. The neighborhood depicts urban settings but predominated by residential, schools, mosques and trading activities.

1.5. Terms of Reference

Reference is made to the EMCA Legal Notice 61 First Schedule Extract, Acoustics — Determination of noise exposure and estimation of noise-induced hearing impairment recognizing the fact that any person emitting noise in excess of noise emission standards commits an offence therefore legalizing the process of compliance with the set emission goals, permissible standards, control strategies and technologies for noise emission as mandatory.

The scope of work was outlined as follows:

- Review of the legal context as it relates to noise emissions.;
- Evaluation of site meteorology;
- Monitoring of background noise including the noise equivalent levels Leq.

1.6. Acoustic Survey Objectives

To quantify ambient acoustic emissions levels at the proposed residential development in Tudor. The quantifiable results will then be compared to the Environmental Management Coordination excessive noise and vibration controls regulations 2009.

1.7. Assumptions

The short term (1-hr per site) noise emissions survey and data collection for L_{eq}, L_{max} and L_{min} is considered sufficient to understand background acoustic conditions at each location.

1.8. Data Validity and Acceptability of noise survey

All noise emission survey data was taken through a data replications and quality assurance procedure to ensure that any anomalous readings or questionable data is not incorporated in the final results.
Elements of this procedure account for:

- Routine calibration and auditing of the analyzers
- Statistical rendering of outliers

1.9. Definitions.

Table 4: List of acronyms

dBA	Decibels (A) weighted
CBS	Comprehensive Baseline Study
EMC	Environmental Management and Coordination
EBS	Environmental Baseline Study
GPS	Geographic Positioning System
hpa	Hectopascal
km/hr	Kilometer per hour
Leq	Noise equivalent noise
Lmax	Maximum Sound Level
Lmin	Minimum Sound Level
l/min	Liters per minute
NEMA	National Environment Management Authority
TWA	Time Weighted Average
WB	World bank
WHO	World Health Organization

2. ACOUSTIC EMISSIONS OVERVIEW AND NETWORKS

Noise is generally considered to be undesirable sound and sound can be considered undesirable due to amplitude or volume of loudness, category of noise, about the day, or any modality making resonance or obscene. The main sources of noise at a construction site include construction machines (mainly machines which produce impacts, e.g. devices for breaking concrete), earth-moving machines, pile drivers, pneumatically driven devices and combustion engines, air compressors, machine mounted percussion drills, loaders and trucks. These mechanisms must be considered to be point or linear noise sources depending on the level of movement at the construction site. Some types of construction projects are not endangered by increased noise pollution at all, while others are, but only when particular conditions coincide. In the case of certain construction sites, increased impact can already be expected from the very nature and location of the project.

Noise is one of the most important acoustic pollutants in today's society, as it is present in most of people's activities, consequently, not only the workers of certain sectors, but all the citizens, are exposed to high noise doses.

Important environmental sound sources in urban areas are transportation noise, construction noise, noise from terminals, shunting yards, rail and bus stations, noise from industry, cultural, and sports events, and noise from shooting ranges and military training activities. Road traffic noise is the most pervasive of the noise sources and often accounts for more than 70% of the community noise problem. In places where other noise sources dominate, road traffic noise is usually an additional stressor. National reviews indicate that people annoyed by noise are often exposed to multiple exposures (e.g., vehicular and other city air pollution), and single exposure situations are not that common.

In environmental health impact assessments, the overall community situation and the individual exposure at home are in focus. The target of socio-acoustic investigations is to gather both a measure of individual residential noise exposure and a measure of the human response to this exposure. Annoyance is typically measured by self-reports in the form of subject responses to a wide range of questions using response scales with a varying number of response categories. The content of the reaction measure ranges from quality of life impairment, general annoyance, and specific activity interferences to overall indicators of being affected by noise. Two to eleven scale points are usually employed.

Noise-induced hearing loss can be caused by outside (e.g. trains) or inside (e.g. music) noise. High noise levels can contribute to cardiovascular effects in humans and an increased incidence of coronary artery disease. Unwanted sound (noise) can damage psychological health. Sound becomes unwanted when it either interferes with normal activities such as sleeping, conversation, or disrupts or diminishes one's quality of life. Noise pollution can cause hypertension, high stress levels, tinnitus, hearing loss, sleep disturbances, and other harmful effects. High noise levels can result in cardiovascular effects and exposure to moderately high levels during a single eight-hour period causes a statistical rise in blood pressure of five to ten points and an increase in stress, and vasoconstriction leading to the increased blood pressure noted above, as well as to increased incidence of coronary artery disease.

Ambient sound levels are the cumulative effects of countless sounds generated at various instances both far and near. High measurements may not necessarily mean that noise levels in the area are high. Similarly, a low sound level measurement will not necessarily mean that the area is always quiet, as sound levels will vary over seasons, time of the day, faunal characteristics, vegetation in the area and

meteorological conditions (especially wind). This is excluding the potential effect of sounds from anthropogenic origin.

It is assumed that the measurement location represents other dwellings in the area (similar environment and sensitive receptors). Some numerous factors that could impact on ambient sound levels at the time of monitoring could include; the distance to closest trees, number and type of trees as well as the height of trees; available habitat and food for birds and other animals; distance to residential dwelling, locomotive sources (motorbikes, trucks & personal vehicles) and type of equipment used at dwelling (compressors, aircons, generators) was considered.

Noise is often measured by use of equivalent noise levels (Leq).
Leq is the preferred method to describe sound levels that vary over time, resulting in a single decibel value, which considers the total sound energy over the period of time of interest.
Leq noise levels often fluctuate over a wide range with time. For example, in the middle of the night the level might go down as low as 30 dB (A) with occasional passing vehicles of 70dB (A) or more. Later comes the dawn chorus followed by the general noises of the day before relative peace returns in the late evening. Alternatively, it may be an activity with different noise emissions throughout the day or week, with deliveries, intermittent compressors, and lots of varying noisy processes on top of the routine production noise levels. This is where the Leq noise or equivalent continuous noise level meter comes in. The meter follows all the fluctuations, stores them in its memory and at the end of the measurement calculates an 'average energy' or Leq value. When we say average, this is not a simple arithmetic average because we are measuring in decibels which are logarithmic values. The SLM converts the dB values to sound pressure levels, adds them all up then divides by the number of samples and finally converts this equivalent level back to decibels - dBs.

LAeq - It is common practice to measure noise levels using the A-weighting setting built into all sound level meters. In which case the term is properly known as LAeq and the results should say so - for example LAeq = 73 dB or Leq = 73 dB.
Leq noise levels are logarithmic (dB) values and cannot be added directly. A doubling of sound level results in a measured increase of 3 dB, four identical sources in a room would increase the noise level by 6 dB and so on. This works both ways, say 10 similar machines in a room produce 100 dBA then removing one machine completely will only reduce the overall noise level to 0.5 dBA, you would need to silence or remove 50% of the machines to achieve a 3 dB reduction.

Other Parameters

- Lmax: Maximum Sound Level: level during a measurement period or a noise event and is not necessarily peak.
- Lmin: Minimum Sound Level: during a measurement period or a noise event.

Lahvens Limited operated four mobile stations along the project boundary walls as part of its noise levels monitoring networks on the 17th August 2023.

3. NOISE LEGISLATIVE POLICY AND FRAMEWORK

3.1. EMC (Excessive Noise and Vibration Regulations) (control) 2009

The legislative controls relevant to noise emissions associated with any development is outlined in the EMCA Legal Notice 61 First Schedule Extract, Acoustics — Determination of occupational noise exposure and estimation of noise-induced hearing impairment. The standard recognizes that any person emitting noise in excess of noise emission standards commits an offence. It legalizes the process of Environmental Impact Assessment and compliance with the set emission goals, permissible standards, and control strategies and technologies for noise emission as mandatory. With establishment of noise emission standards, it will be a requirement to obtain temporary permits from the National Environmental Management Authorities allowing for emissions of noise in excess of established standards for a period not exceeding three months.

Noise Exposure Standards (First Schedule)

Table 5: EMC (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009.

ZONE		*Sound Level Limits dB (A)* L_{eq}, *14 h*		*Noise Rating Level (NR)* L_{eq}, *14 h*	
		DAY	NIGHT	DAY	NIGHT
A	Silent Zone	40	35	30	25
B	Place of worship	40	35	30	25
C	Residential: Indoor Outdoor	45 50	35 35	35 40	25 25
D	Mixed Residential (with some commercial and places of entertainment)	55	35	50	25
E	Commercial	60	35	55	25

Source: EMC (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009 Legal Notice 61

The survey location falls under Zone D; mixed residential with some commercial and places of entertainment.

4. ACOUSTIC SURVEY METHODOLOGY

A baseline noise survey consisting of an operator attended noise measurements (OANM) was performed.

4.1. Tools and Equipment

- Sound Level Meter Model meter UT-351 IEC 61672 - 1:2013 class 2
- Geographic Positioning System (GPS)
- Digital camera

4.2. Equipment Placement

Noise emission survey was achieved via initial examination of existing road traffic and other noise sources of significance. Noise levels was evaluated using a Sound Level Meter Model UT - 351, C150107874 class 2 was mounted on at 2.0m above ground level and at least 3.5m away from any sound reflecting surfaces at a boundary position and measurements taken at timed intervals of 15 minutes every one-hour period and stored in SLM's memory. The sound level meter was placed on the microphone to reduce any wind interference during measurements. The sound level meters, were within its calibration period, at the time of monitoring.

In addition, the equivalent noise level (Leq), the maximum sound pressure level (Lmax) and the minimum sound pressure level (Lmin) during that measurement period were recorded.

Factors such as time, duration and predictability of the noise emission, amplitude and frequency of the noise emission, nature of the source, location of noise sensitive receptors, ambient and background noise level, nature and character of the locality, presence of special acoustic characteristics and the incongruity or familiarity of the noise during noise survey and site placement were put into consideration. Furthermore, as each individual measurement was being taken, the nature of the noise climate in the area was assessed and recorded. This comprised an auditory observation by the surveyor, as well as identifying those noise incidents which influenced the sound level meter readings during that measurement period.

Ongoing diurnal acoustic level measurements at the proposed boundaries (source: Fieldwork August, 2023)

4.3. Acoustic analysis

4.3.1. Parameters and score criteria

After finding various activities, aspects and impacts, identification of the significant aspects was done. It entirely depended on the management of the system or industry to give a scaling factor. The table 6 below shows six factors naming as A to F (top row) and column 1 to 6 shows rating scheme with minimum as 1 and maximum marks as 10 depending upon their severity.

4.3.2. Procedure of significance evaluation

For evaluation processes, the various activities of the measurement sites are rated based on parameters and score criteria and a benchmark of 75 units is taken as a deciding factor. If the total unit of any aspect for an activity comes out to be more than 75, then the aspect can be considered as significant otherwise insignificant.

Table *6*: Parameters and score criteria

A-Quantity 1-5	B-Occurrence 1-6	C-Impact 1-6	D-Detection 1-5	E-Controls 1-5	F-Legislation 1and10
5-High	6-Continuous	6-Fatal to human life	5-More than 24 hours	5-Absence or no effective controls	10-Not meeting legislation/ control limits
3-Moderate	5-Several times a day	5-Health effects	4-Within 24 hours	4-Mechanism in place but not reliable	1-In Compliance
1-Low	4-Once a day	4-Affects flora and fauna	3-Within 8 hours	3-Control needs human intervention	---
---	3-Once a week	3-Resource consumption	2-Within 1 hour	2-Has in-built secondary control	---
---	2-Once a month or less frequent	2-Discomfort, Acid rain, nuisance	1-Immediately	1-Available and effective at source.	---
---	1-Very Rare	1-Negligible visual impacts.	---	---	---

5. RESULTS PRESENTATION, DISCUSSIONS AND CONCLUSION.

5.1. PRESENTATION OF RESULTS

5.1.1. Summary of singular noise measurements

Table 7: Results for Diurnal singular noise measurements

Measured Sound Pressure Level (Noise) (dBA)				EMC Noise Regulation 2009	Site Notes / Remarks
17th August 2023.				Day time	
Proposed Project boundary	Leq	Lmax	Lmin	Leq	
PB-1	47.7	75.1	40.1	55	The prevailing weather was sunny at the time of acoustic survey. Wind speed averaged about 4.2 km/hr South West wind. Measurements are taken to quantify prevailing ambient levels of noise. **Leq** noise levels complied with the EMC 2009 noise permissible levels. No activities were ongoing during measurements at the proposed site. Environmental noise including Wind breeze and traffic noise were the likely sources of noise emissions. Noise from Motor Vehicles, Windsor Gardens workers cleaning activities, wind action and spill over from neighbourhood were audible during the survey. Ambient conditions were extant.
PB-2	49.2	78.2	42.3	55	The prevailing weather was sunny at the time of acoustic survey. Wind speed averaged about 4.8 km/hr South West wind. Measurements are taken to quantify prevailing ambient levels of noise. **Leq** noise levels complied with the EMC 2009 noise permissible levels. No activities were ongoing during measurements at the proposed site. Environmental noise including Wind breeze and traffic noise were the likely sources of noise emissions. Noise from Motor Vehicles, Windsor Gardens workers cleaning activities, wind action and spill over from neighbourhood were audible during the survey. Ambient conditions were extant.
PB-3	50.2	73.7	43.1	55	The prevailing weather was sunny at the time of acoustic survey. Wind speed averaged about 4.5 km/hr South West wind. Measurements are taken to quantify prevailing ambient levels of noise. **Leq** noise levels complied with the EMC 2009 noise permissible levels. No activities were ongoing during measurements at the proposed site. Environmental noise including Wind breeze and traffic noise were the likely sources of noise emissions. Noise from Motor Vehicles, Windsor Gardens workers cleaning activities, wind action and spill over from neighbourhood were audible during the survey. Ambient conditions were extant.
PB-4	48.3	69.2	40.0	55	The prevailing weather was sunny at the time of acoustic survey. Wind speed averaged about 4.1 km/hr South West wind. Measurements are taken to quantify prevailing ambient levels of noise. **Leq** noise levels complied with the EMC 2009 noise permissible levels. No activities were ongoing during measurements at the proposed site. Environmental noise including Wind breeze and traffic noise were the likely sources of noise emissions. Noise from Motor Vehicles, Windsor Gardens workers cleaning activities, wind action and spill over from neighbourhood were audible during the survey. Ambient conditions were extant.
Average	**48.9**	**74.1**	**41.4**	**55**	

5.1.2. Summary of average diurnal noise equivalents (Leq)

Table 8: Summary results for diurnal noise equivalents

Monitoring locations	Diurnal LAeq average results	Maximum noise level permitted (Leq) in dB (A) Day (0601-2000) hrs	Comments
PB-1	47.7	55	Complies
PB-2	49.2	55	Complies
PB-3	50.2	55	Complies
PB-4	48.3	55	Complies
Avg. Conc.	**48.9**	55	Complies

5.1.3. Tabular presentation of test of significance

Table 9:Determination of diurnal noise significance of results

MEASUREMENT SITE	ASPECT	CONDITION/A	IMPACT	QUANTITY A	OCCURRENCE	IMPACTS	DETECTION	CONTROL	LEGISLATION	TOTAL A*B*C*D	REMARKS SIG / INSIG
PB-1	NOISE	N/A	Hearing impairment	3	6	1	1	3	1	54	SIG
PB-2	NOISE	N/A	Hearing impairment	3	6	1	1	3	1	54	SIG
PB-3	NOISE	N/A	Hearing impairment	3	6	1	1	3	1	54	SIG
PB-4	NOISE	N/A	Hearing impairment	3	6	1	1	3	1	54	SIG
Avg. Conc.	NOISE	N/A	Hearing impairment	3	6	1	1	3	1	54	SIG

5.2. DISCUSSIONS OF RESULTS

Noise measurements was initiated to obtain and quantify the prevailing ambient acoustic levels. The obtained acoustic results were thereafter correlated against the Environmental Management Coordination (Excessive noise and vibration regulations) 2009 to ascertain compliance.

5.2.1. Presentation of singular noise results

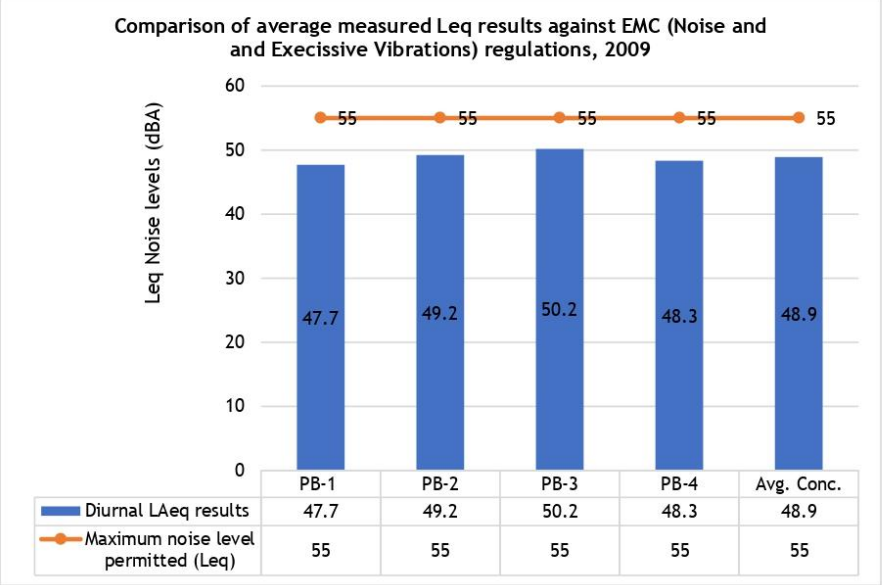
a) Diurnal noise results

The highest diurnal noise emissions recorded at the project boundary 3 (PB-3) extended to levels of 50.2 dBA while the lowest diurnal noise emission recorded at the project boundary 1 (PB-1) extended to levels of 47.7 dBA. The average Leq noise levels in the proposed residential development averaged 48.9 dBA. The average noise levels along all the project boundaries complies with the EMC noise and vibrations regulations of 2009.

5.2.2. Correlation of average noise monitoring results against the noise regulations

Correlation of results against the Environmental Management Coordination (Excessive noise and vibration control regulations) 2009 to ensure compliance was done and presentation of the combined charts are as follows:

a. Diurnal noise results



- The average diurnal noise equivalent levels (Leq) along all the four project boundaries complied with the EMC noise and vibration regulations 2009 before commencement of the proposed residential development.

5.2.3. Determination of significance

Determination of noise significance of results was done vide correlation against the EMC (Excessive noise and vibration regulations) 2009 to ensure compliance amongst other aspects.

- Diurnal noise Leq averages were rated as insignificant having scored <75 units based on parameters and score criteria; therefore, the proposed project site was characterized as noise significant area before the implementation of the proposed project.
- From the results of determination of significance, there is no threat to the noise receivers (residential homes, learning institution and mosque) of the noise emissions before implementation of the project.

5.3. CONCLUSION.

This ambient noise measurement report documented the current noise levels and meteorological conditions for the proposed residential development as follows:

- The quantity of noise measured and recorded along the project boundaries complied with the EMC noise and vibration regulations 2009 maximum Noise Level Permitted (Leq) during the day.
- Baseline results obtained along the project boundaries show that the survey location was a noise insignificant area hence the levels do not pose threat to the sensitive receptors before implementation of proposed residential development.
- Ambient conditions existed at the time of the diurnal survey.
- Wind breeze and noise emissions from motor vehicles / bikes were the main sources of noise emissions. Noise from human interaction also formed part of the noise levels recorded.

6. REFERENCES

1) Environmental Management and Coordination Act (EMCA) 1999 (amended 2015).
2) Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009 (Legal Notice No.61).

LIST OF APPENDICES:

APPENDIX A:
EQUIPMENT CALIBRATION CERTIFICATES

APPENDIX B:
LABORATORY DESIGNATION CERTIFICATES

APPENDIX A: EQUIPMENT CALIBRATION CERTIFICATES

Kenya Bureau of Standards
Standards for quality life

KEBS Head Office
P. O. Box 54974, Nairobi 00200
Tel.: +254 (0) 20 694 8000
Mobile: 0722 202137/8,
0734 600 471/2
E-Mail: info@kebs.org

Web: http://www.kebs.org

KEBS Coast Region
P.O. Box 99376, Mombasa 80100
Tel: +254 (0)41 2317050/1,
2230939/3840
E-mail: kebs-msa@kebs.org

KEBS Lake Region
P.O. Box 2949, Kisumu 40100
Tel: +254 (0) 57 202 8396, 202 9549
E-mail: kebs-kisumu@kebs.org

KEBS South Rift Region
P.O. Box 2138, Nakuru 20100
Tel: +254 771696204;
+254 736170070; +254 771696211
E-Mail: kebs-nakuru@kebs.org

KEBS North Rift Region
P.O. Box 8111, Eldoret 30100
Tel: +254 (0) 53 2033151
E-Mail: kebs-eldoret@kebs.org

KEBS Mt. Kenya Region
P.O. Box 1790, Nyeri 10100
Tel: +254 (0) 61 2031410/1
E-Mail: kebs-nyeri@kebs.org

KEBS North Eastern Region
P.O. Box 978, Garissa 70100
Tel: +254 (0) 46 2102310
E-Mail: kebs-garissa@kebs.org

Certified to:
QMS - ISO 9001
ISMS - ISO/IEC 27001
BCMS - ISO 22301
ABMS - ISO 37001

CALIBRATION REPORT

Page 1 of 3 BS/MET/19/15/3/9/94

REQUESTED BY:	LAHVENS LIMITED
ADDRESS :	P.O. BOX 34153-80118 MOMBASA KENYA
EQUIPMENT:	SOUND LEVEL METER
TYPE/MODEL:	UT351
SERIAL NO.:	C1507
MANUFACTURER:	UNI-T
LAB. NO. :	ACOUSTICS AND VIBRATION-NP 15
DATE :	2022-09-08
REPORT NO.:	BS/MET/19/15/3/9/94

1.0. STANDARDS AND REFERENCE EQUIPMENT USED

Multifunction Acoustic Calibrator Type 4226 S/No. 2532059 with a standard uncertainty of ± 0.075 dB was used in the calibration process.

2.0. METROLOGICAL TRACEABILITY

This calibration report documents traceability to the national measurement standards, and to the units of measurement realized at KEBS, or other recognized national standards laboratories according to the International System of Units (SI). KEBS is a signatory of the CIPM Mutual Recognition Arrangement (CIPM MRA) and where there is no published Calibration and Measurement Capabilities (CMCs), KEBS has documented the traceability of the standard equipment used in 1.0 above

3.0. CALIBRATION PROCEDURE

The Sound Level Meter was calibrated using Kenya Bureau of Standards Laboratory Procedure MET/15/CP/02: *Sound level meter calibration.*

Prepared By: **Collins Taiti** Date: **2022-09-16**

Checked By: Anderson Maina Date: 2022-09-22

Signed: ..... Date: 2022-09-22

For: Director Metrology and Testing

4.0. CALIBRATION RESULTS

4.1 Reading at Reference

Function	Standard Sound Pressure Output (dB)	Reading Before Adjustment (dB)	Reading After Adjustment (dB)	Expanded Uncertainty (dB)
FAST	94.1	93.8	94.1	0.2

4.2 Frequency Response (Inverse A)

Nominal Frequency (Hz)	Expected Sound Pressure Level (dB)	DUT Reading (dB)	Acceptable Tolerance (±dB)	Expanded Uncertainty (dB)
31.5	94.1	94.5	3.5	0.2
63	94.1	94.2	2.5	0.2
125	94.1	94.4	2.0	0.2
250	94.1	94.0	1.9	0.2
500	94.1	93.9	1.9	0.2
1000	94.1	94.1	1.4	0.2
2000	94.1	94.1	2.6	0.4
4000	94.2	93.9	3.6	0.7

4.3 C - Frequency Weighting Response

Nominal Frequency (Hz)	Expected Sound Pressure Level (dB)	DUT Reading (dB)	Acceptable Tolerance (±dB)	Expanded Uncertainty (dB)
31.5	110.0	112.8	3.5	0.2
63	113.3	114.4	2.5	0.2
125	113.9	114.8	2.0	0.2
250	114.1	114.4	1.9	0.2
500	114.1	114.4	1.9	0.2
1000	114.1	114.1	1.4	0.2
2000	113.9	113.6	2.6	0.4
4000	113.3	112.6	3.6	0.7

APPENDIX B: LABORATORY DESIGNATION CERTIFICATES

nema

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

Mobile Lines: 0724-253 398, 0723-363 010, 0735-013 046
Telkom Wireless: 020-2101370, 020-2183718
Incident Lines: 0786-101100, 0741-101100

P.O. Box 67839, 00200
Popo Road, Nairobi, Kenya
E-mail: dgnema@nema.go.ke
Website: www.nema.go.ke

NEMA/21/2/LAB 77/LLL **20th April, 2023**

Lahvens Limited Laboratory
Lahvens House,
P.O. Box 34153-80118
MOMBASA.

RE: LABORATORY DESIGNATION BY NEMA.

Pursuant to your application for designation, your laboratory was inspected and evaluated based on ISO 17025 for laboratory competence to carry out tests and samplings.

The Lahvens Limited Laboratory qualified and has in principle been designated to undertake **Air Quality Analysis (Stack Emission and Ambient Air) and Noise Level Measurements** subject to the attached terms and conditions.

However, pursuant to section 119 of EMCA 1999 the Gazettement will take effect once the Authority places a notice in the Kenya Gazette.

DAVID ONGARE
For: DIRECTOR GENERAL

Our Environment, Our Life, Our Responsibility

ISO 9001:2015 Certified

Annexure 7: Copy of Proceedings of the stakeholder's kick-off meeting held at the project site on 22nd August 2023

ENVASSES ENVIRONMENTAL CONSULTANTS LIMITED

Environmental and Social Impact Assessment (ESIA) Study Report for the Proposed Residential Development on Plot L.R. No. Mombasa/Block X/85 in Tudor area, Mombasa County.

PROCEEDINGS OF THE STAKEHOLDER'S KICK OFF MEETING HELD ON 22ND AUGUST 2023 AT THE PROPOSED PROJECT SITE IN TUDOR AREA, MOMBASA COUNTY.

Proponent	Firm of Experts
Ultra Modern Homes Limited, P.O. Box 99848-80100, Mombasa, Kenya.	Envasses Environmental Consultants Limited, P.O. Box 2013-80100, Mombasa, Kenya.

1. Meeting Agenda

Envasses Environmental Consultants Limited in collaboration with the Ministry of Interior and National Administration organized and held a stakeholder's kick off meeting on 22nd August 2023 at the proposed project site in Tudor area, Mombasa County. The agenda of the meeting was as follows;

1. Prayer and Introductions
2. Opening remarks
3. Project overview
4. Plenary
5. Way Forward
6. Closing Remarks

2. Prayer and Introductions

The meeting began at 10.50 a.m. with a word of prayer from Ms. Beatrice Ombasa from Nora B and thereafter introductions. The meeting was attended by 29 participants drawn from the Ministry of Interior and National Administration, County Government of Mombasa, local community, Proponent and Envasses Environmental Consultants Limited (Figure 1 and Annexure 1).

Figure 1: Sections of the participants following deliberations during the stakeholder's kickoff meeting at the proposed project site (Stakeholder's kick off meeting, August 2023).

3. Opening remarks

3.1 Ministry of Interior and National Administration

Mr. Tsuma Mangale, the Area Chief – Tudor, thanked all participants for attending the meeting. He emphasized on the importance of the public participation process in the ESIA process and urged the participants to be attentive and seek clarification where necessary. He then welcomed the Assistant County Commissioner – Mombasa Island, Mr. Robin Mgeywo, to give his remarks.

Mr. Robin thanked the proponent for initiating the project within Tudor since it would meet the housing demand within the area. He noted that the aim of the meeting was to inform the stakeholders on the proposed project and provide an opportunity to air their views, comments and concerns regarding the project. He further highlighted the legal consequences faced by developers who ignore public participation in the ESIA process. Having said that, he declared the meeting officially open.

3.2 County Government of Mombasa

Mr. Sagaf Ali from the County Government of Mombasa - Department of Lands, Housing and Urban Planning emphasized on the importance of stakeholder's engagement in project development as they inform decision making from relevant government authorities.

4. Overview of the proposed project

Mr. Omar Said from Envasses Environmental Consultants Limited noted that under Regulation 17 of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003 as well as the Kenya Constitution of 2010, public participation meetings are required to inform and sensitize stakeholders and communities on the proposed project activities and obtain their views and concerns on the proposals. He further reiterated that the public participation process would help capture the views and concerns of interested and affected parties with respect to the impacts of the proposed project on the community. He noted that the concerns could be environmental or social in nature and could either be positive or negative.

He then gave an overview of the proposed project. He stated that Ultra Modern Homes Limited proposes to construct a residential development on Plot L.R. No. Mombasa/Block X/85 in Tudor area of Mombasa County. He informed the meeting that the proposed residential development will comprise of seven residential blocks (A, B, C1, C2, D, E1 & E2) of basement, ground plus thirteen (13) floors with a total of 350 apartments. Residential blocks A, B, C1 & C2 will comprise of 246 two bedrooms units while D, E1 & E2 will comprise of 104 three bedrooms units. Other associated amenities will include living/dining, kitchen, laundry, balcony, parking areas, shops, underground water tanks, six bio-digesters, stand by generator, lift shaft and rooftop. The total built up area will be 41,878.001m^2.

Table 1: The built-up areas of the proposed residential development (Source: Ultra Modern Homes Limited, 2023).

Built up areas		Description	No. of units	Total Area in M^2
Basement Floor		Parking area	-	3,603.000
Ground Floor		Parking area	-	3,603.000
Blocks	A	Two bedrooms, living/dining, kitchen, laundry and balcony	90	7333.300
	B		52	4064.255
	C1		52	4751.695
	C2		52	4749.615
	D	Three bedrooms, living/dining, kitchen, laundry and balcony	52	6795.308
	E1		26	3488.914
	E2		26	3488.914
Total			**350**	**41,878.001**

In addition, Mr. Usamah Osman, the proponent representative, gave a detailed overview of the structural and architectural designs of the proposed project. He further added that the timeframe for the construction activities would be four years.

5. Plenary session

Mr. Kassim Osman from Tudor Day wanted to know whether concrete mixing would be carried out during the night since it might lead to noise pollution causing disturbances to the neighbors. In response, Mr. Usamah stated that concrete mixing would be limited to day time only.

Mr. George Kamau from Tudor Four welcomed the project and noted it was beneficial through provision of housing apartments that would enhance the socio-economic and infrastructural development of the area.

Ms. Phyllis Keiza from Tudor Four requested the proponent to allow food vendors specifically from women groups within the area to sell food to the construction workers at construction phase.

Mr. Sagaf wanted to know the recommended mitigation measures for waste management, air and noise pollution during demolition of the existing residential house and construction phase of the proposed project. He further inquired on potential interference with the public beach access adjacent to the proposed project site, the land survey status, involvement of the National Construction Authority (NCA) and immediate site neighbors in the meeting, source of water for the proposed residential development once occupied and community benefits from the proposed project. His concerns were seconded by Mr. Robin Mgeywo, Mr. Peter Munyoki, Ms. Phyllis Keiza and Ms. Naomi Daniel.

In response, Mr. Omar stated that the recommended mitigation measures for waste management, air and noise pollution would be presented during the second stakeholder's meeting to review the Draft ESIA Study Report. He further informed the meeting that the public beach would be accessible to the local community/fishers during the entire project cycle. He then stated that NCA would conduct a site visit prior to licensing construction of the development and the site immediate neighbors would participate in the second and third stakeholders meetings.

In addition, Mr. Usamah stated that the development would source water from Mombasa Water Supply and Sanitation Company Limited (MWSSCL) and supplemented by borehole water. He noted that the proponent will liase with MWSSCL to ensure reliable water supply to the development. Moreover, he noted that the proponent would prioritize employment opportunities for both skilled and non-skilled labor to the local community within the area at construction phase and rehabilitate the dilapidated sections of the Tom Mboya Road as part of Corporate Social Responsibility.

Ms. Beatrice from Nora B was concerned about the safety of Mombasa Island residents amidst the growing number of multi-story buildings. She also noted that the construction activities would impact negatively on the neighbors. In response, Mr. Usamah assured the community that competent consultants and engineers would address potential issues and implementation of their recommendations would be overseen by relevant stakeholders. In addition, Mr. Omar noted that the ESIA Study report would recommend mitigation measures against negative environmental impacts.

Mr. Ibrahim Ndeme, the Assistant Chief - Tudor Four sub-location, recommended that the proponent should provide a contact person that would act as a link between the proponent and the neighbors throughout the entire project cycle incase grievances arise.

6. Way forward

Mr. Omar informed the meeting that the views and issues raised by the stakeholders will be incorporated in the ESIA Study report. He further informed the meeting that a second stakeholder's meeting to present the Draft ESIA Study Report was scheduled on 29th August 2023.

7. Closing Remarks and Prayer

There being no other business, the meeting ended at 11.50 a.m. with a word of prayer from Mr. Ibrahim.

Signed: Date: 4th September 2023

Mr. Brian Omondi,
Envasses Environmental Consultants Limited,
Secretary.

Signed: Date: 4th September 2023

Mr. Tsuma Mangale,
Area Chief – Tudor location.

4/09/2023

ENVASSES ENVIRONMENTAL CONSULTANTS LTD
Tel:0722 347 165
04 SEP 2023
Email: info@envasses.org
P.O. Box 2013-80100, MOMBASA

Annexure 1: Attendance list

ENVASSES ENVIRONMENTAL CONSULTANTS LIMITED

Environmental and Social Impact Assessment (ESIA) Study Report for the Proposed Residential Development on Plot L.R. No. Mombasa/Block X/85 in Tudor area, Mombasa County.

Task: Kick-off meeting

Date: 22nd August 2023

Venue: Project site

List of participants, contact details and signatures

NO.	NAME	AFFILIATION	TELEPHONE NO/EMAIL	SIGNATURE
1.	GEORGE N KAMAU	TUDOR FOUR	0729078063	Baloz! Tudor 4
2.	PATRICK M NDEMWA	TUDOR DAY	0757061470	
3.	PAUL THIKA	TUDOR DAY	0746	
4.	PETER MULYOKI	TUDOR BAY	0746972625	
5.	EMILY K. AMUGADA	TUDOR FOUR	0757076359	BMLOZI TUDOR NDAMI (B)

NO.	NAME	AFFILIATION	TELEPHONE NO/EMAIL	SIGNATURE	
6.	GRACE NZAMBU KIVITE	TUDOR FOUR	0713105063		BALOZI
7.	BEATRICE OMBASA	TUDOR FOUR	0720367995		ELDER NORAH
8.	GILIAN MWECHE	TUDOR FOUR	0704977088		MKAAZI
9.	KASSAM; S. OSMAN.	TUDOR BALOZI DAY	0727621621		
10.	OMAR MWIKAA	TUDOR VIELDER DAY	0723366996		VILLAGE ELDER TUDOR FOUR
11.	PHYLLIS .C. KEIZA	TUDOR FOUR	0727631287		
12.	REHANA BALUCHI	TUDOR BALOZI FOUR	011303 1976.		BALOZI
13.	NAOMI DANIEL	TUDOR DAY BALOZI	0720209435		BALOZI TUDOR DAY
14.	Robin Mgeywo	Acc Island	0714834068		
15.	Usamah Osman	Ultra modern	0799 286594		
16.	SAGAF ALI	CGM. Dept L,P,E,H	0724959886		
17.	Tsuma R. MANGALE	CHIEF - TUDOR	0711770277		
18.	OMAR SALUMU	DEVELOPER	0791 183363		
19.	Abdulrehman s	Tudor Day	0757858965		
20.	MWANAIDI SHAN	Tudor Day	0793744022		- BALOZI
21.	FLORENCE AYESA	TUDOR FOUR	0726439236		BALOZI TUDOR FOUR

NO.	NAME	AFFILIATION	TELEPHONE NO/EMAIL	SIGNATURE
22.	MOHAMED SHARIFF	DEVELOPER	0700122272	
23.	Rodah Ayugi	Tudor 4 BALOZI	0714343513	
24.	Hassan Bobo	Ultra Modern	0723 677 775	
25.	Omar Said	Envasses	0706784101	
26.	Swalha Wanjiku	Envasses	0700242807	
27.	Brian Omondi	Envasses	0701587740	
28.	Simon Nzuki	Envasses	0722347155	
29.	Brian Omondi	E		
30.	IBRAHIM C NDEME	ASST CHIEF TUDOR4	0718802069	
31.				
32.				
33.				
34.				
35.				
36.				
37.				

Annexure 8: Copy of Proceedings of the second stakeholder's meeting to review the Draft ESIA Study Report held at the project site on 29th August 2023

Environmental and Social Impact Assessment (ESIA) Study Report for the Proposed Residential Development on Plot L.R. No. Mombasa/Block X/85 in Tudor area, Mombasa County.

PROCEEDINGS OF THE SECOND STAKEHOLDER'S MEETING TO REVIEW THE DRAFT ESIA STUDY REPORT HELD ON 29TH AUGUST 2023 AT THE PROPOSED PROJECT SITE IN TUDOR AREA, MOMBASA COUNTY.

Proponent	Firm of Experts
Ultra Modern Homes Limited, P.O. Box 99848-80100, Mombasa, Kenya.	Envasses Environmental Consultants Limited, P.O. Box 2013-80100, Mombasa, Kenya.

1. Meeting Agenda

Envasses Environmental Consultants Limited in collaboration with the Ministry of Interior and National Administration organized and held a second stakeholder's meeting to review the Draft ESIA Study Report on 29th August 2023 at the proposed project site in Tudor area, Mombasa County. The agenda of the meeting was as follows;

1. Prayer and Introductions
2. Opening remarks
3. Presentation of the Draft ESIA Study Report
4. Plenary
5. Way Forward
6. Closing Remarks

2. Prayer and Introductions

The meeting began at 10.45 a.m. with a word of prayer from Ms. Phyllis Keiza from Tudor Four and thereafter introductions. The meeting was attended by 38 participants drawn from the Ministry of Interior and National Administration, County Government of Mombasa, Tudor-Shimanzi Beach Management Unit (BMU), local community, Proponent and Envasses Environmental Consultants Limited (Figure 1 and Annexure 1).

Figure 1: Sections of the participants following deliberations during the second stakeholder's meeting to review the Draft ESIA Study Report at the proposed project site (Second stakeholder's meeting to review the Draft ESIA Study Report, August 2023).

3. Opening remarks

3.1 Ministry of Interior and National Administration

Mr. Tsuma Mangale, the Area Chief – Tudor, thanked all participants for attending the meeting. He emphasized on the importance of the public participation process in the ESIA process and urged the participants to be attentive and seek clarification where necessary. He then welcomed the Assistant County Commissioner – Mvita, Ms. Irene Ndambuki, to give her remarks.

Ms. Irene thanked the proponent for initiating the project within Tudor since it would meet the housing demand within the area. She stated that the government was in support of the project and urged the stakeholders to embrace the project as it aims to provide affordable housing within the area. Having said that, she declared the meeting officially open.

4. Presentation of the Draft ESIA Study Report

Mr. Omar Said from Envasses Environmental Consultants Limited noted that under Regulation 17 of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003 as well as the Kenya Constitution of 2010, public participation meetings are required to inform and sensitize stakeholders and communities on the proposed project activities and obtain their views and concerns on the proposals. He further reiterated that the public participation process would help capture the views and concerns of interested and affected parties with respect to the impacts of the proposed project on the community. He noted that the concerns could be environmental or social in nature and could either be positive or negative. In addition, he informed the meeting that the consultant had previously engaged the stakeholders via a kick off meeting on 22nd August 2023.

He then presented the Draft ESIA Study Report including the methodology in carrying out the study, the technical scope and non-technical summary outlining the key findings, conclusions and recommendations of the study pursuant to Regulation 18 (1) and (2) of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003.

5. Plenary session

Mr. George Kamau from Tudor Four welcomed the proposed project and urged the stakeholders to embrace the project since it would address the housing demand in Kenya, provide affordable housing and promote decongestion of urban settlement.

Ms. Zakia Mohamed from Tudor Four wanted to know the cost, potential buyers of the proposed apartments and commencement of the project. In response, Engineer Mwinyi Mwinyi, the proponent representative, stated that the cost of the apartments range from KES 4Million to KES 9Million and the payments would be made in monthly installments of KES 200,000 for a period of 4 years. In addition, he stated that the potential buyers are middle class income earners. Further, Mr. Omar informed the meeting that the project would commence after the proponent has obtained pertinent approvals from relevant government authorities.

Mr. Tsuma wanted to know whether the site immediate neighbours were invited to the meeting as recommended in the kick-off meeting. In response, Mr. Ibrahim Ndeme, the Assistant Chief, Tudor Four Sub-location, informed the meeting that the neighbors had been invited and attended the meeting. He further stated that the neighbors had no objection to the proposed project.

Ms. Munira Abdul from Citadel Royal School stated that the proposed project site lies adjacent to the school and was concerned on the impact of air and noise pollution resulting to disruption of learning activities. In response, Mr. Omar stated that the report had recommended mitigation measures to mitigate the impacts to either low or negligible levels i.e. locating peak noise producing machines away from the school, using serviceable machinery, installation of appropriate and adequate dust screens around the project site, sprinkling water at the excavation areas to suppress fugitive dust and covering of stockpiles of construction materials (aggregates, sand and fill material) to reduce dust emissions especially during windy conditions.

Ms. Rhodah Ayugi from Tudor Four requested the proponent to allow food vendors specifically from women groups within the area to sell food to the construction workers. She further requested the proponent to prioritize employment opportunities for both skilled and non-skilled labor to the local community. Her comments were seconded by all participants. In addition,

Engineer Mwinyi noted that the contractor will organize community employment in collaboration with the office of the area Chief.

Mr. Bomazi Ngovi, the Tudor-Shimanzi BMU Chairman, wanted to know the impacts of the proposed project on the fishery within Tudor Creek. In response, Mr. Omar stated that the development does not extend to the Creek and the report has recommended mitigation measures to mitigate the impacts to either low or negligible levels. He further stated that the report has an environmental and social monitoring plan to enhance the environmental performance of the proposed project by providing data and information on compliance with legislative standards, conservation and preservation of the environment and determining the levels of deviation from the values obtained during the baseline monitoring.

Mr. Sagaf Ali from the County Government of Mombasa - Department of Lands, Housing and Urban Planning stated that during the validation meeting the consultant should present the proceedings of the kick-off meeting and second meeting to review the Draft ESIA Study Report and provide each stakeholder with the design plans for the proposed project. He further stated that the construction contractor should attend the meeting to assure the community members that they will be given priority for both skilled and non-skilled labor, food vendors (women groups) would be allowed to sell food to the construction workers and disclosure of information on how to purchase the apartments. His comments were seconded by Ms. Irene.

6. Way forward

Mr. Omar informed the meeting that the views and issues raised by the stakeholders will be incorporated in the ESIA Study report. He further noted that a third stakeholder's meeting to validate the Draft ESIA Study Report was scheduled on 4th September 2023.

7. Closing Remarks and Prayer

There being no other business, the meeting ended at 12.00 noon with a word of prayer from Ms. Phyllis.

Signed: Date: 4th September 2023

Mr. Brian Omondi,
Envasses Environmental Consultants Limited,
Secretary.

Signed: Date: 4th September 2023

Mr. Tsuma Mangale,
Area Chief – Tudor location.

TSUMA K. MANGALE
4/09/2023

ENVASSES ENVIRONMENTAL CONSULTANTS LTD
Tel:0722 347 165
04 SEP 2023
Email: info@envasses.org
P.O. Box 2013-80100, MOMBASA

Annexure 1: Attendance list

ENVASSES ENVIRONMENTAL CONSULTANTS LIMITED

Environmental and Social Impact Assessment (ESIA) Study Report for the Proposed Residential Development on Plot L.R. No. Mombasa/Block X/85 in Tudor area, Mombasa County.

Task: Second Stakeholder Meeting to review the Draft ESIA Study Report

Date: 29th August 2023

Venue: Project site

List of participants, contact details and signatures

NO.	NAME	AFFILIATION	TELEPHONE NO/EMAIL	SIGNATURE
1.	BOMAZI SWALEH NGOVI	(B.M.U. CHAIRMAN) TUDOR/BANDARINI	0706675867	
2.	RODAH -T. AYUGI	Tudor 4 BALOZI	0714343513	
3.	George N KAMAU	TUdor 4. Balozi	0729078063	
4.	Rehana Baluchi.	Tudor 4 Balozi	074322873	
5.	SAGAF ALI SAGAF	CGM-DEPT L,P,H	0724959836	

NO.	NAME	AFFILIATION	TELEPHONE NO/EMAIL	SIGNATURE
6.	MUNIRA ABDUL SORAN	MUita PROJECT	0795790179	
7.	HASINA SAID	"		
8.	AHMED SAID OMAR.	MUITA PROJECT.	0713025666	
9.	MARIKO B. MUYEMBE.		0701615678	
10.	Grace Nzambi Kirita	Tudor 4 Balozi	0713105063	
11.	Maurice Aluanzi	Tudor 4 Balozi	0114708404	
12.	FLORENCE HAGAI	Tudor 4	0726459226	
13.	Suleiman Amin	Tudor 4, Balozi	0705598103	
14.	Eng. Mwiungu Mwingi	Project Engineer	0735988221	
15.	PHYLLIS KEIZA	VILLAGE ELDER	072763287	
16.	EMILY AMUGADA	BALOZI TUNDUNDA	0757076359	
17.	KASSIM SULEIMAN	BALOZI TUDOR PRY	0727621621	
18.	WAMBUNGO MKAHA		0718845996	
19.	KANYIRI MKALA	VILAGE ELDER NGOMA	0711946509	
20.	PETTY KADZO	VILAGE ELDER	0714611703	
21.	JOSEPH MWAISAKA	MALANDINI BALOZI	0725333280	

NO.	NAME	AFFILIATION	TELEPHONE NO/EMAIL	SIGNATURE
22.	ISACC MWIKA	MALANDINI TUDOR 4 CRI	0712365560	
23.				
24.	OMAR K MKUKUMA	VILLAGE ELDER	0723356996	
25.	PETER MUNYOKI	TUDOR DAY	0746972625	
26.	EMMANUEL KAIANA	TUDOR 4	0769711820	
27.	Zakia S. Mohamed	Tudor 4 (SPAKI)	0722367467	
28.	IRENE NDAMBUKI	MVITA ACC	0710992388	
29.	ISUMA K. MANGALE	TUDOR-20R.	0711770277	
30.				
31.	Ibrahim C. Ndeme	ASST-CHIEF TUDOR 4	0718802069	
32.	LILLIAN BARASA	TUDER DAY	0718930736	
33.	STEPHEN SYENGO	KHAMIS, SECONDARY	0746972625	
34.	KIBWANA SAID	VILLAGE ELDER KIZIWI	0794440438	
35.	LINA WAKIO	BALOZI KIZIWI	0713253364	
36.	FATUMA KHAMIS	BALOZI KIZIWI	0712893370	
37.	Omar Said	Enveass	0706784101	

NO.	NAME	AFFILIATION	TELEPHONE NO/EMAIL	SIGNATURE
38.	Brian Omondi	Envasses	0101587745	
39.	Sheila Wanjiku	Envasses	0700282807	
40.	Simon Ndeti	Envasses	0722347155	
41.				
42.				
43.				
44.				
45.				
46.				
47.				
48.				
49.				
50.				
51.				
52.				
53.				

Annexure 9: Copy of Proceedings of the third stakeholder's meeting to validate the Draft ESIA Study Report held at the project site on 4th September 2023

Environmental and Social Impact Assessment (ESIA) Study Report for the Proposed Residential Development on Plot L.R. No. Mombasa/Block X/85 in Tudor area, Mombasa County.

PROCEEDINGS OF THE THIRD STAKEHOLDER'S MEETING TO VALIDATE THE DRAFT ESIA STUDY REPORT HELD ON 4TH SEPTEMBER 2023 AT THE PROPOSED PROJECT SITE IN TUDOR AREA, MOMBASA COUNTY.

Proponent	Firm of Experts
Ultra Modern Homes Limited, P.O. Box 99848-80100, Mombasa, Kenya.	Envasses Environmental Consultants Limited, P.O. Box 2013-80100, Mombasa, Kenya.

1. Meeting Agenda

Envasses Environmental Consultants Limited in collaboration with the Ministry of Interior and National Administration organized and held a project validation meeting on 4th September 2023 at Tudor area, Mombasa County. The forum was convened to validate the kickoff and stakeholder participatory meeting proceedings with the local community and relevant stakeholders with respect to the ESIA for the proposed residential development on Plot L.R. No. Mombasa/Block X/85 in Tudor area, Mombasa County. The agenda of the forum was as follows;

1. Prayer and Introductions
2. Opening remarks
3. Validation of the Draft ESIA Study Report
4. Way Forward
5. Closing Remarks

2. Prayer and Introductions

The meeting began at 10.26 a.m. with a word of prayer from Ms. Phyllis Keiza from Tudor Four. The meeting was attended by 50 participants drawn from the Ministry of Interior and National Administration, County Government of Mombasa, local community, Tudor-Shimanzi BMU, Project Engineer/Contractor, Housing Agent and Envasses Environmental Consultants Limited (Figure 1 and Annexure 1).

Figure 14: Sections of the participants following deliberations during the third stakeholder's meeting to validate the Draft ESIA Study Report at the proposed project site (Third stakeholder's meeting to validate the Draft ESIA Study Report, September 2023).

3. Opening remarks

3.1 Ministry of Interior and National Administration

Mr. Tsuma Mangale, the Area Chief – Tudor, thanked the participants for showing up in the previous two meetings and the final validation meeting. He further noted that all the issues that require clarifications will be finalized in the validation meeting, by the relevant stakeholder for the satisfaction of all the participants.

4. Validation of the Draft ESIA Study Report

Mr. Omar Said from Envasses Environmental Consultants Limited thanked the participants for attending the meeting. Mr. Omar explained the design plans for the proposed project with printout

illustrations. He then invited Mr. Omar Sagaf, the housing agent, to explain the booking process of the apartments.

Mr. Sagaf explained that the acquisition of the apartments worth KES 4Million – KES 5Million starts with a deposit of KES 1Million with monthly payment of the remainder within a period of four years. He further noted that the agency issues brochures to the individuals who visit their office at Kizingo on the same. Mrs. Zakiah Mohamed wanted to know how affordable KES 1Million deposit is to the local community. Mr. Sagaf responded that if an interested buyer has a commitment plan and is not able to raise the KES 1Million deposit there is room for negotiations. He further noted that the agency has given a longer duration of pay for a period of four years contrary to the usual two years duration to accommodate the local community. Ms. Phyllis Keiza also wanted to know the bedroom sizes of housing units worth KES 4Million. Mr. Sagaf responded that the bedrooms measure 3.6m by 3m. He further noted that if an interested individual reports that he is no longer able to continue with the payment, the unit is advertised for a potential buyer and a refund made to the client.

Mr. Omar invited the project contactor, Eng. Mwinyi Mwinyi, to give clarifications on employment procedure of the local community and labour servicing at the site as requested in the stakeholders participation meeting by the community. Eng. Mwinyi acknowledged that having been confirmed as the project contractor, the community should not be worried about non-residents getting jobs at the expense of the local community. He noted that he will be in close engagement with the office of the Chief while sourcing for labour and persons responsible for servicing the labour workforce at project site. Ms. Rodah Ayugi wanted to know the onset of construction. Eng. Mwinyi responded that the actual construction will start in about two months' time.

Thereafter, the participants were given an opportunity to review the updated report after which it was validated as Final ESIA Study Report to be submitted to NEMA.

5. Way forward

Mr. Omar stated that the proceedings for the meeting will be prepared and the views and issues raised by the stakeholders will be incorporated in the ESIA Study Report and submitted together to NEMA. In addition, he informed the participants that the proposed project will be advertised for a period of thirty (30) days in Kenya Gazette, a newspaper with nationwide circulation and local radio station inviting the public to submit oral and written comments on the proposed project to NEMA.

6. Closing Remarks and Prayer

There being no other business, the meeting ended at 12.00 noon with a word of prayer from Mr. Job Mutundu.

Signed: Date: 4th September 2023

Mr. Brian Omondi,
Envasses Environmental Consultants Limited,
Secretary.

Signed: Date: 4th September 2023

Mr. Tsuma Mangale,
Area Chief – Tudor location.

4/09/2023

ENVASSES ENVIRONMENTAL CONSULTANTS LTD
Tel:0722 347 165
04 SEP 2023
Email: info@envasses.org
P.O. Box 2013-80100, MOMBASA

Annexure 1: Attendance list

ENVASSES ENVIRONMENTAL CONSULTANTS LIMITED

Environmental and Social Impact Assessment (ESIA) Study Report for the Proposed Residential Development on Plot L.R. No. Mombasa/Block X/85 in Tudor area, Mombasa County.

Task: Third Stakeholder Meeting to validate the Draft ESIA Study Report

Date: 1st September 2023

Venue: Project site

List of participants, contact details and signatures

NO.	NAME	AFFILIATION	TELEPHONE NO/EMAIL	SIGNATURE
1.	Zakia S. Mohamed	Tudor (Spanky)	0722367467	
2.	Grace Nzambu	Tudor 4	0713105063	
3.	Fatuma Khamis	Kizuzi	0712893370	
4.	CHARLES O. OKOYA	TUDOR MBURUKANGE	0712794172	
5.	Isaac Mwita	Tudor 4 CC CC	0712365560	

NO.	NAME	AFFILIATION	TELEPHONE NO/EMAIL	SIGNATURE
6.	MARIKO B. MUYEMBE	Tudor 4	0701615678	
7.	PETER MUTUNGA	Tudor Kiziwi	0759287333	
8.	GEORGEN KAMAU	TUDOR FOUR BALOZI	0729078063	
9.	ALII ABDALLA OMAR	TUDOR 4	0714032278	
10.	Maurice Aluvanzi	Tudor Mombasa	0114708404	
11.	WILSON. M. MADIGA	TUDOR	0791729761	
12.	OMAR SHELUDE	AGENT INVOLVED	0791183363	
13.	Florence Ayesa Hagai	Tudor 4	0726439236	
14.	OMAR K MWICAN	TUDOR DAY(V/HOUSE	0723356996	
15.	KASSAM. SULEMAN.	TUDOR DAY (BALOZI)	0727 621621	
16.	BOMAZI SWALEH NGOYI	CHAIRMAN T./SHIMANZI	0719122854	
17.	Rodah Ayugi	BALOZI T. 4	0714343513	
18.	Mwinyi Mwinyikombo	Engineer	0735988221	
19.	Peter Munyoki	Tudor day	0746972625	
20.	PATRICK MALUMBE	TUDOR DAY	0706053517	
21.	Rosemary Joseph	Tudor Day	0718961567	

NO.	NAME	AFFILIATION	TELEPHONE NO/EMAIL	SIGNATURE
22.	FATIMA MOHAMED	SPAKI. A. TUDOR	0716193085	Fatma
23.	Rehema Rajab	Majengo Yai Simba	0727110033	
24.	SAIDA MBARAK	SPAKI B' TUDOR	0724061295	
25.	LINA WAKIO	KIZIWI TUDOR	0713253364	
26.	Paul Theka	Tudor 4	0742153105	
27.	WILIAN BARASA	Tudor day	0718930736	
28.	PHYLLIS KEIZA	TUDOR FOUR	0727631287	
29.	Rehana Baluchi	Tudor four balozi	0743228731	Rana
30.	~~CHARLS MBITI KAYOYO~~	~~BURUKENGE~~	~~0718845916~~	
31.	KIBWANA. S. KIBWANA.	TUDOR - KIZIWI	0744440438	
32.	SAGAF ALI SAGAF	CGM - DEP L, P, H	0724999886	
33.	WAMBUGO MKAZA DAWA	BURUKENGE	0748845996	
34.	EMILY K. AMUGADA	TUDOR 4 NORAH BALOZI	0757076359	Amugada
35.	MICHAEL KOSTI KATSIVO	TUDOR 4	0741933069	
36.	JOSEPH MWAISAKA	TONONOKA MALANDINI	0725333280	
37.	ILANYIRI MILALA	TUDOR 4	0711946509	

NO.	NAME	AFFILIATION	TELEPHONE NO/EMAIL	SIGNATURE
38.	MWAKA SAID BABU	INTERIOR ASST CHIEF	0716360340	
39.	IBRAHIM-C. NDEME	ASST CHIEF	0718802069	
40.	IRINE NGAMBUKI	ACC-MVITA	0710992388	
41.	TSUMA MANGALE	CHIEF	0711770277	
42.	Mwinyi Mwinyikombo	Engineer	0739988221	
43.	KAMBUA .H. MAKAU	TUDOR MBURUKENGE	0729863038	
44.	Suleiman Amin KHALFAN	TUDOR 4 BALOZI	0705598103	
45.	MOHAMMED DZOMBO	V. ELDER MBUZI MAPOMBS	0743774590	
46.	JOB M. MUTUNDU	VE TUDOR	0790755816	
47.	CATHERINE AYUGI	BALOZI TUDOR FOR	0721-960232	
48.	SWALEHA WANJIKU	ENVASSES ENVIRONMENTAL.	0700242807	
49.	Omar Said	Envasses Environmental	0706784101	
50.	Brian Omondi	Envasses	0701587740	
51.	Simon Nduki	Envasses	0722347155	
52.				
53.				

Annexure 10: Copy of NEMA practicing license for Envasses Environmental Consultants Limited

FORM 7 (r.15(2))

nema
mazingira yetu | uhai wetu | wajibu wetu

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/18513

Application Reference No: NEMA/EIA/EL/24308

M/S **Envasses Environmental Consultants Ltd**
(individual or firm) of address
P.O. Box 2013 - 80100 Mombasa

is licensed to practice in the capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Firm of Experts** registration number **6175**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **1/12/2023** Expiry Date: **12/31/2023**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001: 2015 Certified

Annexure 11: Copy of NEMA practicing license for Lead Expert, Mr. Simon Nzuki

FORM 7 (r.15(2))

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/18514

Application Reference No: NEMA/EIA/EL/24309

M/S **Simon Kioko Nzuki**
(individual or firm) of address
P.O. Box 2013 - 80100 Mombasa

is licensed to practice in the capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert General**

registration number **1350**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **1/12/2023** Expiry Date: **12/31/2023**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001:2015 Certified