ANNEXURE D
SNGPL APPROVAL LETTER

87/c

Telephones : 092-51-9257710-19
Cable : "SUINORTH"
Fax No. : 092-51-9257770-

SUI NORTHERN GAS PIPELINES LIMITED
Plot No. 28-30, Industrial Area, I-9 Islamabad (Pakistan)

REF. NO. IS/L-42
DATE 20.05.2014

Mr. A. R Nasir
Joint Secretary
I.B Employees Co-operative Housing Society Limited
ISLAMABAD.

SUPPLY OF GAS TO
INTELLIGENCE BUREAU EMPLOYEES CO-OPERATIVE HOUSING SOCIEYT GULBERG ISLAMABAD.

We refer our letter # SGMD-(N)-14 dated 13.01.2014, regarding the subject and wish to advise you as follows:-

Our gas distribution network does not exist in the vicinity of above premises. In order to provide gas to the subject premises, the following network of gas mains are required to be laid at an estimated cost of **Rs. 60864515/- (Sixty Million Eight Lac Sixty Four Thousands Five Hundred and Fifteen Rupees Only)** (E. & O. E) subject to revision if prices of materials escalate).

PIPE DIA	METERAGE	UNIT RATE (Rs.)	COST (Rs.)
8" dia	7.9 KM	6401.71	50571509.00
TBS's (300mcf)	01 No.s	2352156.00	2352156.00
		Escalation Charges	7938849.75
		Total	60864514.75

Please be advised that after receipt of full amount, it normally takes us a minimum period of 18 to 24 months for the procurement of materials and allied fittings after receipt of which the execution of the job is taken in hand. All costs of Road Cross/Road Cuttings/boring will have to be borne by you. You will also be required to obtain prior permission for Road Cross/Cutting/boring from the competent authorities. The reinstatement of roads, pavements, sand filling inside the colonies and Nullah crossing would be carried out by your own arrangements.

Please also note that the security amount and service line cost sharing charges/cost of meter station will have to be deposited by you in addition to the above cost, and will be intimated to you after the successful laying/commissioning of the proposed gas main.

The proposed laying of the gas mains can be considered on 100% cost recovery basis. Proprietary rights of the Gas Network and its maintenance will rest with Sui Northern Gas Pipelines Limited and the Company will have the right to supply gas through the system to any other applicants. Therefore, should you agree to our above offer, you are requested to remit us the cost estimates along with the 'draft agreement' (specimen attached) duly filled in/signed on a **Rs.100/-** non-judicial stamp paper. This offer is valid up to **20.06.2014.**

Assuring you of our best services at all times.

Sui Northern Gas Pipelines Limited

(Faiz Ahmed Chaudhary)
GENERAL MANAGER (ISLD)

Note: This refers to SGMD-(N)-14 dated 15.05.2014

ANNEXURE-E

SEWAGE TREATMENT PLANT REPORT

I. B. Employees' Cooperative Housing Society Limited

(Registeration No. 144)

PAKISTAN SECRETARIAT BLOCK 'K'

ISLAMABAD

Ref. No. IBECHS/33/2009/522 *Date* 03-06-2019

Mr. Faraz Malik
Director Housing Societies
Capital Development Authority (CDA), Sector G-7/4, Islamabad.

SUBJECT: **ENGINEERING DESIGN AND SERVICES / UTILITIES OF GULBERG RESIDENCIA (IBECHS PHASE-III) HOUSING SCHEME ISLAMABAD SPONSORED BY M/S INTELLIGENCE BUREAU EMPLOYEES'COOPERATIVE HOUSING SOCIETY LIMITED, ZONE-V, ISLAMABAD**

Dear Sir,

This is with reference to Clause 3 (h) of LOP approval letter No. CDA/PLW/HS (127)/Ext/2018/Vol-V/440 dated 13.08.2018 regarding the subject matter.

2. M/s Intelligence Bureau Employees' Cooperative Housing Society (IBECHS) Limited is pleased to submit the Engineering Design and the detailed specifications of the services/utilities of Gulberg Residencia (IBECHS Phase-III) Housing Scheme, Islamabad designed by **M/s Urban Planning & Design (Pvt.) Ltd. Islamabad (PEC Regd. No. CONSULT/1423)** and duly vetted by **M/s DESIGNMEN Consulting Engineers (Pvt.) Ltd. Islamabad having PEC Registration No. CONSULT/201 and CDA Design Vetting Engineer License No. Structures-220/14** for the approval of CDA. Details of the submissions are as under:

i.	Topographic Survey Plan	1 Set
ii.	Road Finished Elevation Plans	1 Set
iii.	Road Profiles (Volume 1, 2, 3, 4, 5)	1 Set
iv.	Storm Water Drainage System Plan	1 Set
v.	Sewerage Layout Plan	1 Set
vi.	Trunk Sewer Layout Plan	1 Set
vii.	Sewerage Treatment Plant Design Report	1 Report
viii.	Nullah and Culvert Construction Drawings & Report	1 Set
ix.	Water Supply Distribution System Plan	1 Set
x.	Tube Wells, UGT, OHT water tanks, Reservoirs, and Rising Main Plan	1 Set
xi.	General Notes and Typical Drawings of Storm Water Drainage System, Sewerage System, and Water Supply	1 Set
xii.	Infrastructure Design Report	1 Report
xiii.	Infrastructure Design Report Enclosures (Volume I, II, III , IV)	1 Set
xiv.	Design Calculation Report of Elevated Water Tank-100,000 Gallons	1 Report
xv.	Design Calculation Reports of UGWT (100,000, 200,000, 500,00, 600,000 Gallons)	4 Reports
xvi.	Structural Drawings of Overhead Water Tank, Underground Water Tanks & Reservoirs	1 Set

3. Vetting Certificate from M/s Designmen Consulting Engineers (Pvt.) Ltd. Islamabad is also enclosed herewith.

4. Submitted for your kind perusal and approval, please.

Yours sincerely,

(Shujaat Ullah Qureshi)
SecretaryIBECHS

o/c

Encl: (As above)
Copy to:

i. The Member (Planning & Design), CDA, Islamabad.
ii. M/s Urban Planning & Design (Pvt.) Ltd., Islamabad.

Member (P&D Office), CD... Dy. No. 4623 Date 3-6-19

HS Dte Dy No. 23322 Date 03/06/2019.

DESIGN REPORT
FOR
SEWAGE TREATMENT PLANT 1

CONSULTANCY SERVICES FOR ENGINEERING
DESIGN OF SEWAGE TREATMENT PLANT FOR GULBERG RESIDENCIA
ISLAMABAD

MAY, 2019

SHUJAAT ULLAH QURESHI
IB Employee

VETTED
Designmen
CONSULTING ENGINEERS (Pvt) Ltd.
PEC Reg # CONSULT/201

Engr. MOHAMMAD ARIF
ARIF CONSULTING ENGINEERS
CDA Licence # CDA/D.Arch-2(72) (277) AE/2003
PEC Consult # 1050
Office # 1104, 11th Floor, Green Trust Tower, Blue Area, Islamabad.
Ph: 051-2813013 Fax: 051-2813014

Contents

Engr. MOHAMMAD ARIF
ARIF CONSULTING ENGINEERS
CDA Licence # Cat-I, Area-(272) (277) AE/2003
P.E.C. Consult # 1950
Office # 11th, 11th Floor, Evacuee Trust Tower, Blue Area, Islamabad.
Ph: 051-2813013 Fax: 051-2813014

ACRONYMS ANDABBREVIATION

FAO Food and Agriculture Organization of the United Nations
IARC International Agency for Research on Cancer
JECFA Joint FAO/WHO Expert Committee on Food

NOAEL No-Observed-Adverse-Effect Level
PTWI Provisional Tolerable Weekly Intake USA United States of America WHO World Health Organization
RDA Rawalpindi Development Authority
CDA Capital Development Authority
WASA Water and Sanitation Authority

WBD Water Born Diseases

WRD Water Related Diseases

DO Dissolved oxygen

COD Chemical Oxygen Demand

BOD Biological Oxygen Demand

ICT Islamabad Capital Territory

KPK Khyber Pakhtoonkhwa

MKDA Murree Kohota Development Authority

MG Million Gallons

MGD Million Gallons per day Pollutants
TWS "**Tube Well water system**" means a distributed water system that is served by one or more tube wells or combination of tube well and surface water source.

CCP "**Composite correction program**" means a program consisting of two(2)elements: a comprehensive performance evaluation and comprehensive technical assistance;

CPE "**Comprehensive performance evaluation**" means a thorough review and analysis of a treatment plant's performance-based capabilities and associated administrative, operation and maintenance practices. It needs to be conducted to identify factors that may be adversely impacting a plant's capability to achieve compliance and emphasizes approaches that can be implemented without significant capital improvements. The comprehensive performance evaluation shall comprise a written report consisting of at least the following components:

a. Assessment of plant performance;
b. Evaluation of major unit processes;
c. Identification and prioritization of performance limiting factors;
d. Assessment of the applicability of comprehensive technical assistance;
e. Identification of improvements selected by a consultant to enhance the treatment plant's capability to achieve compliance; and
f. A schedule of dates for the implementation of the improvements;

EPA The Pakistan Environmental Protection Agency;

GAC Granular Activated Carbon Filter
HAA5 "Halo-acetic-acid five" means the sum of the concentrations in milligrams per liter of the halo-acetic acid compounds (monochloro-acetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid), rounded to two(2) significant figures;

MCL "**Maximum contaminant level**" means the maximum permissible level

Of a contaminant in water that is delivered to any consumer of a public water system;

MCLG	"Maximum contaminant level goal" means the maximum level of a contaminant in drinking water at which no knows nor anticipated adverse effect on the health of persons would occur; and which allows an adequate margin of safety. MCLG are our suggested goals but non-enforceable health goals;
MRDL	"Maximum residual disinfectant level" means a level of a disinfectant added for water treatment that may not be exceeded at the consumer's tap without an unacceptable possibility of adverse health effects. MRDL is enforceable in the same manner as maximum contaminant level;
MRDLG	"**Maximum residual disinfectant level goal**" means the maximum level of a disinfectant added for water treatment at which no known or anticipated adverse effect on the health of persons would occur, and which allows an adequate margin of safety. MRDLG is a non-enforceable health goal and does not reflect the benefit of the addition of the chemical for control of waterborne microbial contaminants;
MDL	"**Method detection limit**": the minimum concentration of a substance that can be measured and reported with ninety-nine percent (99%) confidence that the true value is greater than zero (0)
BDL	"**Below detection limit**" or "BDL" means below MDL
TNTC	"**Too numerous to count**"; that the total number of bacterial colonies exceeds two hundred (240) on a forty-seven (47) mm diameter membrane filter used for coliform detection;
TOC	"**Total organic carbon**"; total organic carbon in mg/L measured using heat, oxygen, ultraviolet irradiation, chemical oxidants, or combinations of these oxidants that convert organic carbon to carbon dioxide, rounded to two (2)significant figures
TTHM	"**Total trihalomethanes**"; the sum of the concentrations in milligrams per liter of bromodichloromethane, Ibromochloromethane, tribromoethane (bromoform), and trichloromethane (chloroform) rounded, to two (2) significant figures;
DALYs	Disability Adjusted Life Years
YLDs	Years Lived with Disability
RS	Remote Sens

DEFINITIONS

1) "**Active source of supply**" means all surface Water sources or underground water from which water is taken on a regular or periodic basis for water supply purposes. One or more sources that are supplying water to one distribution system.
2) "**Annual average**" means the arithmetic average of the quarterly averages of four (4) consecutive quarters of monitoring;
3) "**Coagulation** "means a process using coagulant chemicals and mixing by which colloidal and suspended materials are destabilized and agglomerated into flocs;
4) "**Complete conventional treatment**" means coagulation, sedimentation or rapid granular filtration, and disinfection carried out by WASA at filtration plant;
5) "**Comprehensive technical assistance** "means a performance improvement phase that is implemented using results from the comprehensive performance evaluation;
6) "**Confluent growth**" means a continuous bacterialgrowthcoveringtheentirefiltrationareaofa membranefilter, reapportion thereof, in which bacterial colonies are not discrete;
7) "**Consecutive public water system**" means a public water system that purchases all of its water from one or more public water systems;
8) "**Consultation**" means appointment of consultant for advice
9) "Consumer" means one that is taking water from WASA / CDA / Gulberg Residencia water supply
10) "Contaminant" means any physical, chemical, biological, or radiological substance or matter in water as in chapter 1 & 3 of this document or published by EPA and nPCRWR
11) "**Conventional filtration treatment**" means a series of processes including coagulation, flocculation, sedimentation or dissolved air flotation, and filtration resulting in substantial particulate removal;
12) "**Corrosion inhibitor**" means a substance capable of reducing the corrosiveness of water toward metal plumbing materials, especially lead and copper, by forming a protective film on the interior surface of those materials;
13) "**CT" or "CT CALC**" means the product of the "residual disinfectant concentration" (C) in milli grams perliter (mg/l) determined before rat the first customer, and the corresponding "disinfectant contact time" (T) in minutes (i.e., "C" X "T"). If disinfectants applied at more than one point prior to the first customer, it shall determine the CT of each disinfectant sequence before or at the first customer to determine the total percent in activation;
14) "**Customer**" means water or sewage consumer
15) "**Department**" means Directorate of Water Supply CDA or WASA Rawalpindi;
16) "**Direct filtration**" means a series of processes including coagulation and filtration, but excluding sedimentation, resulting in substantial particulate removal;
17) "**Disinfectant contact time**" ("T" in CT calculations) means the time in minutes that it takes for water to move from the point of disinfectant application or the previous point of disinfectant residual measurement to a point before or at the point where residual disinfectant concentration ("C") is measured;
    a. Where only one "C" is measured (single application point), "T" is the time in minutes that it takes for water to move from the point of disinfectant application to a point before or at which residual disinfectant concentration ("C") is measured;
    b. Where more than one "C", is measured (multiple application points), "T" is: for the first measurement of "C", the time in minutes that it takes for water to move from the first point of disinfectant application to a point before or at the point where the first "C" is measured; and
    c. for subsequent measurements of "C", the time in minutes that it takes for water to move from the previous "C" measurement point to the "C" measurement point for which the subsequent "T" is being calculated;
    d. Disinfectant contact time in pipelines shall be calculated by dividing the internal volume of the pipe by the maximum hourly flow rate through that pipe (plug flow); and
    e. Disinfectant contact time within mixing basins, clear wells, and storage reservoirs shall be determined by tracer studies or an equivalent demonstration;
18) "**Disinfection**" means a process which inactivates pathogenic organisms in water by chemical oxidants or equivalent agents;

19) "**Disinfection profile** "means a summary of daily giardia lamblia, coliform and E.coli inactivation through the treatment plant;
20) "**Domestic or other non-distribution system plumbing problem**" means a coliform contamination problem in a public water system with more than one service connection that is limited to the specific service connection from which the coliform-positive sample was taken i.e. house bore hole well etc.;
21) "**EC medium/mug tests**" means analytical tests for waterborne bacteria;
22) "**Effective corrosion inhibitor residual**" means a concentration sufficient to form a passivizing film on the interior walls of pipe;
23) "**End of distribution system**" means the last service connection on a dead-end water main;
24) "**Enhanced coagulation**" means the addition of sufficient coagulant for improved removal of disinfection byproduct precursors by conventional filtration treatment;
25) "**Enhanced softening**" means the improved removal of disinfection byproduct precursors by precipitates oftening;
26) "**Filterprofile**"means a graphical representation of individual filter performance, based on continuous turbidity measurements or total particle counts versus time foranentirefilterrun, from startup to backwash inclusively, that includes an assessment of filter performance while another filter is being back washed;
27) "**Filtration**" means a process for removing particulate matter from water by passage through porous media;
28) "**First draw sample** "means aone-litersa maple of tap water, that has been standing in plumbing pipes at least six (6) hours and is collected without flushing the tap;
29) "**Flocculation**" means a process to enhance agglomeration or collection of smaller floc particles into larger, more easily settle able particles through gentle stirring by hydraulic or mechanical means;
30) "**Large water system**" means a water system that serves more than fifty thousand (50,000) persons;
31) "**Legionella**" means a genus of bacteria, some species of which have caused a type of pneumonia called legionnaires 'disease;
32) "**Local director of health**" director of health or his authorized agent;
33) "**mg/L**" means milligrams per liter;
34) "**Medium-size water system**" means a water system that serves greater than three thousand three hundred (3,300) and less than or equal to fifty thousand (50,000) persons;
35) "**Near the first service connection**" means at one of the twenty percent (20%) of all service connections in the entire system that are nearest the water supply treatment facility, as measured by water transport time within the distribution system;
36) "**Notification level**" means the level of a contaminant that if exceeded shall require public notification by a public water system to its consumers;
37) "**Optimal corrosion control treatment**" means the corrosion control treatment that minimizes the lead and copper concentrations at users 'taps while ensuring that the treatment does not cause the water system to violate any drinking water statutes or regulations;
38) "**Physical parameters**" means color, turbidity, ph and odor;
39) "**Point of disinfectant application**" is the point where the disinfectant is applied and water downstream of that point is not subject to recontamination by surface water;
40) "**Point of entry**" means a location on an active source of supply that is after any treatment and before entrance to the distribution system;
41) "**Public water system**" or "System" means Water Supply Directorate of CDA or WASA with its division's and staff including whole systemand mechanism of water supply.
42) "**Repeat sample**" means a sample that is collected as a result of a total coliform-positive routine sample;
43) "**Residual disinfectant concentration**" ("C" in CT calculations) means the concentration of disinfectant measured in mg/L in are preventative sample of water;
44) "**Routine sample**" means a sample that is collected data location and frequency as specified in the approved sampling plan;
45) "**Sanitary survey** "means an on-site inspection of the water source, treatment, distribution system, finished water storage, pumping facilities and controls, monitoring and reporting data, system management and operation, and staff compliance with organizational requirements.
46) "**Sedimentation**" means a process for removal of solids before filtration by gravity or separation;
47) "**Self-assessment** "means an assessment which shall comprise a written report consisting of at least the following components:

a. Assessment of filter performance;
b. Development of a filter profile;
c. Identification and prioritization of factors limiting filter performance;
d. Assessment of the applicability of improvements;
e. Identification of improvements selected by a public water system to enhance filtration and achieve compliance; and
f. A schedule of dates for the implementation of the improvements;
g. "Service line sample" means a one (1) liter sample of water, that has been standing for at least six (6) hours in a service line;

48) "**Slow sand filtration**" means a process involving passage of raw water through a bed of sand at low velocity (generally less than 0.16 gallons per minute per square foot, gpm/sq. ft.) resulting in substantial particulate removal by physical and biological mechanisms;
49) "**Small water system**" means a water system that' serves three thousand three hundred (3,300) persons or fewer;
50) "**Source water**" means raw water before any kind or type of treatment at the source of supply;
51) "**Surface water**" means all water that is open to the atmosphere and subject to surface runoff;
52) **The maximum contaminant level** (MCL) for total coliforms when fecal coliform or E. coli are Present in the water distribution system, or when the public water system fails to test for fecal coliforms or E. coli when any repeat sample tests positive for coliform;
53) "**Virus**" means a microorganism of fecal origin which is infectious to humans by waterborne transmission;
54) "**Water system**" means all community water systems and non-transient non-community water systems;
55) "**Waterborne disease outbreak**" means the significant occurrence of acute infectious illness, epidemiologicallyassociatedwiththe ingestion of water from a public water system as determined by the health department;
56) **"Remote sensing"** is the acquisition of information about an object or phenomenon, without making physical contact with the object. In modern usage, the term generally referstothe use of aerial sensor technologies to detect and classify objects on Earth (both on the surface, and in the atmosphere and oceans) by means of propagated signals (e.g. electromagnetic radiation emitted from aircraft or satellites)

EXECUTIVE SUMMARY

The sewage generated by the newly developed schemes requires compulsory treatment before discharged into natural streams. The untreated discharge of sewage from these schemes into land and water streams can cause contamination of recipient water bodies and ground water resources.

Realizing the Water quality deterioration in water streams, the developer of Gulberg Residencia has launched a comprehensive project to treat the entire sewage generated from the project areas before its disposal to the environment. The present report describes the design of the sewage treatment system to be developed for Gulberg Residencia.

The preliminary design report, provides insight of prevailing environment, including; General Geography of the project area, Climate (temperatures, winds, rain, evaporation), General socio-economic level of the population, preliminary estimate of population, flow quantity, quality, and projections. It also discusses potential alternatives for the disposal of the treated effluents, identification of sewage-treatment plants and solutions; existing sewage network and treatment facilities; and ultimately, the potential limits of the project (physical limits and design horizon in time

1. INTRODUCTION

1.1. THE CONTEXT

High population growth in Islamabad during last few decades resulted in new settlements or colonies. The major issue of any settlement is environmental impacts of sewage on the quality of streams and the ground water aquifer. This project aims to save the environment of streams downstream of Gulberg Residencia especially Korong river.

1.2. STP DESIGN STAGES

Following design steps will be adopted by the consultant for establishing a complete sewage treatment package for Gulberg Residencia:

- Project framework or sewage master planning.
- Working out parameters required for design of sewage treatment plant like population and sewage flow estimation, determining organic load and site-specific conditions.
- Developing preliminary wastewater treatment plan considering the sewer-shed and the disposal point of the treated effluent.
- Selecting appropriate treatment technology and preparation of concept design
- Process design for the selected sewage treatment plants to match with the sewage flow, pollution load and the point of disposal of treated sewage
- Estimating the capital cost of the project and its operation cost on unit basis

1.3. PLANNING CONSIDERATIONS TO BE EMPLOYED

Gulberg Residencia has been divided into two zones w.r.t collection of wastewater and therefore two Sewage Treatment Plants are planned to be developed, one for each zone. The proposed STPs will be generally based conventional centralized sewage-treatment system with application of some mechanical and rapid treatment techniques, keeping in view topography, geographical orientation, space constraints and also the time cycle of the treatment processes.

The consultant proposes that the phasing of these plants should be done keeping in view their ultimate demographic evolution of the residential scheme.

2. FIELD INVESTIGATIONS &DATA

2.1.PROLOGUE

This chapter describes the data collected by the consultant's field team and the data provided by the developer. This database will provide the basis for conducting Feasibility Study for the proposed Sewage treatment System, site selection of proposed new STP and its design.

2.2. PHYSIOGRAPHY AND PROJECT AREA DELINEATION

This section describes the geographical location of the project area, and the physiographical propertied of land in the area. This also describes the lithological properties of area and soil types. The data will be used in the design of sewage treatment plant and sewage lines.

2.2.1. GEOLOGY AND PEDOLOGY

Geologically, the rocks in the Islamabad, range in age from Jurassic to Paleocene and are of sedimentary origin and comprises of sandstone, limestone and shale. The area is generally stable and free of any slope instability; however, minor rocks fall on the escarpment side take place due to erosion of underlying shale beds. This phenomenon is prominent along the central ridge where the overlying sandstone beds dip at shallow angles. Project area is underlain by sedimentary rocks comprising limestone, sandstone, conglomerate, siltstone and clay of sedimentary origin, ranging in age from Miocene to Recent.

Bedrock belonging to Murree formation of Miocene age and is exposed in more than 20% of the project area. The remaining area is mostly covered with alluvial soils generally comprising silt and lean clay. The thickness of the

Alluvial soils near rock outcrop are between 1-2 meters, while the soil deposits near streams are expected to be up to 6 meters thick.

Sandstone is one of the major constituents of area which is medium-hard to hard in nature and moderately jointed. It is relatively less susceptible to weathering as compared to shale and can provide good foundations for engineering structures.

Brief descriptions of various litho logical units of the project area are described below;

Murree Formation

Murree formation of lower Miocene consists of continental sandstone and clay. The sandstone is reddish gray to purple gray, fine to medium grained, thick bedded, micaceous, cross-bedded, jointed, and calcareous. The clay is purple to dark red and contains mottled lenses of pseudo-conglomerate. Epidote is common in the sandstone of the Murree formation. The contact with the overlying Kamlial Formation is conformable.

Kamlial Formation

Kamlial formation of lower and middle Miocene composed of sandstone and clay. The sandstone is purple, gray, and dark brick red, medium to coarse grained, thick bedded, micaceous, jointed and calcareous. The Kamlial formation contains inter-beds of hard purple clay beds; some clay beds are weathered and have yellow mottles. These weathered beds resemble conglomerate. The unit is distinguished from the underlying Murree formation by its spheroidal weathering. The upper contact beneath the Chinji formation of Cretaceous is conformable.

Lei Conglomerate

Lei Conglomerate was accumulated in Potowar and Southern Kala Chitta over Neogene platform which started in Pliocene and continued up to Early Pleistocene period. It was followed by intense folding and faulting which was associated with late Himalayan organic phase.

It contains lenses of sandstone and clay with occasional siltstone and clay of quaternary. The conglomerate contains boulders and pebbles derived mainly from Eocene rocks with a small proportion of pebbles from older sedimentary and igneous rocks. It caps the older rocks with an unconformity.

Potwar Clay

The Potwar Clay is comprised of clays, silts and siltstones of which a major partis wind-blown. The clay is buff,and earth colored and is very fine grained. The siltstone is reddish brown and grayish brown in color. Loessic clay is characterized by bad land topography and a diacritic drainage pattern covers the bed rocks unconformable.

Alluvium

The alluvium clay is mainly consisting of clay, sand and gravel, moderately sorted and low cross-bedding, deposited and flooded river along the river bed and on beds on the meander belts.

Soil Type

The area's stratification of subsoil stratum indicates oil formation is made up of alluvial deposits. The sub soil stratum predominantly consists of mixture of rounded tough boulders, cobbles, and gravel with dark brown clay at various depths. The soil is fertile and easily tilled but is easily eroded by water and wind.ThegeologicformationunderlyingtheseplainsistheQuaternaryPotwarclay. Generally slopes are less than 15percent.At numerous locations, young clay shale (layering formations) is noticed below three feet from existing ground level. These laminated young clay layers are very compact and show plastic behavior with water. Clay shale is composed of thin layers (4to10mm) with extensive discontinuities. Rocks have been observed to date back to the Jurassic and Triassic ages, limestone being main constituent of the region with a lesser amount of shale, clay, and sandstone. Soils are dark, with a high mineral content, and can support good tree growth despite of being shallow.

2.3. TOPOGRAPHY OF PROJECTAREA

The topography of the site was studied by the team to determine the overall terrain of the scheme and to identify the lowest location in the project area to which these wage may easily be collected with the trunk line by gravity up to the Sewage Treatment Plant. The large area required State-of-the-art DGPS/Total station techniques for control points and benchmarking whereas minor details require total station and other surveying equipment for traversing and leveling. Therefore both these techniques have been utilized for this survey.

Team also visited all the area and identified the various sewer lines and drains in the area for making GIS maps. The points of termination of the in the nearby natural fresh water streams were also witnessed by necessary snapshots where required. The overall topography of the area has been developed with the help of Ground Control Point Survey and Digital Elevation Model (DEM). The contour maps of the area representing the detailed physiology and topographical view of the site were developed.

For physical and topographical survey drawings the data is taken from the UPDL (Project Planners).

2.4. CLIMATE

Climate is important for identifying treatment technologies, like warm weather favor certain biological processes used in sewage treatment, therefore it is noted in detail as design parameter.

Climate of the region is classified into four major seasons, summer season (April to June), monsoon season (July to August or mid-September), post Monsoon season (mid-September to November) and winter season (December to March). June is the hottest and January is the coldest month of the year. More than 50% of rainfall occurs in monsoon period.

2.4.1. TEMPERATURE

Mean monthly temperature is estimated at project area by analyzing metrological Department data of weather station located at Islamabad Airport and Murree. Mean monthly temperature varies from 14.1°C in January to 28.6°C in June at this station. The minimum temperature generally drops below freezing point, in the months of December and January. Highest maximum temperature at Islamabad was recorded 46.1°CinthemonthofJune and lowest, -4°C was recorded in the month of December and January. The other climatic parameters are as follows:

Table 2-1Mean Temperature and Precipitation

Month	Mean Temperature (°C)		Mean Precipitation (Millimeters)
	Maximum	Minimum	
January	17.7	2.6	56.1
February	19.1	5.1	73.5
March	23.9	9.9	89.8
April	30.1	15.1	61.8
May	35.3	19.7	39.2
June	38.7	23.7	62.2
July	35.0	24.3	267.0
August	33.4	23.5	309.0
September	33.5	20.6	98.2
October	30.9	13.9	29.3
November	25.5	7.5	17.9
December	19.7	3.4	37.3
Annual Average	28.6	14.1	95.2

2.4.2. HUMIDITY AND RAINFALL

The area has two distinct rainfall seasons, the summer season from July to September and the winter season from December to April. The bulk of monsoons precipitation occurs in July and August, with monthly averages of 267 and 309 millimeters respectively. The peaks of the Margalla hills are sometimes covered with snow during winter whereas Murree hills get regular snow fall in winter. Thunder storms are more pronounced during July and August. Hail storms also occur in this area. Monthly heaviest precipitation at Islamabad was recorded 743 mm in the month of July and annual heaviest rainfall 1735 mm at Islamabad. The percentage of relative humidity is fairly high in the Project Area. With the advent of monsoon, the humidity increases during July and August and is again on the decline from September.

2.4.3. WIND

Islamabad experiences westerly and north-westerly winds during winters and spring seasons and southerly and south-easterly winds during summers and monsoons. Wind speeds are low during winters, picking up during the spring season and peaking during the summer months. The maximum wind speed recorded has been 40 knots during May. Prevailing winds are generally light (5-25 km/h) with insignificant variations; however occasional windstorms with gusts up to 60 km/h may occur during April to May.

Table 2-2Wind Speed and Direction in Islamabad

Month	% of time Calm	Mean Speed (knots)	Directions	Steadiness	Max Speed (knots)
January	72	1.4	W	49	12
February	63	2.3	W	59	22
March	57	2.7	NW	48	25
April	59	2.4	NW	36	35
May	54	3.1	VRB	18	40
June	49	3.0	S	32	39
July	59	2.2	SE	67	28
August	71	1.4	SE	40	26
September	78	1.1	VRB	20	22
October	87	0.8	VRB	22	24
November	86	0.6	W	49	12
December	83	0.7	NW	56	10

2.4.4. EVAPORATION

Evaporation is an important climatic factor bearing on agriculture and water resources development. It influences the loss of water in the upper layers of the soil, received from rain or irrigation. It determines the major part of the losses from reservoirs and from river flows. The pan evaporation data are available for Islamabad. The average pan evaporation observed was 5.7mm/day and maximum in the month of August that was 12mm/day.

2.5. ESTIMATION OF POPULATION AND SEWAGE FLOWS

Population is the main parameter to calculate sewage flows, which is required for the design of sewer system, treatment plants and other management tasks. Consultant collected the information on demography utilizing the planning

Maps, socio-economic and physical survey carried out by the field teams and the GIS professionals.

For estimation of sewage flows, normally 70% to 80% of the domestic water supplied to households is taken as domestic sewage flow. The skew of design and actual figures of water supply in Islamabad is not recorded therefore sewage flow can't be based on design water supplyfigures.

In addition to the domestic sewage, recreational and leisure time areas, schools, mosques, community centers etc. also produce significant amounts of sewage. These areas will be considered separately while estimating the sewage flows. The contains number of parks, play grounds, clubs, play lands, restaurants, and recreational resorts. The sewage generation from all these amenities is also calculated.

Details of domestic wastewater generated from the Gulberg Residencia as given in sewage master plan are as follows;

3. PRELIMINARY DESIGN

3.1. PROLOGUE

In this chapter, conceptual design and proposed dimensions to meet with EPA requirements for effluent disposal in natural stream, shall be discussed. The sewage treatment plant for Gulberg Residencia, Islamabad, is conceptually designed to treat sewage water with the application of Aerobic and Anaerobic processes.

Estimated influent of 28 cusecs, as per calculations is expected to be available at time of full occupation of living community. So, it is appropriate to construct STP into phases as per requirements of providing treating facility with respect to change/increase in influent with passage of time.

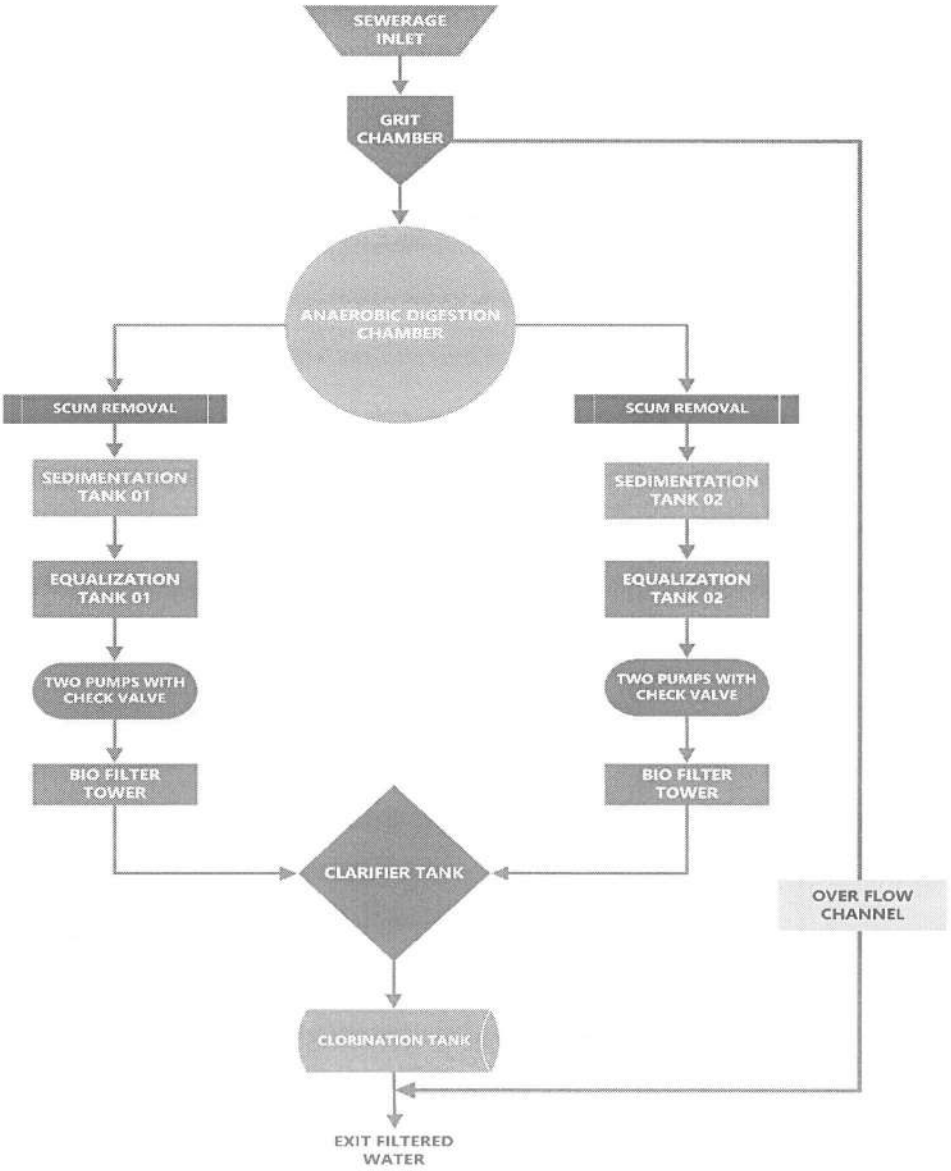
It is proposed to *construct twelve STP units* with each unit's capacity to treat influent of 2.4 cusecs. The following sections describe process diagram of single unit STP and dimensions, while all the units will have similar dimensions and processes. The sewage water shall be collected from the scheme, which will be treated, and part of effluent can be used for irrigation purpose and remaining will be discharge to nearby natural stream.

TREATMENT PROCESS

The treatment plant is mainly comprised of anaerobic and aerobic process.

The STP key treatment process shall be comprised of Preliminary Treatment (screening), Primary Treatment (grit removal), Secondary Treatment (anaerobic) and tertiary treatment (Aerobic trickling filter) to remove unwanted elements from water which may not efficiently remove through anaerobic process e.g. nitrogen and phosphorus.

Effluent from trickling filter shall be passed through clarifier and chlorination tank to settle particles (engaged from trickling filter) and disinfect treated water, respectively. Process/flow diagram is provided as under.



3.2.1. Box Channel

The box channel receiving influent from trunk sewer and is ending into intake channel. The channel having bottom slope of 0.826%. The width of channel is taken as 3 feet and depth is considered as 3 feet including free board of 1 feet.The box channel combined the flows of Trunk sewer-01 , Trunk sewer -02 ,Trunk sewer-03 and Trunk sewer -04 in the zone-01.

Table 3-1 Dimensions of Box Channel:

Sr. No	**Parameter**	**Dimension / Value**
1	Width	3 ft
2	Height	3ft
3	Free board	1 ft
4	Design Discharge for STP	28 ft^3/sec

3.2.2. Intake Channel

The intake channel receiving influent from box sewer and is ending into grit chamber. The channel is 24 feet long having bottom slope of 0.826%. The width of channel is taken as 1.5 feet and depth is considered as 1.5feet including free board.

Two bar screens of different sizes are installed at two different points separated each by 3 feet. To facilitate mechanical removal of large objects e.g. plastic bags, bottle lids, floating papers, clothes, screened by bar screens, the 8 feet long channel is provided as open surface. The remaining 15 feet long portion of the channel after entering plant boundary is covered with slabs.

Table 3-2 Dimensions of Intake Channel:

Sr. No	Parameter	Dimension / Value
1	Length	24 ft
2	Width	1.5ft
3	Height	2 ft
4	Free board	1 ft
5	Flow velocity	5.734ft/sec
6	Channel Flow	2.4 ft^3/sec
7	Channel Slope	0.826 %

3.2.3. GRIT CHAMBER (GC)

Grit chamber shall receive influent from intake channel from certain level while avoiding back water effect of ponding in grit chamber.

Grit chamber is provided to remove grit from waste water prior to inter into anaerobic chamber.

The grit chamber is 27 feet long narrow tank that is designed to slow down the flow so that solids such as sand, coffee grounds and eggshells will settle out of the water. Grit causes excessive wear and tear on pumps and other plant equipment. Detail can be found in drawings annexed as annexure.

Table 3-3 Dimensions of Grit chamber:

Sr. No	Parameter	Dimension / Value
1	Length	27ft
2	Width	5ft
3	Height	8.5ft
4	Free board	1ft
5	Flow velocity	0.058 ft/sec
6	Detention Time	7.5 mins
7	Terminal Velocity	0.0046 ft/sec

3.2.4. Anaerobic Chamber

Anaerobic treatment is a proven and energy-efficient method for treating wastewater. It uses anaerobic bacteria (biomass) to convert organic pollutants or COD (chemical oxygen demand) into biogas in an oxygen-free environment. Through anaerobic micro-organisms (specific to oxygen-free conditions) shall degrade organic matter present in influent and convert it into organic pollutants into biogas (methane + carbon dioxide). Provision of collection of biogases is provided to use this energy source for power generation as optional. The proposed anaerobic chamber's internal diameter is 32.5 feet.

Table 3-4 Dimensions of Anaerobic Digestion Chamber

Sr. No	**Parameter**	**Dimension/Value**
1	Internal Diameter	32.5 ft
2	Sill Level	4ft
3	Depth of Anaerobic Digestion Chamber	17.5 ft
4	Storage Capacity of Anaerobic Chamber	13,688 ft^3
5	Detention Time	1.7 hrs.

3.2.5. Sedimentation Tank

Two sedimentation tanks will receive water from anaerobic chamber and deliver to equalization tanks with main purpose to settle down organic matter and receive sludge from anaerobic chamber when it shall be filled till certain level. This tank also provides appropriate detention time. The internal dimensions of each tank are as 65 ft long 16 ft wide and 13.5 ft deep and having terminal velocity 0.012 ft/s.

Table 3-5 Dimensions of Single Sedimentation Tank

Sr. No	Parameter	Dimension/Value
1	Length	65
2	Width	16
3	Height	13.5
4	Free board	1
5	Flow velocity	0.006 ft/sec
6	Terminal Velocity of particle	0.012 ft/sec
7	Detention Time	3 hrs.
8	Storage Capacity of Sedimentation tank	13,000 ft^3

3.2.6. Equalization Tank

Equalization tank plays a vital role to minimize and control of inconsistencies in wastewater. Here, the equalization tank was engineered to deliver a constant rate of flow and contaminants presented in wastewater. In general, larger equalization tanks provide greater absorption and more effectively reduce the irregularities in discharges. The internal dimensions of equalization tank are defined as 32 ft. long, 16 ft. wide and 9.5 ft. deep from H.F.L. Free board is provided as 1 ft. The storage capacity of equalization tank is calculated as 4532 ft^3.

Table 3-6 Single Equalization Tank

Sr. No	Parameter	Dimension/Value
1	Length	32 ft
2	Width	16 ft
3	Height	9.5 ft
4	Free board	1 ft

5	Flow Velocity	0.009 ft/sec
6	Detention Time	1.0 hrs.
7	Storage Capacity of Equlization tank	4352 ft^3

It will act as a source for mechanical pump, installed to deliver equalized wastewater from equalization tank to spray at the top of bio-filter tower.

The water aeration will be done in this tank by introducing fountains, which will pump water to some height where water will form droplets having larger surface area and providing opportunity to transfer oxygen. In this sense it will also be helpful to reduce BOD at some extent and will increase the level of dissolved oxygen.

Like other tanks, overflow spillway is also provided to spill extra water having width of 6 ft.

3.2.7. PUMPING TO BIOFILTER TOWERS

A trickling filter is a type of wastewater treatment system. It consists of a fixed bed media made of polyurethane foam. The four layers of media are provided with air spaces to largely contact air with media to maintain aerobic conditions. The equalized water shall be sprinkled over trickling filter and with gravity flow water shall penetrate towards second layer of media.

Purpose of Bio filter

i. Biological filtration or bio filtration is one water treatment process that can effectively remove organic matter that is not able to be removed from water and biologically treated sewage effluent in conventional sewage treatment.

ii. The biological filter mainly relies on the activities of the community of microorganisms that are attached onto the filter media.

iii. Moreover, biological filtration is economical and safe for environment. Biofiltration is more suitable than other treatment methods in terms of removing organic matter.

The dimensions of Bio filter tower are given as under:

Table 3-7 Dimensions of Single Bio Filter Tower

Sr. No	**Parameter**	**Dimension/Value**
1	Length	16ft
2	Width	16ft
3	Air Space (b/w two filter media)	2 ft
4	Filter Media Height (each layer)	3 ft

3.2.8. Clarifier tank

The clarifier tank acts as multipurpose tank of treatment plant. It will be used for storage of treated water, allowing detention time to resettle any suspended particles engaged with effluent released from bio filter tower. It is internally 14 ft wide and 33 ft Long and 11 ft high.

Table 3-8 Dimensions of Single Clarifier Tank

Sr. No	**Parameter**	**Dimension/Value**
1	Length	33 ft
2	Width	14 ft
3	Height	11 ft
4	Free board	1 ft
5	Flow Velocity	0.01 ft/sec
6	Detention Time at mid of the tank	0.53 hrs.
7	Storage Capacity of Clarifier tank	4620 ft^3

3.2.9. Chlorination tank

Chlorination tank is provided to disinfect effluent before disposal into nature stream.

Table 3-9 Dimensions of Chlorination tank are given below:

Sr. No	Parameter	Dimension/Value
1	Length	33 ft
2	Width	14 ft
3	Height	11 ft
4	Free board	1 ft
5	Detention Time	1.2 hrs.
6	Storage Capacity of Chlorination tank	4620 ft

3.2.10. Outlet channel

The outlet channel will receive water from clarifier tank to deliver it to Nullah. The channel is internally 1.5 ft. wide and 1.5 ft. deep with bottom slope of 0.5%.

3.2.11. Overflow Channel

The purpose of overflow channel is to receive overflow wastewater from treatment units. The internal dimension of each overflow channel is 1.5 feet.

3.2.12. Control Room

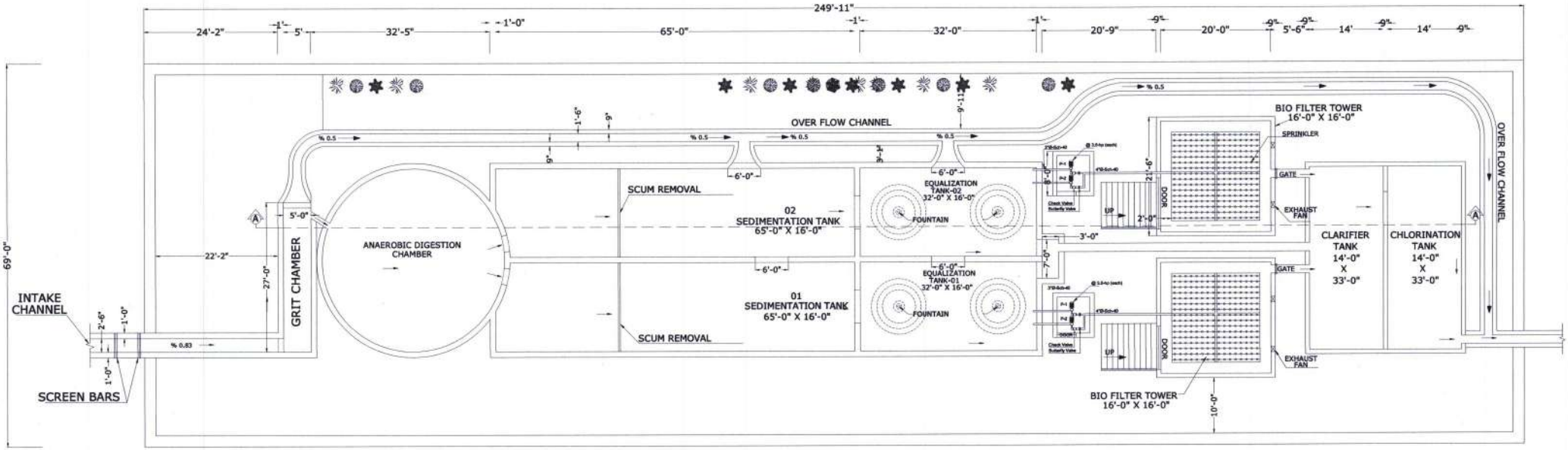
The treatment plan location one control room will be constructed with dimensions 10 feet × 12 feet.

3.2.13. Dry Sludge Belt

The Sludge drying belt is proposed near to the Sewage treatment plants for the dumping of solid waste.

4. ANNEXURE

SEWAGE NETWORK MASTER PLAN &
SEWAGE TREATMENT PLANT
DRAWINGS



TREATMENT PLANT PLAN

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PEC Reg # CONSULT/201

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NOTE:-
Read these drawings in conjunction to Environment /Infra structure/Public health drawings.

REV No.	DATE	REVISIONS

IMPORTANT NOTE:-
THE OWNER WILL APPOINT SUPERVISOR FOR CONSTRUCTION OF THIS STRUCTURE. THE OWNER AND THE SUPERVISOR ARE RESPONSIBLE FOR QUALITY AND STABILITY OF BUILT STRUCTURE. THE STRUCTURE ENGINEER/ARCHITECT IS ONLY RESPONSIBLE FOR STRUCTURAL/ARCHITECTURAL DESIGN OF THE STRUCTURE, RESPECTIVELY.

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		CHECK BY:	NAJUM US SAQIB
		APPROVED BY:	ARIF Consulting Engineers (Pvt) Ltd.

TITLE
TREATMENT PLANT PLAN

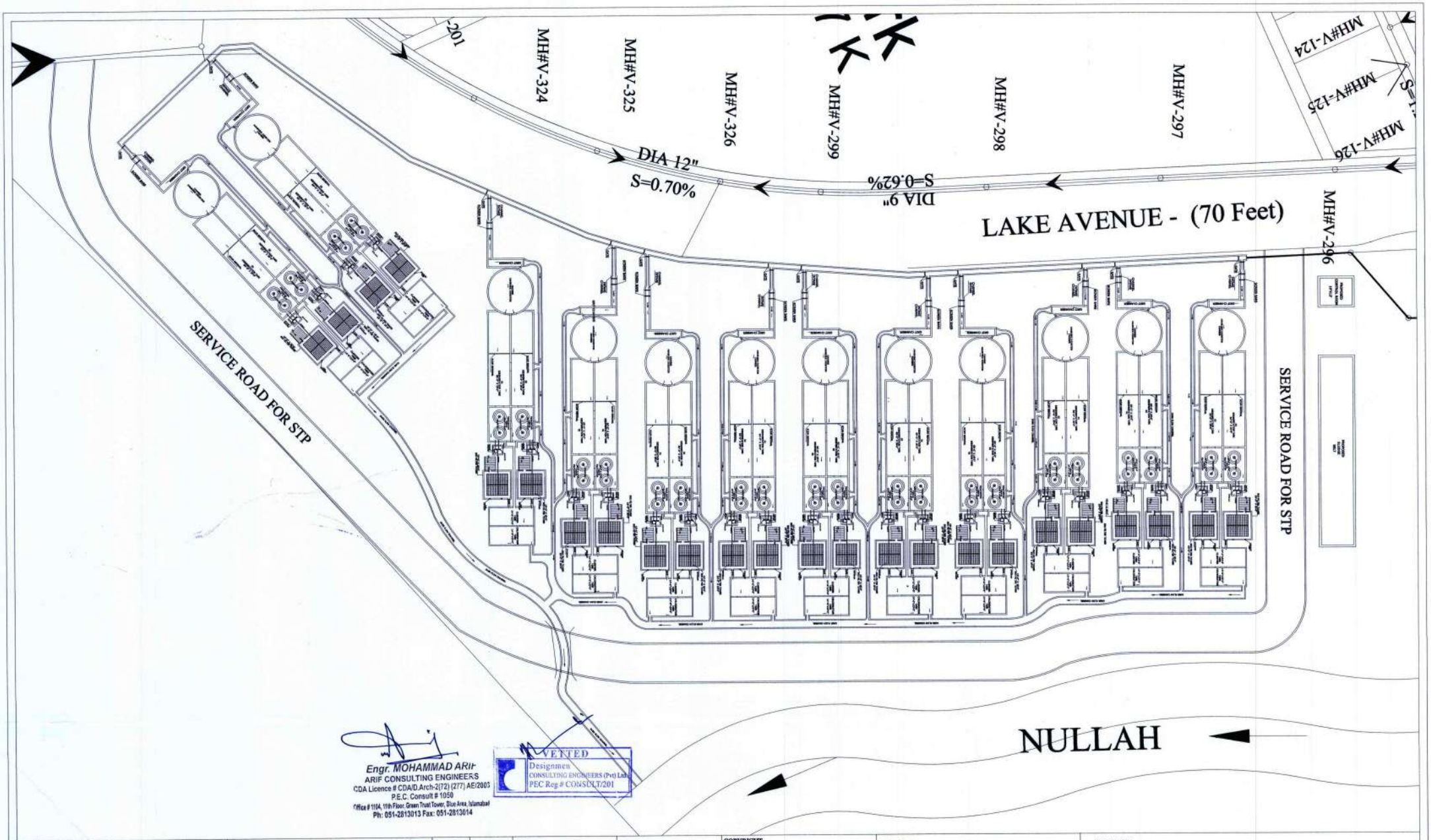
TYPE OF DRAWING
STRUCTURE

ISSUED FOR:

PROJECT:-
GULBERG RESIDENCIA ISLAMABAD

PROJECT

SCALE	DATE	DWG.NO.	REVISION
N.T.S	MAY-2019	02	00



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CHECK	

DRAWN BY:	ANEES AHMAD
DESIGN BY:	SAJJAD HUSSAIN
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APPROVED BY:	ARIF Consulting Engineers (Pvt) Ltd.

TITLE
SEWERAGE TREATMENT PLANT
LOCATION PLAN

TYPE OF DRAWING
STRUCTURE

ISSUED FOR:

PROJECT:-
GULBERG RESIDENCIA ISLAMABAD

PROJECT

SCALE	DATE	DWG.NO.	REVISION
N.T.S	MAY-2019	01	00


SHEET 1 OF 9
SCALE 1 : 2000
SHEET 3 OF 9
SCALE 1 : 2000
SHEET 5 OF 9
SCALE 1 : 2000
SHEET 7 OF 9
SCALE 1 : 2000
SHEET 9 OF 9
SCALE 1 : 2000
Gulberg Greens
Gulberg Greens
Gulberg Greens
Gulberg Greens
Future Extension
Future Extension
Future Extension
Future Extension
Graveyard
Location of STP
SHEET 2 OF 9
SCALE 1 : 2000
SHEET 4 OF 9
SCALE 1 : 2000
SHEET 6 OF 9
SCALE 1 : 2000
SHEET 8 OF 9
SCALE 1 : 2000
GULBERG RESIDENCIA
ISLAMABAD
N
CERTIFICATE-
GULBERG RESIDENCIA
ISLAMABAD
TRUNK SEWER LAYOUT PLAN
VETTED
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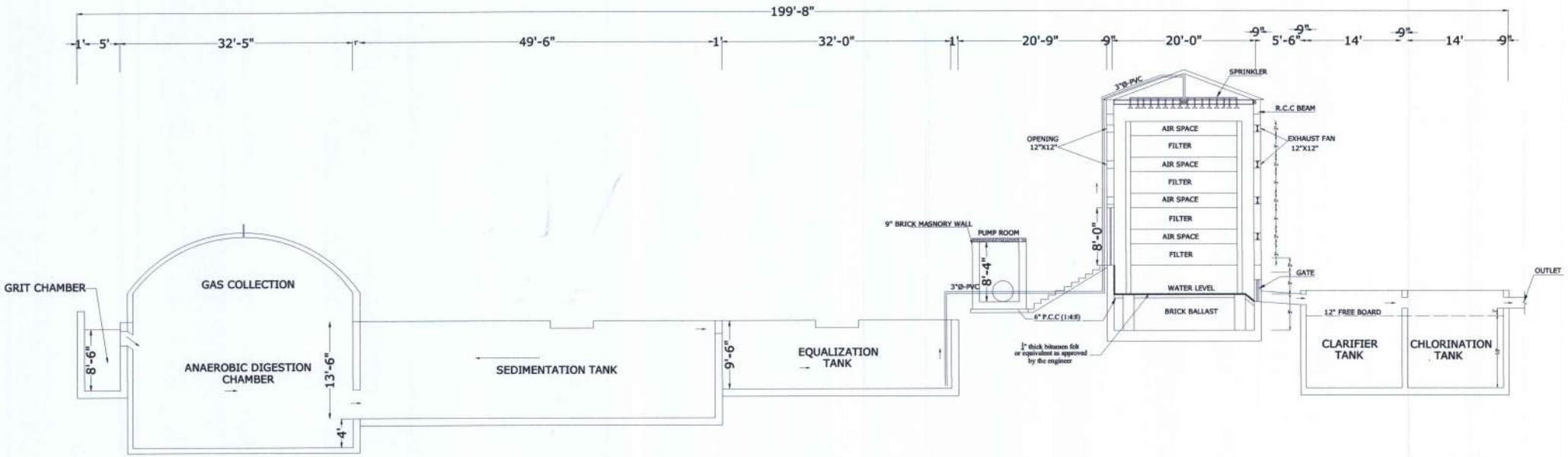

TREATMENT PLANT PLAN
SECTION A-A

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NOTE:-
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DRAWN	APPR.
CHECK	

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DESIGN BY:	SAJJAD HUSSAIN
CHECK BY:	NAJUM US SAQIB
APPROVED BY:	ARIF Consulting Engineers (Pvt) Ltd.

TITLE
TREATMENT PLANT PLAN
SECTION A-A

TYPE OF DRAWING
STRUCTURE

ISSUED FOR:

PROJECT:-
GULBERG RESIDENCIA ISLAMABAD

SCALE	DATE	DWG.NO.	REVISION
N.T.S	MAY-2019	03	00

ANNEXURE-F
ENVIRONMENTAL MONITORING REPORTS

Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 13754

Monitoring & Test Report

- Ground Water
- Ambient Air Monitoring

GULBERG RESIDENCIA ZONE V

10th Dec. 2025

Job Reference No.: GCEC-PK-ISL-109/2025

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
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042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Client Detail:	
Name of Contact Person:	Miss. Humera Qasim Khan
Designation:	Environmental Manager
Contact Number:	+92-33-39219198
Address:	Gulberg Residencia, Islamabad, Pakistan

GCEC Details:	
Director:	Mr. Mian Khurram Usman
Telephone:	+92 42 35962885
Fax:	+92 42 35962884
Email:	*manager.operations@gcee.ae*
Address	House No. 368-B Block B, Canal View, Lahore

Signatories:

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
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Ph: 051 2375145

Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 13756

CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Sample Details			
Job Ref. No:	GCEC-PK-ISL-109/2025	Client Name:	Gulberg Residencia Zone V
Contact Number:	+92-33-39219198	Sample Matrix:	Ground Water Sample
Sample Date:	05-12-2025	Sampled By:	GCEC
Sample Receipt Date:	06-12-2025	Date of Completion of Analysis:	09-12-2025
Grab/Composite:	Grab Sampling	Address:	Gulberg Residencia, Islamabad, Pakistan
Sample Identification			
01	Gulberg Residencia		

Parameters	Analysis Method	Unit	LOR	Results 01	NEQS
PYSICAL & CHEMICAL ANALYSIS					
pH	APHA-4500H+ B	-	0.01	7.28	6.5-8.5
Odor	In-house	-	-	Odorless	Non-Objectionable
Taste	In-house	-	-	Sweet	Non-Objectionable
Color	APHA-2120 B/C	Pt/Co	1.0	<1.0	≤15 TCU
Turbidity	APHA-2130 B	NTU	0.1	<0.1	<5 NTU
Total Hardness	APHA-2340 B&C	mg/l	0.1	180.0	< 500 mg/l
Total Dissolved Solid (TDS)	APHA-2540 C	mg/l	1.0	348.0	< 1000
Ammonia	APHA-4500-NH_3-B	mg/l	0.002	<0.002	-
Chloride	APHA-4500 B	mg/l	0.24	20.13	< 250
Cyanide (CN)	APHA-4500CN E	mg/l	0.01	<0.01	≤ 0.05
Fluoride (F)	APHA-4500F- D	mg/l	0.01	<0.01	≤ 1.5
Nitrite	APHA-4500NO2 B	mg/l	0.01	<0.01	≤ 3 (P)
Nitrate	APHA-4500NO3 C	mg/l	0.1	2.0	≤ 50
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	-
Residual Chlorine	APHA-4500Cl G	mg/l	0.1	<0.1	0.2-0.5
Aluminum (Al)	APHA-3111Al B	mg/l	0.028	<0.028	≤ 0.2
Cadmium	APHA-3111 B	mg/l	0.0028	<0.0028	0.01
Copper	APHA-3111 B	mg/l	0.0045	<0.0045	2
Chromium	APHA-3111 B	mg/l	0.0054	<0.0054	≤ 0.05 (P)
Mercury	APHA-3112Hg B	mg/l	0.0008	<0.0008	≤ 0.001
Antimony (Sb)	APHA-3111 B	mg/l	-	ND	≤ 0.005 (P)
Nickel	APHA-3111 C	mg/l	0.008	<0.008	≤ 0.02
Zinc	APHA-3111 B	mg/l	0.0033	<0.0033	5.0
Arsenic	APHA-3111As B	mg/l	0.01	<0.01	≤ 50 (P)
Barium	APHA-3111Ba B	mg/l	0.031	<0.031	0.7
Manganese	APHA-3111 B	mg/l	0.0016	<0.0016	≤ 0.5
Iron	APHA-3111 B	mg/l	0.1	<0.1	-
Boron	APHA-4500-B (C)	mg/l	0.1	<0.1	0.3
Lead	APHA-3111 B	mg/l	0.013	<0.013	≤ 0.05
Selenium	APHA-3111Se B	mg/l	-	ND	0.01 (P)
MICROBIOLOGICAL ANALYSIS					
Total Coliforms	APHA:9222 B	CFU/100ml		Absent	0/100ml
Faecal Coliforms (Ecoli)	APHA:9222 D	CFU/100ml		Absent	0/100ml

Abbreviations:
ND: Not Detected **LOR:** Limit of Reporting **NEQS:** National Environmental Quality Standards

Note:
** Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per the client's requirement. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%.*

Disclaimer: This Report is not valid for EPA or any other court purposes.

Prepared By: **Reviewed By:** **Approved By:**

Green Crescent Environmental Consultants Pvt. Ltd. ★ PAKISTAN ★

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Islamabad Office:
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Ph: 051 2375145

Ambient Air Monitoring Location

Near Admin Block

(Gulberg Residencia, Islamabad)

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
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042 35962884-85 0320 4143318
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Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Ambient Air Quality Monitoring

Job Reference Number	GCEC-PK-ISL-109/2025
Monitoring Point	Gulberg Residencia (Near Admin Block)
Date of Intervention	05-Dec-2025 to 06-Dec-2025
Coordinates	33°36'05.8"N 73°12'29.1"E

Sr. #	Time	CO (mg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10} (µg/m³)	NO (µg/m³)	NO_2 (µg/m³)	NO_x (µg/m³)	SO_2 (µg/m³)
1	11:16	2.32	101.5	150.3	33.82	49.44	83.26	35.84
2	12:16	2.12	104.7	144.0	32.22	48.85	81.07	36.94
3	13:16	1.54	105.7	152.3	31.20	50.15	81.35	38.10
4	14:16	2.42	106.7	145.1	34.80	50.39	85.18	36.05
5	15:16	1.90	103.6	143.0	34.58	45.81	80.39	38.08
6	16:16	1.94	107.8	139.9	35.53	46.40	81.93	36.43
7	17:16	2.39	105.7	144.0	33.61	48.04	81.65	34.60
8	18:16	2.26	108.8	137.8	32.76	45.88	78.63	33.32
9	19:16	2.29	105.7	133.6	32.91	45.44	78.35	32.82
10	20:16	2.19	106.7	141.9	31.60	45.70	77.31	30.91
11	21:16	2.32	105.7	134.7	32.85	44.98	77.83	33.78
12	22:16	2.27	103.6	133.4	30.75	45.62	76.37	32.79
13	23:16	2.00	107.8	128.9	28.85	43.90	72.75	36.35
14	00:16	1.90	103.6	126.7	29.86	43.41	73.27	36.43
15	01:16	2.11	102.6	135.7	30.85	45.44	76.29	34.60
16	02:16	2.13	100.5	131.5	26.95	45.55	72.50	35.07
17	03:16	2.16	98.4	139.9	25.41	46.59	72.00	38.14
18	04:16	2.14	96.3	141.9	28.43	44.82	73.25	39.48
19	05:16	2.08	103.6	145.1	30.22	45.24	75.46	38.43
20	06:16	2.29	100.5	151.3	30.94	46.76	77.70	35.44
21	07:16	2.27	104.7	154.4	30.53	43.27	73.80	34.83
22	08:16	2.10	103.6	144.0	31.75	42.45	74.20	36.03
23	09:16	1.96	104.7	154.4	33.59	44.76	78.35	37.84
24	10:16	1.91	103.6	156.5	33.81	45.47	79.27	38.71
Average Concentration		**2.12**	**104.03**	**141.47**	**31.57**	**46.01**	**77.59**	**35.88**

Deputy Analyst:

Reviewed By:

Approved By:

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Ambient Air Quality Monitoring

Job Reference Number	GCEC-PK-ISL-109/2025
Monitoring Point	Gulberg Residencia (Near Admin Block)
Date of Intervention	05-Dec-2025 to 06-Dec-2025
Coordinates	33°36'05.8"N 73°12'29.1"E

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	NEQS
Nitrogen Dioxide (NO_2)	µg/m³	24 Hours	1.00	46.01	80.0
Nitrogen oxide (NO)	µg/m³	24 Hours	1.00	31.57	40.0
NO_x	µg/m³	24 Hours	1.00	77.59	120.0
Sulphur Dioxide (SO_2)	µg/m³	24 Hours	1.00	35.88	120.0
Carbon Monoxide (CO)	mg/m³	24 Hours	0.01	2.12	5.0*
Ozone (O_3)	µg/m³	24 Hours	-	24.99	130.0**
Particulate Matter (PM_{10})	µg/m³	24 Hours	1.00	141.47	150.0
Particulate Matter ($PM_{2.5}$)	µg/m³	24 Hours	1.00	104.03	35.0
Total Particulate Matter (TSP)	µg/m³	24 Hours	1.00	280.50	500.0

Abbreviations:
LDL= Lowest Detection Limit
NEQS= National Environmental Quality Standards
(*8 hours standard for CO
**1 hour standard for O_3)
µg/m³= Micrograms per Cubic Meter
mg/m³= Milligrams per Cubic Meter

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Noise Level Monitoring Report

Job Reference Number	GCEC-PK-ISL-109/2025
Monitoring Point	Gulberg Residencia (Near Admin Block)
Date of Intervention	05-Dec-2025 to 06-Dec-2025
Coordinates	33°36'05.8"N 73°12'29.1"E

Sr. #	Time	Method/Technique	Unit	Results LAavg	NEQS (Residential)
Night Time					
1.	23:16	Noise Meter	dB	43.9	
2.	00:16	Noise Meter	dB	41.4	
3.	01:16	Noise Meter	dB	40.4	
4.	02:16	Noise Meter	dB	41.1	
5.	03:16	Noise Meter	dB	42.3	45.0
6.	04:16	Noise Meter	dB	39.1	
7.	05:16	Noise Meter	dB	40.9	
8.	06:16	Noise Meter	dB	41.2	
Night Time Average			**dB**	**41.29**	**45.0**
Day Time					
9.	07:16	Noise Meter	dB	55.2	
10.	08:16	Noise Meter	dB	54.2	
11.	09:16	Noise Meter	dB	49.7	
12.	10:16	Noise Meter	dB	55.4	
13.	11:16	Noise Meter	dB	56.8	
14.	12:16	Noise Meter	dB	54.1	
15.	13:16	Noise Meter	dB	57.0	
16.	14:16	Noise Meter	dB	48.0	
17.	15:16	Noise Meter	dB	49.7	55.0
18.	16:16	Noise Meter	dB	50.5	
19.	17:16	Noise Meter	dB	56.9	
20.	18:16	Noise Meter	dB	54.4	
21.	19:16	Noise Meter	dB	55.1	
22.	20:16	Noise Meter	dB	56.3	
23.	21:16	Noise Meter	dB	57.0	
24.	22:116	Noise Meter	dB	48.9	
Day Time Average			**dB**	**53.70**	**55.0**

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Pictorial Evidence for Ground Water Sampling & Ambient Air Monitoring

Figure 1: Ground Water Sampling of Gulberg Residencia

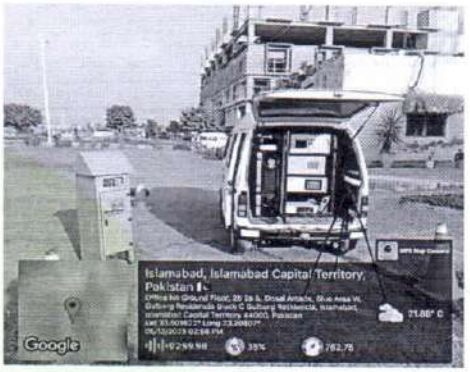

Figure 2: Ambient Air Monitoring of Gulberg Residencia (Near Admin Office)

End of Report

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