PHILIP MORRIS
(PAKISTAN) LIMITED

22nd July, 2024

PMPKL Water Stewardship Commitment

Philip Morris Pakistan Limited ("PMPKL"), as a result of its commitment to good water stewardship , undertakes to implement following measures at its Green Leaf Threshing plant situated at 22nd KM Mardan Swabi Road- Mardan:

1. Endorse, sustain and support the Alliance for Water Stewardship ("AWS") principles and 5 outcomes: i) good water governance, ii) sustainable water balance, iii) good water quality, iv) good conservation of important areas related to water, and v) safe water, sanitation and hygiene;
2. Engage and involve stakeholders in an open and transparent way;
3. Comply with any legal and regulatory requirements related to water;
4. Respect water-related rights, including ensuring appropriate access to safe water, sanitation, and hygiene for all persons at Site;
5. Support and coordinate with stakeholders (internal and external) for implementation of plans and policies, including working together to meet the right to water and sanitation;
6. Implement the AWS standard in alignment with existing catchment sustainability plans
7. Improve and continually adapt the actions and plans for water stewardship of the Site in order to mitigate shared water related risks;
8. Implement and disclose progress on water stewardship programs to achieve improvements in AWS water stewardship outcomes
9. Maintain the organizational capacity required to successfully implement the AWS Standard, through necessary resources required to accomplish the implementation and maintenance of requirements of the AWS Standard i.e., improving water quality, water sanitation and hygiene, reduce water wastage, etc.
10. Disclose relevant information related to water.

Director Manufacturing, Pakistan
Hussain Ali

Philip Morris (Pakistan) Limited
Green Leaf Threshing Plant, 22nd KM Mardan Swabi Road- Mardan
www.philipmorrispakistan.com.pk

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PHILIP MORRIS
(PAKISTAN) LIMITED

9th Sep, 2024

PMPKL Alliance for Water Stewardship Strategy (2.3.1)

In line with PMI's vision to create a smoke-free future through science and innovation, and with the PMPKL Mardan Water Stewardship Commitment (2.1.1)., PMPKL Mardan has identified the following Water Stewardship Strategy:

- Assessment of specific water risks at site and catchment level
- Identification of shared-water challenges, opportunities, and risk mitigation actions at catchment level and site level.
- Engagement of relevant stakeholders from diverse and representative sectors to plan, identify and execute joint initiatives and projects in relation to shared water challenges.
- Reduction of the factory water footprint via water consumption reduction.
- Minimization of factory effluent discharges and improve parameters.
- Ensure adequate factory water quality and WASH standards.

This strategy aims to act as a pillar for achieving potable water reduction and/or optimization at factory level with the aim of generating a positive impact at a wider scale (i.e., increase catchment water availability) for other users and sensitive environments.

We are committed to create, maintain, and continuously review and adapt the factory Water Stewardship Strategy Plan (2.3.2.), which contains site and catchment—based SMART actions and targets description, targets measurement and monitoring methods for the five AWS outcomes.

Director Manufacturing,

Hussain Ali

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AWS Certification Unveiling- PMPKL Mardan 2024

[(20+) Viva Engage - Conversation (cloud.microsoft)]
Link to Viva Engage

Disclaimer: Pictures are blurred to keep confidentiality

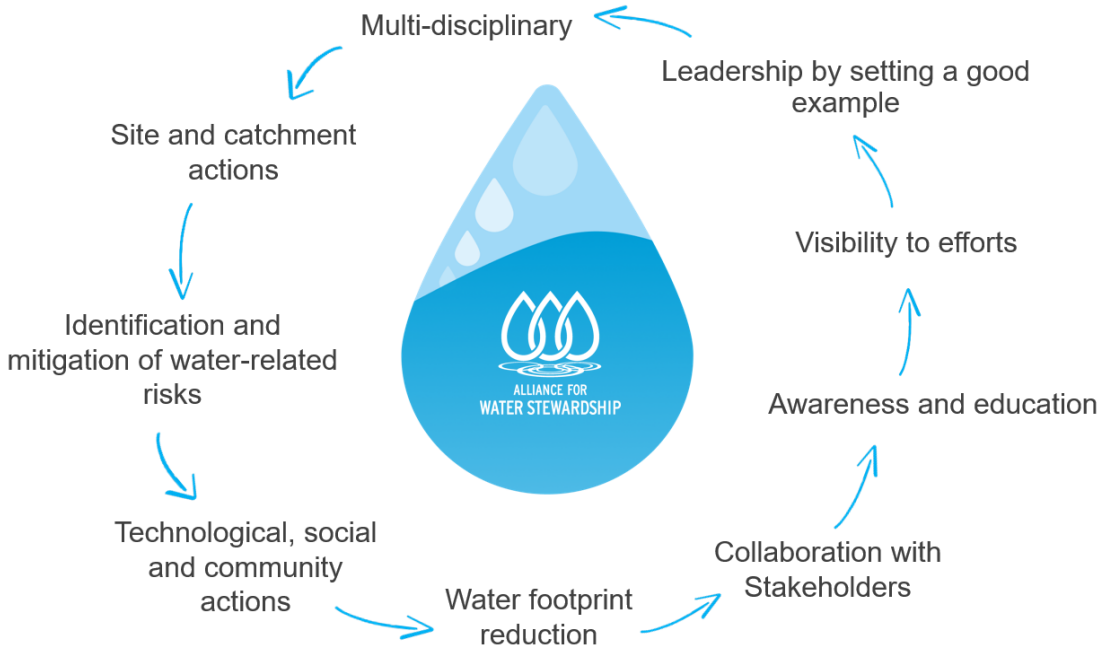
Stakeholder Engagement

ALLIANCE OF WATER STEWARDSHIP- Journey

Introduction

Benefits

- Global organization committed to leading water stewardship
- Certification based on a 5-step Standard that certifies water stewardship
- Water stewardship means sustainable water management by mitigating challenges and risks in a **out of the box** approach
- Stakeholder engagement and participation in catchment-based projects is key to successful water stewardship



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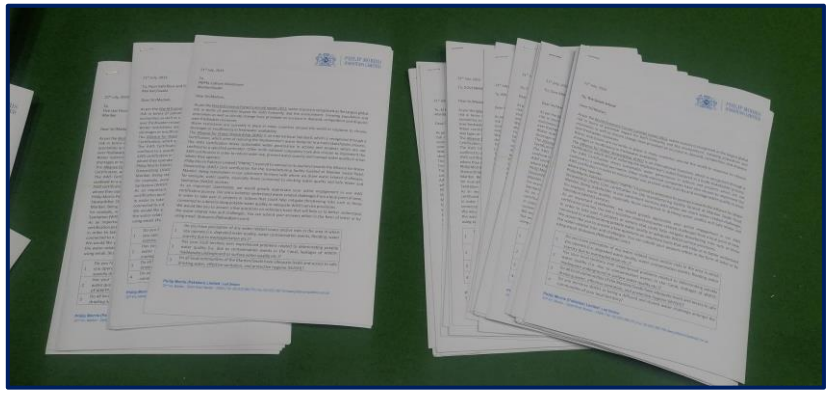
Director Manufacturing, Pakistan
Hussain Ali

ALLIANCE OF WATER STEWARDSHIP- Journey Commitment

Disclaimer: Pictures are blurred in view of the data privacy and confidentiality

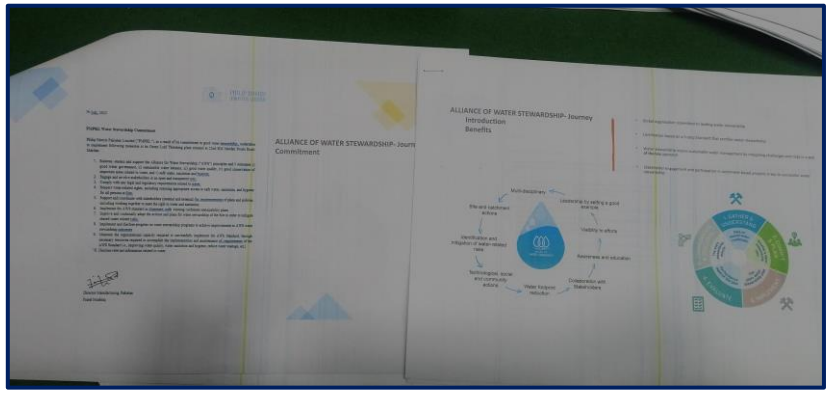
Stakeholder Visits

- Introduction about AWS.
- Site viewing with stakeholders
- Feedback survey in view of AWS including performance feedback
- Identification of projects in view of 5 AWS outcomes
- Invitation to GLT to share best practices and work on combine projects in view of the shared risks & challenges.










Stakeholder Visits

- Risks & Challenges
- Site viewing with stakeholders
- Identification of projects in view of 5 AWS outcomes (Washrooms R&M, Installation of waste bins, Tree plantation, Drinking water tests, Provision of sanitation PPEs, Water filtration units, Bores/wells, site cleanup activities, R&M of drain channels to avoid mixing of rain water & waste water.
- Awareness sessions

Engagement with Local community & stakeholders via Engaging NGO

By Collaborating with local NGO “Dragon Fly”, 17 master trainers were developed.
The master trainers will be delivering awareness sessions to Females, PMPKL contracted farmers, sharecroppers, tenants, local labors (temporary and full time) on below topics:

1- WASH
2- Water Saving and shared challenges
3- AWS and 5 intended outcomes
4- Feedback & Queries

Stakeholder Engagement (PHED, Irrigation, TMA, WSSCM, Alkhidmat, Smart School)

PHED

WSSCM

TMA

Irrigation

Meet & Greet

Introduction & Awareness Session on AWS, its 5 outcomes

Risks & shared Challenges, collaboration on initiatives

Feedback Survey & Performance feedback

Discussion on the Government Projects done or planned

Sessions conducted on 7th & 8th of August, 2024

Stakeholder Engagement with Water & Sanitation Service Company Mardan (WSSCM

Meeting Highlights:

- Meet & Greet with Head- AWS & its 5 outcomes, PMPKL intentions & way forward
- Discussed the risks challenges (Water shortage, Water contamination due to rusted pipelines, WASH)
- Mitigation measures- Plans (Sewerage treatment plant in construction for 6UCs, Water testing kits, Addition of low quality plastic in the STP – including segregation, recycling, composting), conversion of low plastic in usable products.)
- Site visit: STP plant under construction & Integrated Resource Recovery Center where organic fertilizers as output.

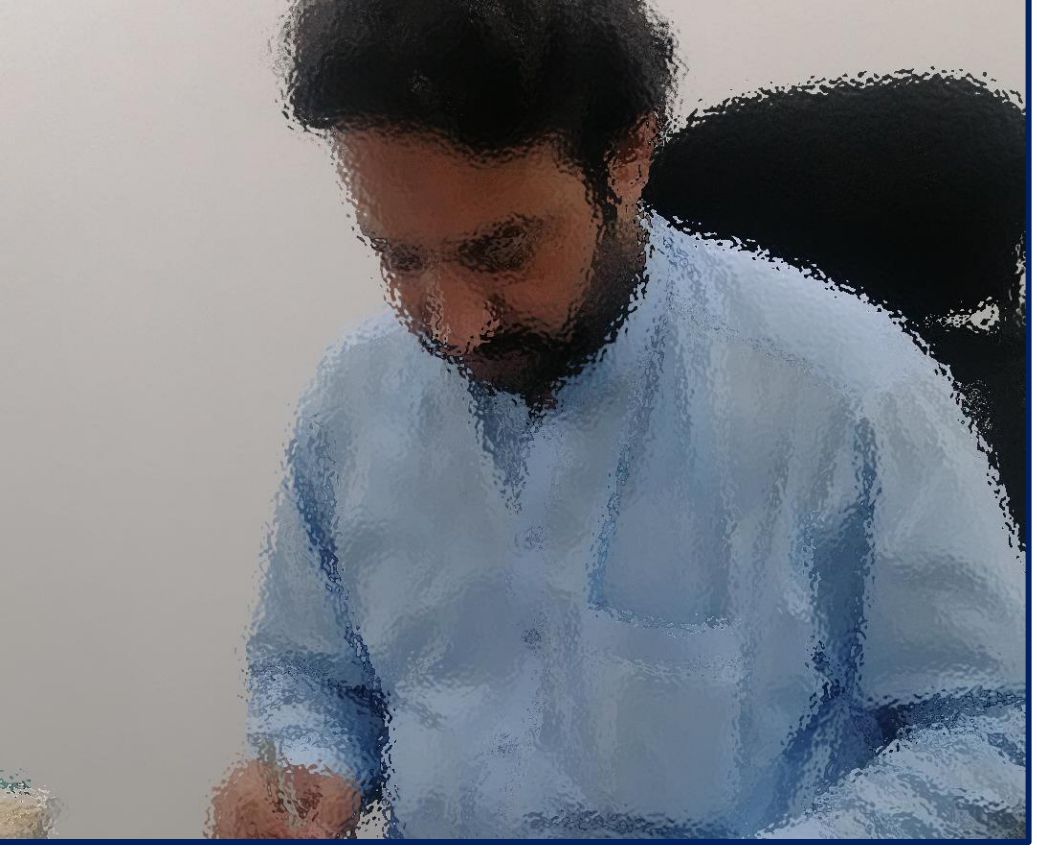
Collaboration: Rain harvesting Project reapplication as best practice, To check if the organic product can be used as fertilizer for farmers. This will help with the shared water infrastructure issue of pollution of Kalpani & Kabul River.

Rain harvester was installed in GLT for water reuse.









Stakeholder Engagement with Mardan Development Authority (MDA)

Meeting Highlights:

- Meet & Greet with DD- AWS & its 5 outcomes, PMPKL intentions & way forward
- Discussed the risks challenges (Water contamination with diseases like Hep B & C
- Mitigation measures- Plans (Sewerage system under construction where pipelines, drain archery would be made and the drain lines would be directed to STP and complaint disposal in Kalpani, R&M of roads.) As all sewerage water goes to Kalpani & Kabul River

Water Governance- Stakeholder Meetings

S.NO	Authority	Authority representative & designation	PMPKL representative & designation	Outcome
1	EPA	Dr Israr Assistant Director	Kulsoom Iftikhar Manager EHS Leaf	- AWS & 5 outcomes/ feedback - Risks & challenges & Mitigation - Rules & regulations discussed - Collaboration on Tree plantation activity
2	Rescue 1122	Imran – District Officer	Kulsoom Iftikhar Manager EHS Leaf Shahid Ali EHS specialist	- Initiative discussed - Risks & challenges & feedback, Mitigation - PMPKL Awareness session collaboration - AWS & 5 outcomes
3	PHED	Ijaz Ahmed - SDA	Kulsoom Iftikhar Manager EHS Leaf Waseem Ali- WPE supervisor	- Initiative discussed/ Best Practices - Risks & challenges & feedback - PMPKL Awareness session collaboration - AWS & 5 outcomes
4	Irrigation	Syed Atiq Ahmed SDO	Kulsoom Iftikhar Manager EHS Leaf Waseem Ali- WPE supervisor	- Initiative discussed - Risks & challenges & feedback/ Best Practices - PMPKL Awareness session collaboration - AWS & 5 outcomes
5	TMA	Sarfaraz- TMO Mohsin Amin- Architect	Kulsoom Iftikhar Manager EHS Leaf Waseem Ali- WPE supervisor	- Initiative discussed - Risks & challenges & feedback, Mitigation - AWS & 5 outcomes
6	WSSCM	Rahat – HR Manager	Kulsoom Iftikhar Manager EHS Leaf Waseem Ali- WPE supervisor	- Initiative discussed - Risks & challenges & feedback/ Best Practices, Mitigation - PMPKL collaboration on Rain harvester - AWS & 5 outcomes - Site visit & Collaboration on Rain Harvester
7	MDA	Fazle Ghaffar- DD	Kulsoom Iftikhar Manager EHS Leaf Waseem Ali- WPE supervisor	- Initiative discussed/ - Risks & challenges & feedback - AWS & 5 outcomes

Engagements- Awareness Sessions

- AWS Awareness for general population & Workers






Session Covered:

- AWS and its 5 outcomes
- WASH
- Anti littering
- Keeping Environment & water areas clean
- Clean Water & healthy Life
- Stop open burning
- AWS Policy

Engagements- Session with Service Providers/ Outsourced services

- AWS Awareness for general population & Service Providers

Session Covered:
AWS and its 5 outcomes

- WASH
- Anti littering
- Keeping Environment & water areas clean
- Clean Water & healthy Life
- Stop open burning
- AWS Policy
- How to save water
- Water usage by service providers & mitigation measures
- Indirect Water Usage & KPI definition

Engagements- Session with Farmers on the Indirect Water Usage







Session Covered:
AWS and its 5 outcomes

- WASH
- Anti littering
- Keeping Environment & water areas clean
- Clean Water & healthy Life
- Stop open burning
- AWS Policy
- How to save water
- Water usage by service providers & mitigation measures
- Indirect Water Usage & KPI definition
- Land Leveller Project

PMPKL & outsourced vendors & Suppliers on the Indirect Water Usage

Session Covered:
AWS and its 5 outcomes

- WASH
- Anti littering
- Keeping Environment & water areas clean
- Clean Water & healthy Life
- Stop open burning
- AWS Policy
- How to save water
- Water usage by service providers & mitigation measures
- Indirect Water Usage & KPI definition
- Land Leveller Project

Stakeholder Engagement -Irrigation Department

Rehabilitation of distribution and minor canals annually:

1-Removal of silts from ground water.

2-Surface drainage- Rain water is directed to Kalpani river via drains and ultimately to Kabul river.

3-For subsurface draining: Due to water logged area, no growth of crops occurs due to extra water so perforated pipes are installed under ground which collects water & directs to Kaplani & Kabul River.

4- Construction of drains in road construction.

5- Flood protection work is done by identifying risk points to avoid disaster of people & land.

6- Scarp system is active for underground drainage and new pipes are installed.

Future Plans:

1- KP City Improvement Project: (MDA, Irrigation, TMA, WSSCM)

- Sewerage system improvement- Archery of drains, man holes, roads would be made.
- All drains will be directed to the planned STP and cleaned/processed water will be drained to Kalpani and Kabul river.
- **ADP funded project** is in progress where STP sewerage treatment plant for 6 Ucs is in progress.
- Garbage collection & dumping: From houses waste will be collected & end product will be usable product.
- **Master Plan for Sustainable towns** is planned where sanitation, roads, parks, drains will be constructed. Residential/commercial and social zones will be separate.
- **Pakistan : Khyber Pakhtunkhwa Water Resources Development Project**
- The Government of Pakistan requested Project Readiness Financing (PRF) from the Asian Development Bank (ADB) to prepare the Khyber Pakhtunkhwa Water Resources Development Project. The project supports the Government of Pakistan's Vision 2025 and ADB's country partnership strategy for Pakistan, 2021-2025, which emphasizes addressing the food security constraints, building climate resilience, and investing in value-chain rural infrastructure developments importantly improving water storage and regulatory capacity, irrigation system upgrades, facilitating institutional transformation and sustainable maintenance and operational management of water resource systems.
- 51249-004: Khyber Pakhtunkhwa Water Resources Development Project | Asian Development Bank (adb.org)

Environmental Protection Agency:

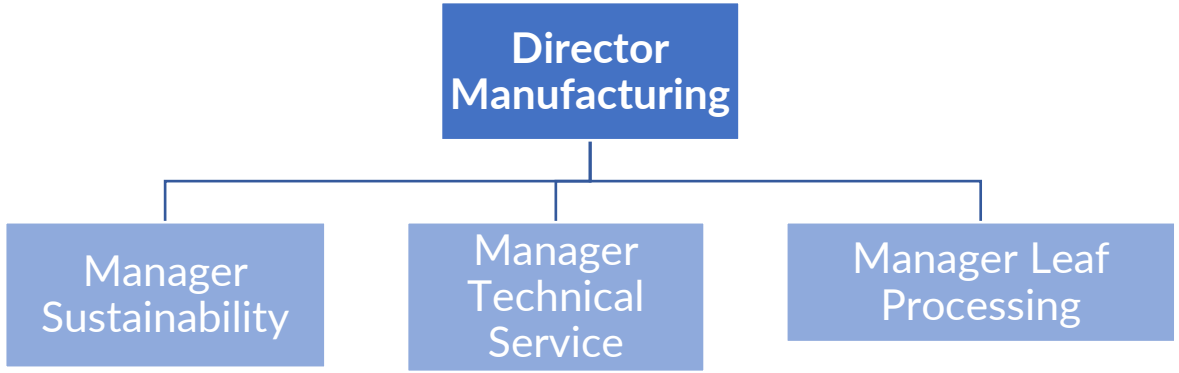
Environmental Audit and Initial Environmental Examination (Fuel Storage, LPG, Genset) is conducted by a 3rd party consultant and submitted to the Environmental Protection Agency, Khyberpakhtunkhwa (EPA KPK) for its approval as a legal requirement. As a corrective and preventive measure, a third party consultant is hired to update the legal requirements in Red on Line System. Response is awaited from EPA KPK by PMPKL–with respect to the Environmental Audit and Initial Environmental Examination.

Site Water-related internal governance

Water-related governance Team charter:

At PMPKL's Mardan factory, water governance is an integral part of our business strategy. It's linked to PMI's global ambitions towards responsible water use and strong routine governance systems.

Below mentioned hierarchy is responsible & accountable for water-related governance, ~~applicable Laws~~ adherence with applicable laws and action planning.



Site Water-related internal governance org chart

Water KPIs & Governance at site

- At PMPKL's factory in Mardan, ***total use of water at site*** is monitored as a Key Performance Indicator (KPI).
- KPI data is reviewed with top site leadership i.e., Director Manufacturing on defined review frequencies.
- Improvement actions are tracked for efficient closure. (Corrective & Preventive actions taken as per need)

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Water Related Roles & Responsibilities

Identification and Management of Legal and Other Requirements

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PK-EHS-3L-0P17 EHS Management System

Position	Roles/ Responsibilities	Current Occupant of Position (30.08.2024)
Director Manufacturing	• Ensure there is established process and documented plan for all legislative and other regulatory requirements. • Ensures the provision of resources targeted towards compliance to legal and other requirements	Hussain Ali
Sustainability Manager	• Ensure that this procedure is being implemented • Communicates with the Leadership Team the status of compliance through the Management Review	Kulsoom Iftikhar
Sustainability Specialist	• Identifies all applicable and relevant legal and other requirements related to the environment • Evaluates and monitors compliance to environment-related legal and other requirements together with the concerned personnel or department • Ensures implementation of this Procedure	Junaid Shahzad
Employees/ Head of Departments	• Informs EHS of changes in processes, materials, or products that may impact compliance to legal and other requirements • Assist in the evaluation and monitoring of the compliance to legal and other requirements	M. Bilal Ahmad M. Shahid M. Nadeem Khan M. Bilal Anjum Waseem Ali Haseeb Ahmad Waqas Ali Harris Khan Khattak Muhammad Afzal Babar Numair Saleem

Environmental Complaints Management

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PK-EHS-3L-P-02 Environmental Management System

Entity/ Department	Key responsibilities	Current Occupant of Position (30.08.2024)
Director Manufacturing	Ensure that environmental complaints are addressed and allocate, if required.	Hussain Ali
Sustainability Manager	Monitor environmental complaints and ensure that investigations, corrective and preventive actions are implemented. Notify internal and external parties on the nature of complaints and corrective and preventive actions taken. Liaise with Corporate affairs and Legal Departments regarding the complaint.	Haseeb Ahmed/ Kulsoom Iftikhar
Sustainability Specialist	Record the environmental complaint. Notify & Investigate with the relevant Line Management on the nature of the complaint .Coordinate and monitor the implementation of the corrective and preventive actions undertaken by the company.	Junaid Shahzad
Line Management	Investigate with the EHS delegate and Implement the corrective and preventive actions to address the complaint.	All concerned line management
Corporate Affairs	Liaise with related government agency, if required.	Rid Vaka
Legal Department	Review notices and responses on the nature of the complaint.	Kulsum Khan

Water and Wastewater Non-conformity Management Procedure

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3S-EHS-11 Water & waste water non-conformity procedure

Entity/ Department	Key responsibilities	Current Occupant of Position (30.08.2024)
Manufacturing Director	• Ensure water and waste water non-conformity program is in place.	Hussain Ali
Sustainability Manager	• Ensure that a Water and Wastewater Non-conformity Management Procedure is developed and implemented. • Monitor the implementation and effectiveness of this procedure. • Select appropriate third party service provider to conduct the sampling and analysis of water and wastewater.	Haseeb Ahmad/Kulsoom Iftikhar
Department Managers	• Ensure that this procedure is being implemented. • Identify, develop and implement wastewater and water minimization programs with quantifiable objectives and time frame. • Review wastewater and water minimization program.	M. Bilal Ahmad M. Shahid M. Nadeem Khan M. Bilal Anjum Waseem Ali Haseeb Ahmad Waqas Ali Harris Khan Khattak Muhammad Afzal Babar Numair Saleem
Sustainability Specialist	• Ensures that all regulatory requirements pertaining to water and wastewater are complied. • Maintain an inventory of water and wastewater sampling points in the facility. • Review results of analysis for any deviations to standards. • Guide the review team through the incident investigation process. • Validate the results of analysis. • Ensure compliance to water and wastewater related EHS permits, clearances and certificates • Provide the updated standards to be complied with for water and wastewater. Liaise with relevant government bodies for permit requirements, regulatory updates, reports and other ɔmmunications relating to water and wastewater.	Junaid Shahzad

Water and Wastewater Non-conformity Management Procedure

#PAKISTAN NOW

3S-EHS-11 Water & waste water non-conformity procedure

Entity/ Department	Key responsibilities	Current Occupant of Position (30.08.2024)
Manager Technical Services	• Maintain an inventory of water and wastewater sampling points in the facility • Selection of the wastewater and water treatment manager service provider and ensure that they have the capability to comply with the set standards and requirements of the law and the contract. • Set and monitor the requirements for process water. • Ensure the proper treatment of water and wastewater prior to use or discharge. • Update the inventory for changes in the water or wastewater stream and communicate the changes appropriately. • Lead the investigation of non-conformities.	Abdul Waris
Water and Wastewater Management Service Provider	• Ensures that water and wastewater are tested according to the standards and requirements. • Maintain all internal testing and monitoring results • Ensure on-time submission of required reports and documentation. • Participate in any non-conformity incident investigation as necessary. • Implement corrective actions necessary to comply with the standards and requirements.	Badar Zaman- GeoWatt
Area Supervisor and Team Lead	• Ensures that this procedure is being implemented. • Ensures that wastewater and chemicals are disposed through the right channels, in coordination with Law and PMI requirements. • Ensure that all machines/equipment are operated and maintained properly. • Implement and monitor wastewater and water minimization programs. • Ensure that employees are informed and trained in wastewater and water minimization programs.	Syed Muhammad Ali Waseem Ali Arshad Zaman Abdul Waris Numair Saleem Junaid Shahzad Muhammad Afzal Babar Muhammad Asghar Khan
Employee	• Implement and follow the wastewater and water minimization programs. • Inform the supervisor of any issues regarding the requirements of the procedure.	

Identification and Management of Legal and Other Requirements

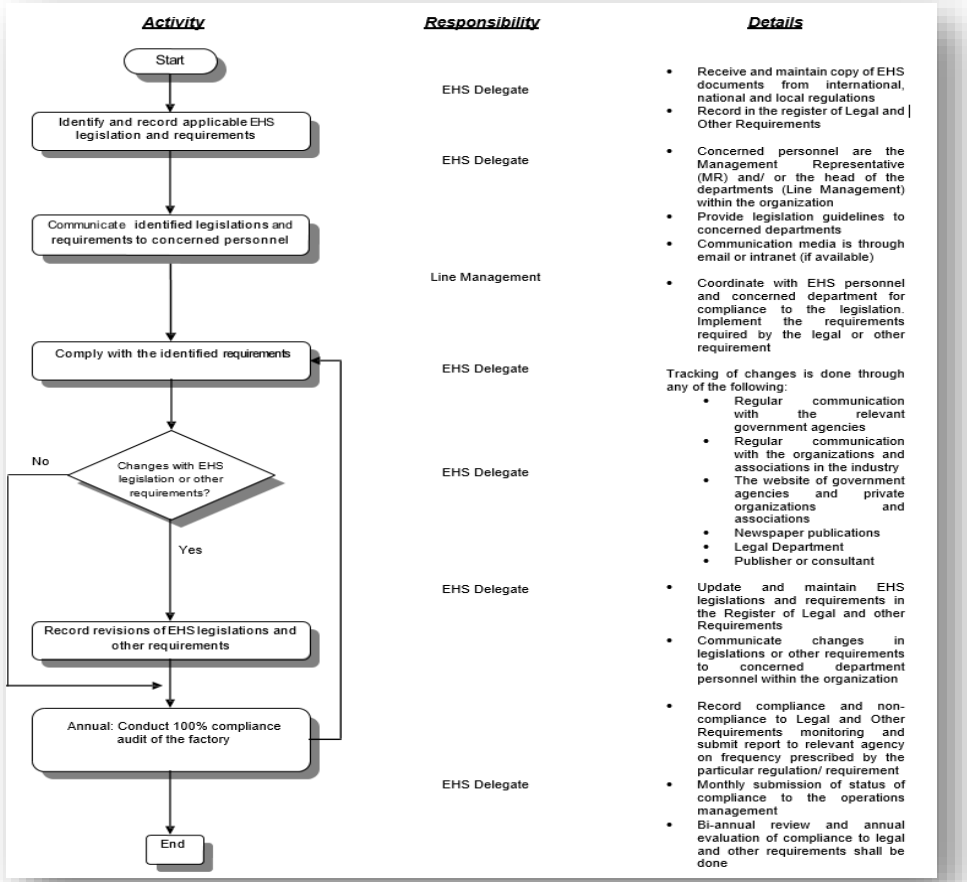
PK-EHS-3L-0P17 EHS Management System

manufacturing OF THE future

RACI Matrix for Legal & Other Requirements

Process Phases	Activities	Sustainability Managers	Manufacturing Director	Line Manager	Legal Department	Labor Relations	Risk & Control	Employee
ESTABLISH THE PROCESS	Implement a documented plan for conducting Legal requirements	R	A	I	C	C	C	I
	Create and maintain a formal Legal register	R	A	I	C	C	C	I
Implementation & Control	Ensure that legal requirements are Implemented and followed.	R	A	R	I	I	I	I
	Conducting & Recording Legal assessments / reviews	R	A	R	C	C	C	I
Maintain & Improve	Establish periodic reviews to ensure that corrective actions from legal reviews / assessments are tracked to completion.	R	A	R	I	I	I	I
	Implement a formal communication process that shares relevant information from legal register / assessment to stakeholders	R	A	I	I	I	I	I
	Closure of legal non-compliances / new legislations	R	A	R	C	C	C	I
	Update of legal register / Tracking of change [new requirement]	R	A	I	R	C	C	I

Legal and Other Requirements Identification & Non-compliance management Flow Chart



Process for Legal submissions

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PK-EHS-3L-0P17 EHS Management System

- Red on Line (ROL) is an online system that contains applicable EHS laws which are identified via a 3rd party consultant. The ROL review is conducted quarterly by the 3rd party consultant, in order to assess whether any amendments/addition to the ROL are required.
- In case ~~of~~ any amendments are required to be made to the ROL, a notification is shared and follow up is done by Sustainability Manager & Specialist, Legal team and Area Supervisors & Team leads.
- The submission of environmental monitoring reports as required under applicable law are submitted to the relevant provincial Environmental Protection Agency once a year.

Shared Water Challenges, Mitigation Measures, Public Sector/Infrastructural Agency & Stakeholder Consultation

Shared water challenges	Priority	Risk Level	Data Source	Mitigation Suggested	Public Sector Agency/Institution Initiatives	Existing Initiatives
Surface Water Contamination	1	High	Local data sets, consultancy report, water risk filter	• Improve catchment water quality but also water quality monitoring on-site in order to mitigate and/or prevent pollution/contamination events and consequent deterioration of water quality in the catchment area. • Implement projects and technologies to safeguard and/or improve status of surface water quality • Projects, campaigns and/or actions to safeguard and/or improve status, conservational and/or monitoring strategies of IWRAs that host sensitive or vulnerable biodiversity • Improvement in catchment surface water quality, and consequently the status of water-related environments and aquatic biodiversity • Environmental awareness and sensitivity among local communities, employees and catchment Stakeholders	• Engage and investigate with public-sector agencies and various local stakeholder potential catchment-based projects and/or campaigns related to the safeguard of groundwater bodies/surface waters and potential mitigation of water-related challenges. • Execute anti-littering and clean-up campaigns together with other stakeholder to set a leadership example and mitigate risks such as surface water contamination related to improper waste disposal • Implement new/additional water quality monitoring for maintenance of optimum catchment quality and mitigation/prevention of pollution/contamination events • Participate and/or finance campaigns related directly or indirectly to environmental safeguard or restoration such as projects of reforestation and green urbanization in order to limit anthropisation, biodiversity loss, etc. • Execute tree planting campaigns and anti-littering campaigns	• World Water Day /Earth Day Awareness • Water Stewardship kick off day & Unveiling • Engagement with public sector and infrastructure agencies to improve the quality. As per WSSCM< MDA and PHED upgradation of drain lines from houses to STP and then draining clean treated water to kalpani is in process and future plan. PMPKL to collaborate on awareness on this topic in local community. • "World Cleanup Day" campaign in collaboration with NGOs & WSSCM at locations and IWRA (Stepa and Kalpani) • Wastewater sampling at catchment & IWRA • Raw water sampling and testing for aquifer quality compliance • Indirect water use investigation amongst outsourced services • Tree planting project in local hospital at Baghicha Deri World Environment Day Awareness Flower Plantation activity at Site • Annual public disclosure of water stewardship report as an opportunity to create
Ecosystem Degradation/Bio diversity			Local data sets, consultancy report, water risk filter			
Flood Occurrence, Projected change in flood occurenece	2	Moderate - Low	Local data sets, consultancy report, water risk filter			• Tree planting project in local hospital at Baghicha deri 50 trees 200000 tree spaling plantation to avoid flood and make farmers self sustainable and improve water quality & deforestation. • Engagement with public sector and infrastructure agencies • Engagement activities with Stakeholders • Collaborate with Rescue 1122 to upgrade emergency response and preparedness system Engage with Rescue 1122 to arrange awanress event on Flooding, precautionary measures and contagious diseases. DOnation in form of first aid kits, PPES, de water pump, life jackets to be given to local community
Water Stress/Water Logging	2	Moderate	Local data sets, consultancy report, water risk filter	• Projects, campaigns and/or actions to mitigate, address and/or prev • Reduction and/or optimization of water use on-site in order to decrease groundwater removal from aquifer bodies and consequently increased water availability for other community users and sensitive environments • Set a leading example by promoting a resilient use of water amongst stakeholders and communities in the catchment territory	• Engage relevant stakeholders to discuss and assess the challenges rel • Implement new/innovative technological actions and/or settings • Implement domestic water saving upgrades on-site • Collect and/or reuse rainwater and/or purified waste water that would otherwise be lost and/or wasted • Improve maintenance - monitoring activities in order to account for and/or responsively address water loss anomalies due to leakages • Demonstrating support, collaboration and active partnership with public-sector agencies in order to drive meaningful engagements and water saving projects and promote workshop and/or webinars to discuss on water-related issues	• Reuse of condensate water & heat exchanger • Installation of new water meters • Domestic water saving training and awareness in collaboration with NGOs for local communicty, schools etc. • Data sharing on technical projects • Engagement with public sector and infrastructure agencies • World Water Day Awareness • Water Stewardship kick off Best practice sharing with local farmers • Engagement activities with Stakeholders
WASH- limited Access to drinking water & sanitation	1	Moderate- High	Local data sets, consultancy report, water risk filter	• Implement specific projects, campaigns, actions to ensure WASH provision to on-site workers and, when applicable, to the catchment territory	• Provision of sufficient supplies of safe drinking water for all workers, considering increased needs in hot weather and promote actions and/or projects aimed to ensuring access to WASH facilities amongst local most vulnerable communities • Implement and promote specific projects, campaigns, actions to ensure WASH provision to on-site workers and, when applicable, to the catchment territory, specifically amongst the local most vulnerable communities	• Installation of hand-washing facilities in Local schools Installation of Dustbin and boards at IWRA & Clean up activity • Internal activities to highlight the importance of good practices related to hygiene and sanitation • Awareness on basic WASH principles in the form of posters, notices, brochures etc. • WASH in Schools, Welfare School, farmers premises, community homes New washrooms for workers, managemnt & ablution areas New common room with separate washroom for ladies.
Water Level depletion	1	Low	consultancy report, water risk filter	• Reduction and/or optimization of water use on-site in order to decrease groundwater removal from aquifer bodies/ surface water removal and consequently increased water availability for other community users and sensitive environments	• Implement new/innovative technological actions and/or settings • Implement domestic water saving upgrades on-site • Collect and/or reuse rainwater and/or purified waste water that would otherwise be lost and/or wasted • maintenance - monitoring activities in order to account for and/or responsively address water loss anomalies due to leakages	• Reuse of condenate & heat exchanger • Rainwater collection tank installation & converting the redundant well & tank to rain harvestor • Installation of new water meters • Indirect water use investigation amongst outsourced services Vulnerability assessment by 3rd party to odentify rosks & vulnerabilities
				• Set a leading example by promoting a resilient use of water amongst stakeholders and communities in the catchment territory	• Demonstrating support, collaboration and active partnership with public-sector agencies in order to drive meaningful engagements and water saving projects and promote workshop and/or webinars to discuss on water-related issues • Share best practices and gather feedback from relevant stakeholders to investigate on further opportunities for improvement	• Domestic water saving training and awareness in collaboration with Enivornmental Protection department, Irrigation, Schools etc. • Data sharing on technical projects • Engagement with public sector and infrastructure agencies • World Water Day Awareness • Water Stewardship kick off Rain harvestors

						• Engagement activities with Stakeholders
					• Participate to local initiatives and campaign in order to account for mass water flows and help prioritize water efficiency efforts	• Engagement with public sector and infrastructure agencies
Catchment Water Balance	1	HIgh	Consultancy report, local data sets, government data	Collective study with consultants, government bodies to start collecting the data. Water balance of catchment formation. Adding value to current available information	Collaborative study. Data building & collection Involving new hydrologists & consultants	Hired 3P experts to conduct the study. Meeting with PHEd, Irrigation, MDA,WSSCM to give information on available ground water data. Currently have the study on Indus Basin. Reconsult with another 3P expert on catcmnet water balance

Priority	Summary of Shared Challenges
1	Quality
1	WASH
2	Flood Occurrence
2	Water Stress
1	Water Level Depletion
1	Ecosystem Degradation/Bio diversity

Priotization	Definition	Impact on Action Plans
1	First focus defined within the catchment plans	Mitigation actions defined and priotized
2	Second focus of challenges which is impacted by the 1st focus or other elements	Mitigation actions will be conducted as a plus

Stake holder consultation/Feed Back on shared Water Challenges

S.No	Authority	Authority representative & designation	Questionaire	Response	Performance feedback & Continual improvement 1	Projects completed by the stakeholder	Future planning of the stakeholder	Performance feedback & continual Improvement 2	Remarks
1	PHED	Ijaz Hamad SDA PHED Mardan 03109557664	Do you have perception of any water related issues and/or risks in the area in which you operate (i.e. degraded water quality, water contamination events, flooding, water scarcity due to overexploitation etc.)?	Yes	Best Practice shared by PHED i.e. water quality tests, information sharing and other initiatives together with PHED & PMPKL to be further strenghthened. Thank you for your efforts.	Provided clean drinking water and water pipe line replacement in Mardan area.	Schemes of drinking water where is water scarcity.	Clean drinking water is extremely important and Awarness is required on clean drinking water and proper sanitation. Govt authorities along with public authoroties shall take initiatives for the issues. Your work on rain harvestors, tree plantation, land levellor, wash assessment, water quality tests which are best practices in catchment is appreciated. Discussed the infrastructure of Mardan i.e. tubewells, pipes etc that requires regular repair and maintenece for provision of clean water. website shared for further infotmation i.e work, scope, Organogram and infrastructure etc.	Joint session on contagious diseases for local community
			Has your local territory ever experienced problems related to deteriorating potable water quality (i.e. due to contamination events in the Canal, leakages of WWTP, inadequate underground or surface water quality etc.)?	Yes		Mobile Lab for water testing with the help of NGO	Proposal of drainage system for Mardan flood water		
			Do all local communities of the Mardan/Swabi have adequate levels and access to safe drinking water, effective sanitation, and protective hygiene (WASH)?	No					
			Do you perceive WASH as being a diffused and shared water challenge amongst the communities of your local territory?	Yes					
			Have any actions been taken to support the provision of access to safe drinking water, adequate sanitation and hygiene awareness for the communities of your local territory? If yes, please list the main ones	Yes, Installation of tube wells, water quality tests etc					
			Have water-demanding industries and/or activities in the area impinged on the human rights to safe water and sanitation of local communities through their operations? If so, have remediation actions been implemented and have they been effective?	No					
			What actions or projects would you suggest to implement in order to mitigate risks related to WASH amongst the local communities of the Mardan/Swabi?	Yes					
			Would you actively collaborate with PMPKL on projects, actions, campaigns and/or initiatives focused on mitigating water-related risks and/or improving	Yes					
			Any best practice that you would like to share with us like installation of tube wells, STPs, water quality test, tree plantation, filter installation cleaning campaigns, water quantifications, rain harvestors etc.	Yes (Water quality tests, Tree plantation, meetings, clean up campaigns etc.)					
2	Irrigation	Syed Atiq Ahmad SDO Drainage Irrigation Sub-division Mardan 03459117348	Do you have perception of any water related issues and/or risks in the area in	Yes	Overall very good and meaning ful performance in terms of stakeholder engegment/ consultation, water quality, quantity, mainteining efforts to enhance the water related areas & WASH	distribution and Clearance and Anti-encrochment operation Moon soon 2023	directed to the Upgradation of irrigation through ADB	PMPKL has been actively coordinating with us and we have seen many good initiatives by PMPKL. Tree plantation, land leveller, rain harvestors, c;eaning campaigns and active coordination is highly appreciated. PMPKL to keep up the good work and its a joint effort. Website shared for gathering further information in scope, work, city infrastructure , work done till now etc.	
			Has your local territory ever experienced problems related to deteriorating potable water quality (i.e. due to contamination events in the Canal, leakages of WWTP, inadequate underground or surface water quality etc.)?	Yes					
			Do all local communities of the Mardan/Swabi have adequate levels and access to safe drinking water, effective sanitation, and protective hygiene (WASH)?	Yes					
			Do you perceive WASH as being a diffused and shared water challenge amongst the communities of your local territory?	yes					
			Have any actions been taken to support the provision of access to safe drinking water, adequate sanitation and hygiene awareness for the communities of your local territory? If yes, please list the main ones	yes, damage pipes repair, & repairing walls.					
			Have water-demanding industries and/or activities in the area impinged on the human rights to safe water and sanitation of local communities through their operations? If so, have remediation actions been implemented and have they been effective?	No					
			What actions or projects would you suggest to implement in order to mitigate risks related to WASH amongst the local communities of the Mardan/Swabi?	Yes					
			Any best practice that you would like to share with us like installation of tube wells, STPs, water quality test, tree plantation, filter installation cleaning campaigns, water quantifications, rain harvestors etc.	Yes (Water quality tests, Tree plantation, meetings, clean up campaigns etc.)					
			Would you actively collaborate with PMPKL on projects, actions, campaigns	Yes					
3	Smart School	Sohail Iqbal, Director Smart School 03005723687	Do you have perception of any water related issues and/or risks in the area in which you operate (i.e. degraded water quality, water contamination events, flooding, water scarcity due to overexploitation etc.)?	Yes	The initiatives taken by PMPKL on water related issues are appreciated. Such initiatives must be taken by other organizations too.	Awarness session on chlid health on world child day	To more extend health services in BHU	Overall very good performance on water related initiatives.	To include in our plan the R&M of washrooms, WASH etc.
			Has your local territory ever experienced problems related to deteriorating potable water quality (i.e. due to contamination events in the Canal, leakages of WWTP, inadequate underground or surface water quality etc.)?	Yes					
			Do all local communities of the Mardan/Swabi have adequate levels and access to safe drinking water, effective sanitation, and protective hygiene (WASH)?	yes					
			Do you perceive WASH as being a diffused and shared water challenge amongst the communities of your local territory?	Yes					
			Have any actions been taken to support the provision of access to safe drinking water, adequate sanitation and hygiene awareness for the communities of your local territory? If yes, please list the main ones	yes					
			Have water-demanding industries and/or activities in the area impinged on the human rights to safe water and sanitation of local communities through their operations? If so, have remediation actions been implemented and have they been effective?	No					
			What actions or projects would you suggest to implement in order to mitigate risks related to WASH amongst the local communities of the Mardan/Swabi?	To install water filters, dust bins, clean up campaigns					
			Would you actively collaborate with PMPKL on projects, actions, campaigns and/or initiatives focused on mitigating water-related risks and/or improving	Yes					
			Any best practice that you would like to share with us like installation of tube wells, STPs, water quality test, tree plantation, filter installation cleaning campaigns, water quantifications, rain harvestors etc.	Active engagment, rain harvestors					
4	EPA	Dr Israr- Assistant Director 03349137844	Do you have perception of any water related issues and/or risks in the area in which you operate (i.e. degraded water quality, water contamination events, flooding, water scarcity due to overexploitation etc.)?	Yes	This is a good step by PMPKL and we will by happay to assist. They have been submitting the EPA reports quarterly performance is appriciated.	Bscically gives guidelines on opertaion of inductrie sas per applicable guidelines & laws.	Biodegradable plastic bags are to be used with stamp on it NOC will be required for construction & operation of new projects Waste Water treatment plant will be mandatory in all industries Surprised visits and unannounced sample collection of waste and industry effluents to be taken	PMPKL is following legal requirements regarding water using and appreciated to further work on AWS. They agreed to coordinate with PMPKL. And will be working om tree plantation to restore forest and biodiversity in community.	More collaboration on ECC, EIA,etc. To guide PMPKL on their way to guidelines.
			Has your local territory ever experienced problems related to deteriorating potable water quality (i.e. due to contamination events in the Canal, leakages of WWTP, inadequate underground or surface water quality etc.)?	Yes					
			Do all local communities of the Mardan/Swabi have adequate levels and access to safe drinking water, effective sanitation, and protective hygiene (WASH)?	No					
			Do you perceive WASH as being a diffused and shared water challenge amongst the communities of your local territory?	Yes					
			Have any actions been taken to support the provision of access to safe drinking water, adequate sanitation and hygiene awareness for the communities of your local territory? If yes, please list the main ones	No					
			Have water-demanding industries and/or activities in the area impinged on the human rights to safe water and sanitation of local communities through their operations? If so, have remediation actions been implemented and have they been effective?	Yes					
			What actions or projects would you suggest to implement in order to mitigate risks related to WASH amongst the local communities of the Mardan/Swabi?	(WWTP) industries, domestic sewerage disposal via WWTP					
			Would you actively collaborate with PMPKL on projects, actions, campaigns and/or initiatives focused on mitigating water-related risks and/or improving WASH services in the local territory?	yes					
5	TMA	Farhan- TMO- 03018183103	Do you have perception of any water related issues and/or risks in the area in which you operate (i.e. degraded water quality, water contamination events, flooding, water scarcity due to overexploitation etc.)?	Yes	PMPKL has implemented water stewardship program in respect of water reduction targets, water risk assessments, water conservation measures, which shows that PMPKL u sfully comitted to reserve water and its quality for future generations. It is suggested that the scope of the program may be extended and also include indirect water imapcts such as product use and disposal. Further water quality may be targeted for which pollution prevention and waste water managment should be implemented.	Anti littering and cleaning	Sewerage system improvement- Archery of drains, man holes, roads would be made Master Plan for Sustainable towns is planned where sanitation and drains will be constructed.	It is hereby suggested that stakeholder engeggement should be expanded to include more local communities, NGOS and other awareness programes. Also, set more ambitious targets to drive greater impacts. Implement water efficient technologies.	
			Has your local territory ever experienced problems related to deteriorating potable water quality (i.e. due to contamination events in the Canal, leakages of WWTP, inadequate underground or surface water quality etc.)?	Yes		Tree plantation			
			Do all local communities of the Mardan/Swabi have adequate levels and access to safe drinking water, effective sanitation, and protective hygiene (WASH)?	No					
			Do you perceive WASH as being a diffused and shared water challenge amongst the communities of your local territory?	Yes					
			Have any actions been taken to support the provision of access to safe drinking water, adequate sanitation and hygiene awareness for the communities of your local territory? If yes, please list the main ones	1-Installation of water filtration plants to provide safe drinking water to the localities 2- Chlorination of water at different levels such as public and private buildings, community levels					
			Have water-demanding industries and/or activities in the area impinged on the human rights to safe water and sanitation of local communities through their operations? If so, have remediation actions been implemented and have they been effective?	Yes					
			What actions or projects would you suggest to implement in order to mitigate risks related to WASH amongst the local communities of the Mardan/Swabi?	Yes					
			Would you actively collaborate with PMPKL on projects, actions, campaigns and/or initiatives focused on mitigating water-related risks and/or improving WASH services in the local territory?	Water supply schemes, Hygiene awareness, Water quality monitorung, Community led total sanitation, Capacity building, Water conservation, WASH friendly infrastructure, Emergemcy response plan, Community engagement, Collaboration and coordination, Funding and resource mobilization, Resaerch and development, policy and advocacy, Institutional capacity building,					

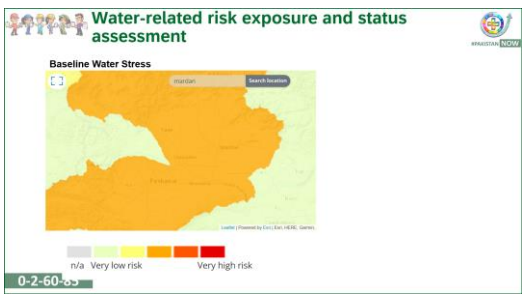
			Any best practice that you would like to share with us like installation of tube wells, STPs, water quality test, tree plantation, filter installation cleaning campaigns, water quantifications, rain harvestors etc.	1- Installations: -Rainwater harvesting system - Greywater reuse systems - Water efficient appliances and fixures - Solar powered water pumps. 2- Cleaning campaigns:- 3- Water quantification, 4- Rain harvestors 5- Water conservation 6- Community engagement 7- Water quality monitoring 8- Waste management 9- Water sensitive agricuture 10- Policy & regulation					
6	MDA	Fazle Ghaffar- DD 0937-9230434	Do you have perception of any water related issues and/or risks in the area in which you operate (i.e. degraded water quality, water contamination events, flooding, water scarcity due to overexploitation etc.)?	Yes	PMPKL had a good approach like presenting AWS, its 5 outcomes, collaboration with all important infrastructural & governing bodies. The project done by them are appreciated. We shared best practices of MDA like dust bin installation, cleanup regimes, water quality tests and discussed risks /challenges & agreed on mitogatoin measures. AWS plan is very well made and appreciate the overall contributions.	Installed Water Filtration Plant s at various locations in Mardan	Master Plan for Sustainable towns is planned where sanitation, roads, parks, drains will be constructed. Residential/commercial and social zones will be separated.	Issues related to drinking water, sewerage and sanitation were discussed. Appreicated the performance of PMPKL on the issues of water. Looking forward to more collaborations.	
			Has your local territory ever experienced problems related to deteriorating potable water quality (i.e. due to contamination events in the Canal, leakages of WWTP, inadequate underground or surface water quality etc.)?	Yes			Project in which all drain channels, man holes and draining line swill be reworked and connected from houses to the STP plant that is under cinstruction. The treated waste from STP will then be directed to the Kaplani drain.		
			Do all local communities of the Mardan/Swabi have adequate levels and access to safe drinking water, effective sanitation, and protective hygiene (WASH)?	Yes					
			Do you perceive WASH as being a diffused and shared water challenge amongst the communities of your local territory?	Yes					
			Have any actions been taken to support the provision of access to safe drinking water, adequate sanitation and hygiene awareness for the communities of your local territory? If yes, please list the main ones	Yes, water filtration plant installed					
			Have water-demanding industries and/or activities in the area impinged on the human rights to safe water and sanitation of local communities through their operations? If so, have remediation actions been implemented and have they been effective?	Not sure					
			What actions or projects would you suggest to implement in order to mitigate risks related to WASH amongst the local communities of the Mardan/Swabi?	Sewerage Treatment Plant (STP)					
			Would you actively collaborate with PMPKL on projects, actions, campaigns and/or initiatives focused on mitigating water-related risks and/or improving WASH services in the local territory?	Yes					
			Any best practice that you would like to share with us like installation of tube wells, STPs, water quality test, tree plantation, filter installation cleaning campaigns, water quantifications, rain harvestors etc.	water quality test, tree plantation, filter installation cleaning campaigns, rain harvestors					
8	WSSCM Mardan	Rahat Ullah HR Manager 03339174877	Do you have perception of any water related issues and/or risks in the area in which you operate (i.e. degraded water quality, water contamination events, flooding, water scarcity due to overexploitation etc.)?	In WSSCM jursidiction, the most frequent complaints revolve around rusted piplines leading to leaks and contamination.	PMPKL has been actively & effeciently coordinating with all the stakeholders & splendedly with WSSCM to mitigate the risks & challenges in the water conservation. We appreciate the best practice adopted by PMPKL from WSSCM in rain harvesting, water quality tests & active participation in best practoces for WASH & environment conservation.	New Tubwell installation in various areas of Mardan for drinking water	All drains will be directed to the planned STP and cleaned/processed water will be drained to Kalpani and Kabul river	We appreciate and extend our support towards adoptation of best practices taken by phillip morris in keeping the environment clean, water conservation, tree plantation and other activities uder CSR. We are ready and welcome you to join hands to keep the environment clear and waste free and water conservation or any best practices under the sustainable development goals (SDG's) set by the UN for all & partnering countries & members. We wish a successful future endeavors in all the postive steps taken by PMPKL.	Re-application of rain harvetor from WSSCM at site and catchment
			Has your local territory ever experienced problems related to deteriorating potable water quality (i.e. due to contamination events in the Canal, leakages of WWTP, inadequate underground or surface water quality etc.)?	We receive complaints about rusted and outdated piplines.		Distribution of bags for for easy collection & disposal of animal entrails and to avoid dumping waste in water channels and drain blockages	Master Plan for Sustainable towns is planned where sanitation, drains will be constructed with ADB project.		
			Do all local communities of the Mardan/Swabi have adequate levels and access to safe drinking water, effective sanitation, and protective hygiene (WASH)?	Access to safe drinking water supply, sanitation, and proper hygiene practices in Mardan remians incomplete. In WSSCM jurisdiction, 70% of the population has access to WASH facilites.		STP is under construction & IRRC is active where different type of waste is segregated, recycled and composting is carried out. The output is an organic product used as fertilizer.	ADP funded project is in progress where STP sewerage treatment plant for 6 Ucs is in progress. Garbage collection & dumping from houses waste will be collected & end product will be usable product		
			Do you perceive WASH as being a diffused and shared water challenge amongst the communities of your local territory?	Yes		Rain harvester was installed for water reuse			
			Have any actions been taken to support the provision of access to safe drinking water, adequate sanitation and hygiene awareness for the communities of your local territory? If yes, please list the main ones	Yes, the WSSCM CLC team consistently interacts with the community actively sharing information about WASH facilities.					
			Have water-demanding industries and/or activities in the area impinged on the human rights to safe water and sanitation of local communities through their operations? If so, have remediation actions been implemented and have they been effective?	Not sure					
			What actions or projects would you suggest to implement in order to mitigate risks related to WASH amongst the local communities of the Mardan/Swabi?	Achieving SDG 6 necessitates a range of initiatives. One crucial step is the replacement of existing piplines , which is vital to mitigate significant health risks to consumers and to replace old pumping machinery and transformers etc.					
			Any best practice that you would like to share with us like installation of tube wells, STPs, water quality test, tree plantation, filter installation cleaning campaigns, water quantifications, rain harvestors etc.	Yes, rain harvestor is collaboration with PMPKL & shared as best practice within PMPKL					
			Would you actively collaborate with PMPKL on projects, actions, campaigns and/or initiatives focused on mitigating water-related risks and/or improving WASH services in the local territory?	We extend our appreciaton and warm welcome to PMPKL for taking on the project of pipline replacement within the WSSCM jusidiction. This includes not only the physical aspect but also encompasses vital soft activities focused on prmoting behavior change and raising awarness about WASH.					
9	Farmers	Noor Islam, Jamal Garhi, 03349466728	Do you have perception of any water related issues and/or risks in the area in which you operate (i.e. degraded water quality, water contamination events, flooding, water scarcity due to overexploitation etc.)?	Yes,	Very good job on land leveller, tree plantaion, WASH assessment	Water Pump constructed for drinking water by NGO	New water pumps will be constructed for safe drinking water		
			Has your local territory ever experienced problems related to deteriorating potable water quality (i.e. due to contamination events in the Canal, leakages of WWTP, inadequate underground or surface water quality etc.)?	Yes		Water sanitation system upgraded	General washrooms will be upgraded		
			Do all local communities of the Mardan/Swabi have adequate levels and access to safe drinking water, effective sanitation, and protective hygiene (WASH)?	No					
			Do you perceive WASH as being a diffused and shared water challenge amongst the communities of your local territory?	Yes					
			Have any actions been taken to support the provision of access to safe drinking water, adequate sanitation and hygiene awareness for the communities of your local territory? If yes, please list the main ones	Yes, Wash					
			Have water-demanding industries and/or activities in the area impinged on the human rights to safe water and sanitation of local communities through their operations? If so, have remediation actions been implemented and have they been effective?	no					
			What actions or projects would you suggest to implement in order to mitigate risks related to WASH amongst the local communities of the Mardan/Swabi?	WASH Assessment					
			Would you actively collaborate with PMPKL on projects, actions, campaigns and/or initiatives focused on mitigating water-related risks and/or improving WASH services in the local territory?	Land leveller, tree plantation, clean up (Hazardous waste collection)					
10	AL-Khidmat Mashal Medical Complex Hospital Mardan/Swabi	Main Daud 0345-5959359	Do you have perception of any water related issues and/or risks in the area in which you operate (i.e. degraded water quality, water contamination events, flooding, water scarcity due to overexploitation etc.)?	Yes	PMPKl has been actively working and participating with us on the risks and challenges. Thank you for resolving many issues like cleanup campaigns, tree plantation, water quality tests etc.			Looking forward to more such meetings & session. Overall very good performance.	
			Has your local territory ever experienced problems related to deteriorating potable water quality (i.e. due to contamination events in the Canal, leakages of WWTP, inadequate underground or surface water quality etc.)?	Yes					
			Do all local communities of the Mardan/Swabi have adequate levels and access to safe drinking water, effective sanitation, and protective hygiene (WASH)?	No					
			Do you perceive WASH as being a diffused and shared water challenge amongst the communities of your local territory?	Yes					
			Have any actions been taken to support the provision of access to safe drinking water, adequate sanitation and hygiene awareness for the communities of your local territory? If yes, please list the main ones	yes					
			Have water-demanding industries and/or activities in the area impinged on the human rights to safe water and sanitation of local communities through their operations? If so, have remediation actions been implemented and have they been effective?	No					
			What actions or projects would you suggest to implement in order to mitigate risks related to WASH amongst the local communities of the Mardan/Swabi?	Yes,					
			Would you actively collaborate with PMPKL on projects, actions, campaigns and/or initiatives focused on mitigating water-related risks and/or improving WASH services in the local territory?	Yes					

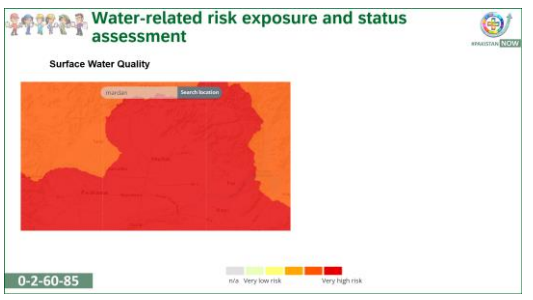
			Any best practice that you would like to share with us like installation of tube wells, STPs, water quality test, tree plantation, filter installation cleaning campaigns, water quantifications, rain harvestors etc.	Tree plantation, water filter unit, quality tests, cleanups at IWRA, Rain Harvestor					
11	Rescue-1122 Mardan	Imran Khan DEO 1122 Mardan 0314-9629626	Do you have perception of any water related issues and/or risks in the area in which you operate (i.e. degraded water quality, water contamination events, flooding, water scarcity due to overexploitation etc.)?	Yes	We would like to thank you for your outstanding services to serve humanity in this crucial time of climate change happening in all around where our pure land has potential threat list. As our country has suffered a lot due to flood and water hazards. We are extremely welcome your services in this regard.	awarness session on Dengue and stagnent water. Works on emergency prepardness & readiness	Arranging of dewatering pumps, and life jackets, first aid boxes and PPES to use during floods.	Issues regarding sanitation and flooding were discussed and authority agreed to work with PMPKL on the issues. The authority with the collaboration with PMPKL will organise awarness session. Also, discussed the organogram and infrastructures the Rescuee 1122 help to maintain like buildings , roads, houses etc from natural disaters and emergencies.	On phone call
			Has your local territory ever experienced problems related to deteriorating potable water quality (i.e. due to contamination events in the Canal, leakages of WWTP, inadequate underground or surface water quality etc.)?	Yes		Contigency plan for flooding i.e preparation of camps, engagement of water rescue team, identified vulnerable areas, mock drill on drowning.			
			Do all local communities of the Mardan/Swabi have adequate levels and access to safe drinking water, effective sanitation, and protective hygiene (WASH)?	No					
			Do you perceive WASH as being a diffused and shared water challenge amongst the communities of your local territory?	Yes					
			Have any actions been taken to support the provision of access to safe drinking water, adequate sanitation and hygiene awareness for the communities of your local territory? If yes, please list the main ones	Yes			Drainage system for Mardan city		
			Have water-demanding industries and/or activities in the area impinged on the human rights to safe water and sanitation of local communities through their operations? If so, have remediation actions been implemented and have they been effective?	Yes					
			What actions or projects would you suggest to implement in order to mitigate risks related to WASH amongst the local communities of the Mardan/Swabi?	NA					
			and/or initiatives focused on mitigating water-related risks and/or improving	Yes					

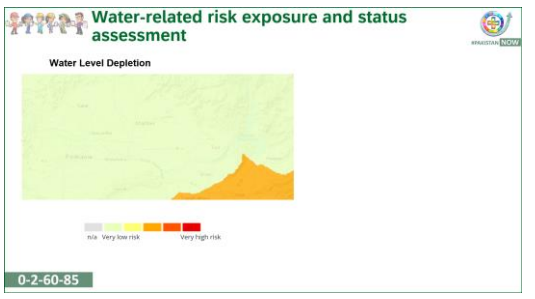
Stake holder consultation/Feed Back on shared Water Challenges

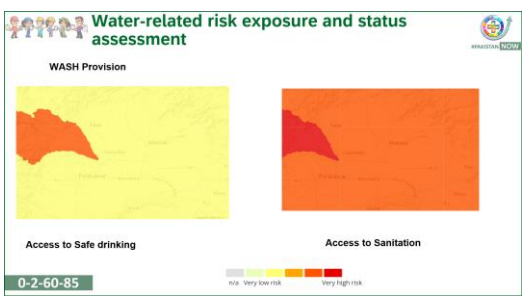
Detail of visit, Questionnaire and Feedback on AWS									
S.No	**Authority**	**Authority representative &**	**Questionaire**	**Response**	**Feedback**	**Projects completed**	**Future planning**	**Outcomes**	**Remarks**
1	Saleem Match Factory Mardan/Swabi	Fayaz	Do you have perception of any water related is	Yes	I appreciate the efforts done by PMPKL regarding the safe use of water, sanitation and water hygeine. Such efforts must be carriout by other deptt & organisation				
			Has your local territory ever experienced probl	Yes					Discussed on call
			Do all local communities of the Mardan/Swabi	No					
			Do you perceive WASH as being a diffused and	No					
			Have any actions been taken to support the pr	No					
			Have water-demanding industries and/or activ	Yes, proper procedure sh					
			What actions or projects would you suggest to	To plan policy for safe dr					
			Would you actively collaborate with PMPKL on	Yes					
2	Five Star Floor and General Mills Mardan	Zafar Ali 0301-8192301	Do you have perception of any water related is	Yes	The performance of PMPKL regarding the water issues appreciative so far. They have proper knowledge about the issues related to drinking water, sewerage and sanitation.				
			Has your local territory ever experienced probl	Yes					
			Do all local communities of the Mardan/Swabi	No					
			Do you perceive WASH as being a diffused and	Yes					
			Have any actions been taken to support the pr	No					
			Have water-demanding industries and/or activ	No					
			What actions or projects would you suggest to	Proper water sanitation					
			Would you actively collaborate with PMPKL on	Yes					
3	PMPKL Etham Warehouse	Nadeem Khan Manager Leaf Buying and Grading 0300-5709365	Do you have perception of any water related is	Yes	I appreciate all the activities regarding the drinking water safety, good water governance, sustainable water of the PMPKL. Because safe drinking water is the basic need of human life.	Water filter installatio	session on water s	To work on water related issues i.e water sanitatoin, misuse of water, clean drinking water.	
			Has your local territory ever experienced probl	Yes		washrooms upgradat	Rain harvester		
			Do all local communities of the Mardan/Swabi	Yes		drainage system			
			Do you perceive WASH as being a diffused and	Yes					
			Have any actions been taken to support the pr	Yes, Awarness Session, w					
			Have water-demanding industries and/or activ	Yes Local NGOs are work					
			What actions or projects would you suggest to	Installation of water coo					
			Would you actively collaborate with PMPKL on	Yes					

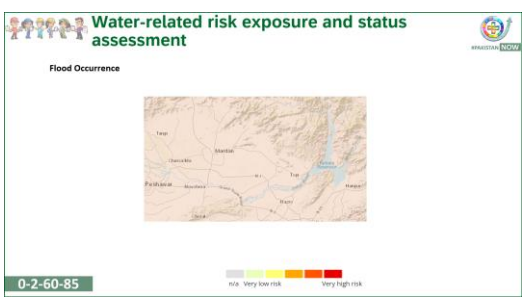
Water Risk Filte on Water Risks & Challenges











AWS.02. AWS Strategy and Plan

Stragety & Plan Document Evalution, Review and Update Process

1) Philsa Staregty & Plan Document shall be reviewed and updated at least **yearly** by EHS AWS Team Lead and AWS Team unless there is no other changes needed to be included within a year.
2) This document shall be updated, when any changes, new projects, updates of ongoing projects are needed to be included.
3) Document last update date, reason of update and responsible person's name shall be noted when any changes made.

Last updated: 27/09/2024, 4/10/2024
Updated by: Kulsoom Iftikhar(AWS Team Leader)
Update reason: Projects details and actions were updated., Priority, probability, severity & costs were added

PMPKL Water Risk and Opportunities

No	Category	Type	Risks	Probability	Severity	Reason	Priority (updated 2022 then 2023)	Impact (on PMPKL & Others, Environment)	Cost ($)	Time frame the risk is expected to occure	Precausions/Countermeasure/ Actions / Initiatives ** Details of all actions & initiatives are given in Strategy amd Plan Documents	Potential savings /value creation
1	Risk	Physical	Access to hygiene	3	B	3B	High	PMPKL has 3P services where unavailability of soap or hand wash can lead to hygiene risks and health risks	353K	Not expected to occur before 2024	• Installation of hand-washing facilities in Local schools • Internal activities to highlight the importance of good practices related to hygiene and sanitation • Awareness on basic WASH principles in the form of posters, notices, brochures etc. • WASH in Schools, Welfare School, farmers premises, community homes New washrooms for workers, management & ablution areas New common room with separate washroom for ladies.	Internal campaign in order to raise awareness on WASH principles and the importance of a good water stewardship for the well-being of all.
2	Risk	Biological	Spread of contagious diseases	3	C	3C	Moderate	Due to unavailability ofadequate drinking water glasses, water borne or other diseases can spread in people.	NA	Not expected to occur before 2024	Provision of clean drinking water with glasses and additional water stations.	
3	Risk	Biological	Flood Occurrence/ Projected Change in Flood Occurance	2	C	2C	Moderate-Low	PMPKL is not located in a flood hazard area, but is adjacent to vicinity to Indus river so when floods occurs its severity can be more. The rainy season in the mardan has more and more above-normal rainfall, with monsoon and storm conditions prevailing, and which may last for several days and weeks.	16.76K	Not expected to occur before 2024	PMPKL has a very active incident Communication which frequently informs all employees on risky events and raise awareness on general flood risk related to its territory. PMPKL is working with Rescue 1122 and is planning on arranging an awareness session on floods, precautionary & safety measures and contagious diseases such as dengue. Donations to be made so that can be used by society. for activities/engagements PO are made. - Tree Plantation - Fuel wood sustainability	- Joint actions with Stakeholders to mitigate shared water-related risk - Awareness amongst local population and Stakeholders on mitigation actions related to shared water challenges -Implementation of best practices in catchment territory. With the awareness session, emphases and people awareness will be made.
4	Risk	Physical	Baseline water stress /depletion	3	C	3C	Moderate	PMPKL is located in a high area of baseline water level depletion i.e. water logging occurs so surface water is there. Ground water depletes due to extraction as surface quality is not good. Continuous extraction of ground water without recharging can deplete the ground water sources	8.71 K	Not expected to occur before 2024	• Tree planting project in local hospital at Baghcha dari 50 trees 200000 tree-spaling plantation to avoid flood and make farmers self sustainable and improve water quality & deforestation • Engagement with public sector and infrastructure agencies • Engagement activities with Stakeholders • Collaborate with Rescue 1122 to upgrade emergency response and preparedness system Engage with Rescue 1122 to arrange awarness event on Flooding, precautionary measures and contagious diseases. DOnation in form of first aid kits, PPES, de-water pump, life jackets to be given to local community.	Value creation by using measures to avoid water usage from wells for cleaning etc.
5	Risk	Physical	Access to Safe Drinking Water	3	B	3B	High	Access to safe water is for everyone however Ozone treated water is used. In case of malfunction of ozone, this supply can be interrupted.	37$	Not expected to occur before 2024	Access to safe water is for everyone however Ozone treated water is used. In case of malfunction of ozone, this supply can be interrupted.	Value creation by giving access and supply of clean drinking water uninterruptedly
6	Risk	Physical	water interruptions	1	D	1D	Low	PMPKL is dependant on 02 site ground water wells and takes all the water to be used from these wells. If the wells becomes non operastable due to water depletion or malfunction so water interruptions to daily routine & process can occur	NA	Not expected to occur before 2024	PMPKL is dependant on 02 site ground water wells and takes all the water to be used from these wells. If the wells becomes non operastable due to water depletion or malfunction so water interruptions to daily routine & process can occur. Implementation of best practice, with rain harvestors people awareness on mitigating water interruptions for cleaning or lawn watering can be developed,. With back up well and potable drinking water , drinking water availability and business continuity can be ensured	Implementation of best practice, with rain harvestors people awareness on mitigating water interruptions for cleaning or lawn watering can be developed,. With back up well and potable drinking water , drinking water availability and business continuity can be ensured
7	Risk	Regulatory	Water non compliances related to quality	4	B	4B	High	PMPKL is bound to provide clean drinking water to people and clean disposal of water to be disposed in discharge bodies. For that quality is to be maintained as per applicable compliance levels. In case of failure, can lead to legal prosecutions and impact on environment and social aspects. Biological parameters (Pseudomonoas, Jeremic, E.coli, total colony count presence) as shown by third party consultant in their report	5077	Not expected to occur before 2024	ground-water quality in order better understand and potentially mitigate water risks related to water quality PMPKL Mardan has contracted relevant authorities and industrial stakeholders in order to raise awareness on water-related catchment risks and challenges, and implement best practices related to mitigation of contamination events.	- Joint actions with Stakeholders to mitigate shared water-related quality risk
9	Risk	Regulatory	Regulatory	4	B	4B	High	PMPKL has certain regulations applicable on it related to water , environment, noise, emissions etc that are required to be fulfilled as per applicability to maintain compliance levels. In case of violations can lead to legal prosecutions, suspension of licences, suspension or business stoppage. It can also affort the different standards certifications.	5077	Not expected to occur before 2024	PMPKL abides by all applicable legal applications and regular environmental tests are conducted and submitted to EPA	- Joint actions with Stakeholders to mitigate shared water-related quality risk. Social and environment value creations
10	Risk	Biological	Environmental - spills	3	B	3B	High	PMPKL has stored certain chemicals and oils that are necessary for running different equipments at site. It also has the risk of spillage that can lead to violations of standards & practices, legal violations, health impacts with slip & trip, water contaminations if reached to drains.	20$	Not expected to occur before 2024	PMPKL has a proper spillage procedure that is applicable across site. All legal applicable laws are applied	Value creation by improving systems, health benefits by avoiding slips, avoidce water & product contaminations
11	Risk	Physical	Business interuptions	3	B	3B	High	In PMPKL, business interruptions can occur due to unavailability or shortange of water or water interruptions. It can affect the people which can lead to labor strikes if unfavorable conditions occur.	NA	Not expected to occur before 2024	To ensure continuity, 02 wells are operational. Where 01 operates at a time	Ensuring business continuity

Risks		Severity			
		D	C	B	A
		Low	Medium	Serious	Catastrophic
Probability	4	Very likely	4D	4C	4B	4A
	3	Likely	3D	3C	3B	3A
	2	Unlikely	2D	2C	2B	2A
	1	Almost never	1D	1C	1B	1A

*** See "risk impact- probably" sheet in the excel document for risk/opportunity criteria

PMPKL Water Risk and Opportunities

No	Category	Type	Risks	Probability	Severity	Reason	Priority (updated 2022 then 2023)	Impact (on PMPKL & Others, Environment)	Cost ($)	Time frame the risk is expected to occure	Precausions/Countermeasure/ Actions / Initiatives ** Details of all actions & initiatives are given	Potential savings /value creation
12	Opportunity	Physical	PMPKL has the opportunity to improve the administration controls on availability & maintenance of hand washs and provide	3	B	3B	High	WASH matters are relevant for all stakeholders in the catchment, especially the local communities, the local population and the authorities which may tremendously help increasing awareness	253K		PMPKL take all opportunities to reduce water consumption * please see Strategy and water stewardship plan documents for all initiatives & actions	Internal campaign in order to raise awareness on WASH principles and the importance of a good water stewardship for the well-being of all.
13	Opportunity	Biological	To maintain adequate supply of drinking water glasses at industrial coolers to avoid the spread of potential contagious diseases.	3	C	3C	Moderate	- Joint actions with Stakeholders to mitigate shared water-related risk - Awareness amongst local population and Stakeholders on mitigation actions related to shared water challenges - Implementation of best practices in catchment territory.	NA		PMPKL take all opportunities to reduce water consumption * please see Strategy and water stewardship plan documents for all initiatives & actions	
14	Opportunity	Physical	which frequently informs internal employees on risky events and raise awareness on general flood risk related to its territory. Joint session with stakeholders like rescue 1122, PHED on floods. precautions and contagious diseases.	2	C	2C	Low		66.76K		PMPKL take all opportunities to reduce water consumption * please see Strategy and water stewardship plan documents for all initiatives & actions	- Joint actions with Stakeholders to mitigate shared water-related risk - Awareness amongst local population and Stakeholders on mitigation actions related to shared water challenges - Implementation of best practices in catchment territory. With the awareness session, emphases and people awareness will be made.
15	Opportunity	Physical	To install rain harvesters to use collected water for cleaning & lawn watering. Giving adequate chance for ground water to avoid extra use and maintain levels.	3	C	3C		PMPKL falls within a low flood risk area and its located near local bodies but if flood occurs its severity is more.	1600		PMPKL take all opportunities to reduce water consumption * please see Strategy and water stewardship plan documents for all initiatives & actions	
16	Opportunity	Physical	To maintain procedures for effective R&M. Backup supply of portable drinking water at site.	3	B	3B	Moderate	PMPKL is located in a sensitive territory due to recent extra-urbanization and population growth	375		PMPKL take all opportunities to reduce water consumption * please see Strategy and water stewardship plan documents for all initiatives & actions	Value creation by using measures to avoid water usage from wells for cleaning etc.
17	Opportunity	Physical	Site can operate from 01 well and keep 01 well as back up. Other opportunity can be keeping drinking water portable waters from suppliers. Rain harvestors can be installed for using for	1	D	1D	High	PMPKL is located in close proximity to several important water-related areas (PARAs) that are protected by environmental national and local authorities	NA		PMPKL take all opportunities to reduce water consumption * please see Strategy and water stewardship plan documents for all initiatives & actions	Value creation by giving access and supply of clean drinking water uninterruptedly
18	Opportunity	Regulatory	Abiding by the applicable laws to show commitment to being responsible organization.	4	B	4B	High	PMPKL has certain regulations applicable on it related to water , environment, noise, emissions etc that are required to be fulfilled as per applicability to	5077		PMPKL take all opportunities to reduce water consumption * please see Strategy and water stewardship plan	Implementation of best practice, with rain harvestors people awareness on milestone water interruptions for cleanine or lawn watering can be developed. With
19	Opportunity	Regulatory	PMPKL has the opportunity to coordinate with different regulatory bodies in maintaining these regulations. On site systems improvement, on site people awareness on applicable resolutions.	4	B	4B	High	PMPKL is bound to provide clean drinking water to people and clean disposal of water to be disposed off as discharge (both wet and dry) is to be maintained as per applicable compliance levels. In case of failure, can lead to legal prosecutions and impact the environment and social aspects. Biological parameters (Pseudomonas, arsenic, E.coli, total colony count presence) as shown by third party consultant in their report.			PMPKL take all opportunities to reduce water consumption * please see Strategy and water stewardship plan documents for all initiatives & actions	- Joint actions with Stakeholders to mitigate shared water-related quality risk,
20	Opportunity	Chemical	systems and controls to avoid spillages. Periodic and accurate maintenance of water-related infrastructure - Correct storage of hazardous	3	B	3B	High	Regulatory changes (methods/ alternative locations) will cause investment cost (for example to connect to municipality WW collection lines etc.)	33.24		PMPKL take all opportunities to reduce water consumption * please see Strategy and water stewardship plan documents for all initiatives & actions	- Joint actions with Stakeholders to mitigate shared water-related quality risk, Social and environment value creations
21	Opportunity	Physical	PMPKL has the opportunity to maintain the systems and controls to maintain the smooth continuity of business	3	B	3B	High	In PMPKL, business interruptions can occur due to unavailability or shortange of water or water interruptions. It can affect the people which can lead to labor strikes if unfavorable conditions occur.	NA		PMPKL take all opportunities to reduce water consumption * please see Strategy and water stewardship plan documents for all initiatives & actions	Value creation by improving systems, health benefits by avoiding slips, avoiding water & product contaminations

Risks		Severity			
		D	C	B	A
		Low	Medium	Serious	Catastrophic
Probability	4 Very likely	4D	4C	4B	4A
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	2 Unlikely	2D	2C	2B	2A
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Last updated: 9/10/2023, 13.10.2023, 20.102023
Updated by: Kulsoom Iftikhar (AWS Team Leader)
Update reason: Projects details and actions were updated. value creation added, link to best practice

Last updated: 5/04/24
Updated by: Kulsoom Iftikhar (AWS Team Leader)
Update reason: Water Quality targert Revised and formulated

Last updated: 16/09/24
Updated by: Kulsoom Iftikhar (AWS Team Leader)
Update reason: Water Quantity targets updated & other KPIs and Projects details and actions were updated. value creation added, link to best practice, benefits updated

PMPKL Water Strategy and Action Plan for 2023-2025

No	Shared Water-related challenges to mitigate				Goal	Strategy	Action	Description	Type	Benefit	Standard	Responsibles & Supporting roles/ functions	Cost (K$)		Time Frame			Measurement / Monitoring		Target	Result	Status	Follow-up Action (status)	Intended AWS Outcomes	Completed Results	Value Creation- Env	Value Creation- Social	Value Creation- Economic K usd	Link to Best Practice
	Baseline water stress / Water Level Depletion	Surface Water Quality	Access to WASH	Flood Occurrence / Biodiversity Degradation									Budget	Actual	Start Date	Due date	Evaluation Date	Modality	Typology										
1	✓	✓	✓	✓	Establish a leadership commitment on water stewardship	Define AWS policy and commitment; communicate internally	Prepare a local AWS commitment and get them signed by PMPKL Manufacturing Director.	Local AWS commitment is to be developed and share with all the stakeholders to get them on-board on water stewardship policy of PMPKL Mardan.	Social & Community (Internal)	Water stewardship commitment on water stewardship addressing the importance of AWS and how to achive the end goal	2.1 Commit to water stewardship	Kulsoom Iftikhar	No cost	No cost	15th Aug, 2024	30th Aug, 2024	15th Sep, 2024	Direct	Engagement	Share with All external Stakeholders & Internal Employees	Shared with All external Stakeholders & Internal Employees	Completed	Done.	Good water governance	Created Water Stewardship commitment on water stewardship	Increase awareness on sustainable water management among PMPKL employees, and all stakeholders	Ultimately, Increase clean and sustainable water source availability for other Sahiwal community.		
2	✓	✓	✓	✓			Train AWS Team and PMPKL Management Team on AWS requirements	Conduct a AWS Kick-off session with AWS team and PMPKL Site to train them on AWS requirements and expectation from them to participate in all the AWS proejcts and initiatives	Social & Community (Internal)	Water stewardship commitment on water stewardship addressing the importance of AWS and how to achive the end goal. Also, to train people on self awareness and linking woth 5 outcomes.	2.1 Commit to water stewardship	Kulsoom Iftikhar	No cost	No cost	1st July, 2024	10th Sep, 2024	15th Sep, 2024	Direct	Engagement	84 employees	84 employees	Completed	Done. AWS standard requirements trainings for all employees conducted.	Good water governance	Created Water Stewardship commitment on water stewardship	Increase awareness on sustainable water management among PMPKL employees, and all stakeholders			Engagement with peer organizations and relevant stakeholders (i.e., public sector such as Environment protection department, Irrigation Department, PHED) to promote water stewardship and open a catchment-based discussion and potential partnership on shared water-related risks and challenges. Executing specific trainings with the agricultural sector in order to advocate for good water governance amongst local farmers. Execute trainings on AWS awareness & its 5 outcomes to site, catchment population and stakeholders
3	✓	✓	✓	✓			Communicate Commitment internally via boards	Signed AWS commitment communication with all the sites to share ownership and responsibilities on water stewardship. Install AWS commitment on Canteen, notice boards CLA, main gate, Office block & locations	Social & Community (Internal)	to display, disclose and communicate the AWS commitment for easy visualization and engagement with people.	2.1 Commit to water stewardship	Kulsoom Iftikhar	0.2	0.13	15th Aug, 2024	29th Sep, 2024	30th Sep, 2024	Direct	Visualization	Display at 6 Locations in site & 6 at offsite locations	Display at 6 Locations in site & 6 at offsite locat	Completed	Done. Communicating the PMPKL AWS, and AWS strategies will continue via trainings, stakeholder engagement	Good water governance	Created Water Stewardship commitment on water stewardship	Increase awareness on sustainable water management among PMPKL employees, and all stakeholders			Public gathering and disclosure of relevant water-related data, such as water risk assessments, catchment water balance and quality status, AWS performmace & reportsin order to increase awareness, drive transparency and synergic projects to mitigate and address common challenges
4	✓						Define Water KPI for PMPKL Mardan and track on Leadership PDCA monthly and daily DDS	Water KPI(quantity & quality) to be defined in the SDDS and track in the leadership monthly PDCA to gauge the perfromance.	Social & Community (Internal)	Good governance of water and water savings and adding to water scarcity,	3.3 Implement plan to achieve site water balance targets 1.3 Gather water-related data for the site 2.4 Responsiveness and resilience to respond to water risks (climate change) 3.4 Implement plan to achieve site water quality	Abdul Waris	No cost	No cost	1st Jan, 2024	Dec-24	9th Sep, 2024	Direct	m3/ton of packed tobacco (Season)	1.81 m3/ton (Full year) 0.70m3/ton Quantity (Season) NEQS legal limits- Quality	0.73 m3/ton (Full Year)Quantity 0.52 m3/ton (season) Quantity NEQS legal limits- Quality	Continuous	Daily assesed in DDS to monitor the quantity trend and how to achive the target. Quarterly water quality tests performed and reports checked for any ambiguity.	Good water governance and sustainable water balance	Monthly follow up in PDCA is Completed.	Water consumption reduction 5906 m3. 0.25 m3/ton water use reduction			Implementing innovative, water saving or optimizing technologies and/or settings, etc., in order to increase water efficiency and waste water reuse, and consequently reduce water consumption. Defining KPIs as well
5	✓	✓	✓	✓	Develop a system that promotes and evaluates water- related legal compliance	Improved management systems promoting and evaluating water- related legal compliance	Review water related regulatory requirements to ensure compliance	Review of legal register with departments to ensure complaince against all water related legal requirements.	Social & Community (Internal)	Developed good water management systems. Identification & listing of legal requirements specific to water & AWS.	2.2 Develop and document a process to achieve and maintain legal and regulatory compliance	Kulsoom Iftikhar	13.48	13.48	1st Jan, 2024	Dec-24	15th Sep, 2024	Direct	Compliance %	80% Complaince	96.51% Complaince	On-Going	Done. Legal compliance is quarterly followed and reported. Next evaluation is on 27th Nov, 2024 IEE for Genset, LPG and Fuel storage tanks is in progress + NOC pending at EPA end. Follows are being done.	Good water governance Good water quality status Safe Water, Sanitation and Hygiene for All	Good documentation, good water governance	Being responsible water consumer, and complying with legal requirements			Facilitating and/or contributing to the development of platforms and instruments for sharing water-related data and feedback
6	✓	✓	✓	✓			Improve on Regulatory follow up via digitalization (Red-on- Line Software deployment)	Implementation of Red-on-line software by engaging 3rd party as a global initiative to improve regulatory complaince and follow up.	Social & Community (Internal)	Developed good water management systems. To make people more capable on laws and introducing the digital platform in line with excel legal register.	2.2 Develop and document a process to achieve and maintain legal and regulatory compliance 3.1 Implement plan to participate positively in catchment governance	Kulsoom Iftikhar	No Cost to PMPKL	No Cost to PMPKL	Jan-24	31st Jan, 2024	27th July, 2024	Direct	etem developm	100% made	100% made	On-Going	Red-Online regulatory follow up system is launched. Next review is in NoV, 2023	Good water governance Good water quality status Safe water, Sanitation and Hygiene Sustainable water balance	Standard legal documentation availabiliy for water management, good water governance	Being responsible water consumer, and complying with legal requirements; reduce waste, mitigate water contamination indirectly			Facilitating and/or contributing to the development of platforms and instruments for sharing water-related data and feedback
7	✓				Reduction of potable water consumption	Increased water efficiency measures Recycle/reuse of waste water,	Reuse of water used for cooling system of hydraulic oil	Water Heat Exchanger is used in order to cool down Hydraulic Oil of packing Station, the Water once pass through heat exchanger were wasted. Cooling Tower is installed to cool down heat exchanger	Technological	Reuse of water brings reduction of water consumption required for cooling helping us in catering for water scarcity, water depletion.	3.3 Implement plan to achieve site water balance targets 1.3 Site water related data	Abdul Waris , Asghar Khan	No Cost	No Cost	Jan-24	30th Aug, 2024	15th Sep, 2024	Direct	m3	15	15	Completed	Done. Reuse of water brings reduction in water consumption	Good water governance Sustainable water balance	Reduce water consumption, understanding sustainable water management. 0.14 m3/ton water savings	Reduce water consumption, increase sustainable water governance & balance 0.14 m3/ton water savings			Implementing innovative, water saving or optimizing technologies and/or settings, etc., in order to increase water efficiency and waste water reuse, and consequently reduce water consumption
8	✓				Reduction of potable water consumption	Recycle/reuse of waste water, Increased water efficiency measures	Reuse Condensate from redryers to reduce water and energy consumption- Best Practice	Reuse Condensate from redryers to reduce water and energy consumption- Best Practice	Technological	Reuse / recycle water to reduce water consumption and also saving energy I boiler area. Aiding in betterment of water sarcity, water strees and re-utilization.	3.3 Implement plan to achieve site water balance targets 1.3 Gather water-related data for the site 1.3 Site water related data	Abdul Waris , Asghar Khan	No cost	No cost	Jan-24	30th Aug, 2024	15th Sep, 2024	Direct	ton	1902.67	1902.67	Completed	Done. Compressor condenate line has been re-routed to feed water tank. Monthly water consumption is followed up by Utility-Engineering Department; if any increase of consumption is observed, communication is made to take corrective actions.	Sustainable water balance Good water governance	Reduce water consumption, understanding sustainable water management. 0.14 m3/ton water savings	Reduce water consumption, increase awareness on sustainable water conservation 0.14 m3/ton water savings			Implementing innovative, water saving or optimizing technologies and/or settings, etc., in order to increase water efficiency and waste water reuse, and consequently reduce water consumption
9	✓		✓		Reduction of potable water consumption	Increased water efficiency measures	-Installation of Lower size Water Taps '-Promptly identified and rectified water leakage points '-Close redundant/extra water consumption points '-Locking System of Water Taps so that only authorized resources can use that area water taps. Like Gardner at Lawns '-Installation of rainwater Storage Tanks to use rainwater for gardening. '-Timing of Water for gardening, provide early morning water to plants to avoid evaporation	-Installation of Lower size Water Taps '-Promptly identified and rectified water leakage points '-Close redundant/extra water consumption points '-Locking System of Water Taps so that only authorized resources can use that area water taps. Like Gardner at Lawns '-Installation of rainwater Storage Tanks to use rainwater for gardening. '-Timing of Water for gardening, provide early morning water to plants to avoid evaporation of water. '-Closed Carwash '-Closed Separate washrooms in GLT	Technological	Reduce water consumption, increase awareness on water conservation (This initiative was suggested by one of employee)	3.3 Implement plan to achieve site water balance targets 1.3 Gather water-related data for the site 1.3 Site water related data	Abdul Waris , Asghar Khan	No Cost	No cost	Feb-23	23-Aug	9th Sep, 2024	Direct	m3	3114	2113	Completed	Done. 2023 target Vs 2024 Achieved result	Good water governance Sustainable water balance	Reduce water consumption, increase awareness on sustainable water conservation 0.06m3/ton water savings	Reduce water consumption, increase awareness on sustainable water conservation			Promoting and encouraging the installation of water efficient fittings (i.e., water aerators in toilets, sensors on water taps etc.) for potable water reduction
13	✓			✓	Reduction of potable water consumption	Recycle/reuse of waste water , Water-saving plant settings	Piping Infrastructure upgrade in lawns by installing sprinklers to minimize fresh water usage	• In some lawns, treated water pipelines were not available leading to usage of fresh water for irrigation purposes. Sprinklers were installed to reduce fresh water consumption.	Technological	Utilization of less water to conserve fresh water, increase awareness on water conservation	3.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities 1.3 Gather water-related data for the site	Waseem Ali , Abdul Waris	TBD	TBD	Jan-24	Jul-24	Jan-25	Direct	m3	TBD	TBD	Proposed	Ensure the health of installed piping to conserve freshwater. Monthly water consumption is followed up by Utility-Engineering Department; if any increase of consumption is observed, communication is made to take corrective actions.	Good water governance Sustainable water balance	Reduce water consumption, understanding sustainable water management	Reduce water consumption, understanding sustainable water management			Implementing innovative, water saving or optimizing technologies and/or settings, etc., in order to increase water efficiency and waste water reuse, and consequently reduce water consumption
14	✓	✓			Reduction of potable water consumption	Maintenance - monitoring activities	Improvement in water metering at site for effective tracking and monitoring	• Additional water meters are installed in all areas across factory for effective monitoring and action planning	Technological	Improved water monitoring enabling easily focus on focus areas; ultimately creating opportunities for process water consumption reduction.	3.3 Implement plan to achieve site water balance targets 1.3 Gather water-related data for the site	Abdul Waris , Asghar Khan	3.87	3.87	Feb-23	17th July, 2024	15th Sep-2023	Direct	Installation	5 new meters installation	5meters installation	Completed	Done. Monthly follow up on water consumption through meters continue. Monthly water consumption is followed up by Utility-Engineering Department; if any increase of consumption is observed, communication is made to take corrective actions.	Sustainable water balance Good water governance	More control on water balance; identification of improvement areas, focus areas to focus reduction of water; 0.06 m3/ton water savings	More control on water balance; identification of improvement areas, focus areas to focus reduction of water; 0.06 m3/ton water savings			Increasing the number of water meters installed on-site and/or substitutive old or malfunctioning ones, in order to improve water flow tracking and leakage detection
15	✓				Reduction of potable water consumption	Increased water efficiency measures	Improvement in production machines efficiency leading to reduced water consumption	• Production days optimization by improvement in production machines efficiency leading to lower Compressed air and HVAC load	Technological	Reduced water consumption by optimization of machines efficiency to optimize production days. When machines will be efficient so less energy and less water will be consumed .	3.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities	Abdul Waris , Asghar Khan	TBD	TBD	Nov, 2023	Nov, 2024	May-25	Direct	Frequency	TBD	TBD	Proposed	Daily and Monthly water consumption is followed up by Utility-Engineering Department; if any increase of consumption is observed, communication will be made to take corrective actions.	Sustainable water balance Good water governance		This will help in less water usage		Better machines efficiney means less water and cost usage	Implementing innovative, water saving or optimizing technologies and/or settings, etc., in order to increase water efficiency and waste water reuse, and consequently reduce water consumption. Defining KPIs as well
16	✓				Reduction of potable water consumption	Increased water efficiency measures	Installation of water & steam flow meters on lamina redryer & other points to optimize consumption	water & steam meters are installed in all areas across factory for effective monitoring and action planning	Technological	Improved water monitoring enabling easily focus on focus areas; ultimately creating opportunities for process water consumption reduction. Moving towards site & catchment betterment and	3.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities	Abdul Waris , Asghar Khan	3.6	3.6	Mar-23	Jul-23	Oct-23	Direct	Installation	100% done	100 % done	Completed	Done. Monthly water quality monitoring followed up by Utility-Engineering Department; if any complain is received , communication is made to take corrective actions	Good water governance Safe Water, Sanitation & Hygiene	Improve water quanity usage and sustainable water management	More visability on water usage i.e. at what area or machine how much water is used so more system improvement will take place for less		Less water consumption would lead to cost utilization. Reduce water related costs. Improve company sustainable water system management	Increasing the number of water meters installed on-site and/or substitutive old or malfunctioning ones, in order to improve water flow tracking and leakage detection
17	✓				Develop the Site water balance and diagram	Improved management systems promoting and evaluating water- related to site water balance	Generation of the site water balance and Balance diagram & Sankey Diagram	To conduct and analyze the site water `balance by data gathering and constructing the balance diagram to identify the losses if any , improve site water quantity, optimize the usage and conserve water	Technological	Improved water monitoring enabling easily focus on focus areas; ultimately creating opportunities for process water consumption reduction. This wil help in more better visualization and site water	3.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities	Abdul Waris , Asghar Khan	No cost	No cost	Jan-24	30th Aug, 2024	15th sep, 2024	Direct	Visualization	100 % made	100 % made	Completed	Done in view of the available information. Monthly water quality monitoring followed up by Utility-Engineering Department; if any complain is received , communication is made to take corrective actions. Follow up is	Good water governance Safe Water, Sanitation & Hygiene	Improve water quanity usage and sustainable water management	Reuction in water usage and improve systems			Implementing innovative, water saving or optimizing technologies and/or settings, etc., in order to increase water efficiency and waste water reuse, and consequently reduce water consumption. Defining KPIs as well.
18					Reduction of potable water consumption	Maintenance - monitoring activities	Construction of PID diagrams of identified site water infrastructure	Construction of PID diagrams of identified site water infrastructure for effective maintenace & monitoring	Technological	Improved water monitoring enabling easily focus on focus areas; ultimately creating opportunities for process water consumption reduction. PID diagrams will tell us the flow of meters	3.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities	Abdul Waris , Asghar Khan	No cost	No cost	Jan-24	30th Aug, 2024	15th sep, 2024	Direct	N/A	100 % made	100 % made	Completed	Layouts made and shared with team	Good water governance Safe Water, Sanitation & Hygiene	Improve drinking water quality and sustainable water management	Reuction in water usage and improve systems			Implementing innovative, water saving or optimizing technologies and/or settings, etc., in order to increase water efficiency and waste water reuse, and consequently reduce water consumption. Defining KPIs as well
19	✓		✓		Reduction of potable water consumption,	Maintenance - monitoring activities	Identify and make the water related infrastructure diagram to know the infrastrustre and perform maintanece & monitoring	Identify and list down all site related water infrastructure.	Technological	Improved water monitoring enabling easily focus on focus areas; ultimately creating opportunities for process water consumption reduction. Dedicated water infrastructure list will highlight	3.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities	Abdul Waris , Asghar Khan	No Cost	No Cost	21st June 2024	13th July 2024	15th sep, 2024	Direct	Visualization	100 % made	100 % made	Completed	Submitted	Good water governance Safe Water, Sanitation & Hygiene	Improve drinking water quality and sustainable water management	Reuction in water usage and improve systems			Periodically replace, maintain and/or monitor water-related structures, in order to avoid pipe ruptures, spills and/or contamination events
20			✓		Carry out projects and activities with Stakeholders, employees, community members and local authorities in order to work together towards a sustainable water management and consolidation of AWS outcomes at catchment-level & site level	Engage in water-related campaigns and activities with relevant stakeholders in order to mitigate, anticipate, raise awareness and increase understanding of shared water challenges and risks	1-Construction of ablution area of workers washroom	To construct ablution area for workers & Upgradation/renowation of washrooms to improve the WASH	Social & Community (Internal)	Increased WASH practices, access to WASH. This will also address the basic human rights where PMPKL has been working globally on human rights.	3.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities	Waseem Ali	66	66	Sep-23	20th oct, 2023	20th oct, 2023	Direct	Installation	100 % made	100 % made	Completed	Follow up visits done for R&M	Safe water, sanitation and hygiene	Safe water, sanitation and hygiene		Improving the social aspect by attendingthe basic human rights. Giving a positive message to community as well showing		Provision of sufficient and high standard facilities for toilets and washrooms & handwash for men and women, and any other relevant needs (i.e., disabilities, age, religion, etc.)
21			✓				Construction of new washroom for management	To imrove the WASH & good goveronence at site, new washrooms to be constructed. 2-Upgradation/renowation of ablution area in management washrooms	Social & Community (Internal)		3.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities	Waseem Ali	42	42	2nd oct, 2023	10th nov, 2023	11th nov 2023	Direct	Installation	100 % made	100 % made	On-Going	Follow up visits done for R&M	Safe water, sanitation and hygiene	Safe water, sanitation and hygiene		Improving the social aspect by attendingthe basic human rights. Giving a positive message to community as well showing		Provision of sufficient and high standard facilities for toilets and washrooms for men and women, and any other relevant needs (i.e., disabilities, age, religion, etc.)
22			✓				Provision of washroom in new lady common room	To imrove the WASH & good goveronence at site, new washrooms constructed for lady common room.	Social & Community (Internal)	Increased WASH practices, access to WASH, good water goveronance. This is also helping with the inclusion and diversity improvement.	3.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities	Waseem Ali	31	31	15th June, 2023	18th July, 2023	25th July, 2023	Direct	Installation	100% done	100% done	Completed	Phase wise construction was done and inaugorated in presence of leadership	Safe water, sanitation and hygiene	Safe water, sanitation and hygiene, Good water governance		Improving the social aspect by attendingthe basic human rights. Giving a positive message to community as well showing		Provision of sufficient and high standard facilities for toilets and washrooms for men and women, and any other relevant needs (i.e., disabilities, age, religion, etc.)
23	✓	✓	✓				Consruction of new operational well to meet the waterrequirements- qulaity & quantity, WASH	Consruction of new operational well to meet the waterrequirements- qulaity & quantity, WASH	Social & Community (Internal)	Increased WASH practices, good water goveronancem, IWRA, Good qulaity & sustained quantity.	3.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities	Abdul Waris , Asghar Khan	70.175	70.175	Mar-23	25th Jul, 2023	3rd Aug, 2023	Direct	Installation	100% done	100% done	Completed	New operational well was succesfully constructed	Good water governance Safe Water, Sanitation & Hygiene, Goow wuality & sustained quantity, IWRA	Good water governance Safe Water, Sanitation & Hygiene, Good quality & sustained quantity, IWRA	Maintaining good water quality & IWRAs.	Attending the basic needs of people. Having a backup of water.		Provision of sufficient supplies of safe drinking water for all workers, considering increased needs in hot weather & as backup
24	✓		✓		Reduction of waste water , Reuse of rain water	Reduce water footprint based on established targets by employing process improvements, re-use and recycling activities and adapt technological measures	Installation of Rain harvestors in coordination with WSSCM at site & catchment	To reduce water consumption, a water collection tanks constructed to capture rainwater from plant roof and used for the watering of plants	Social & Community (Internal)	Reuse of rain water to avoid excess water usage . This will also show our commitment to stakeholders like WSSCM from where we are copyinh this idea.	3.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities 1.3 Gather water-related data for the site	Waseem Ali, Kulsoom , Waris	1.6	1.6	31st Aug, 2024	15th Sep, 2024	30th Dec, 2024	Direct	Installation	100%		On-Going	Rain harvestors installed at site and showed to WSSCM. Next we will be installing in catchment.	Sustainable	Sustainable water balance, Important water-related areas	Utilizing the rain water and aiding less water consumption		Building the systems on site in such a way that reuse of water will save money in future. As its beginning so more data sets will show the water reduction usage & its costs.	harvestors amongst local communities (i.e., Municipalities, villages etc.) to optimize the collection of rain water . 2- Active engagement, collaboration and best practice sharing with stakeholders from the industrial sector, in order to encourage the implementation of technical actions related to the reduction of groundwater withdrawals
25	✓	✓	✓	✓	Carry out projects and activities with Stakeholders, employees, community members and local authorities in order to work together towards a sustainable water management and consolidation of AWS outcomes at catchment-level	Engage in water-related campaigns and activities in order to mitigate, anticipate, raise awareness and increase understanding of shared water challenges and risks	Communication on water related topics awareness raising posters, video sharing through PMI communication channels, emailing, stakeholder communication meetings.	Increased awareness of PMI employees and service providers on AWS standar requirements and water conservation.	Social & Community (Internal / External)	Increased awareness of proper management of resources. Shoing our commitment to AWS and its 5 outcomes.	5.1 Disclose water-related internal governance of the site's management 5.2 Communicate the water stewardship plan with relevant stakeholders	Kulsoom Iftikhar	No cost	No cost	Dec-23	Oct, 2024	Dec-24	Direct	Visulization, me	PMPKL employees, stakeholders	PMPKL employees, stakeholders	On-Going	Water awareness video preparation(March 2022); Water awareness raising poster preparation (September 2020) TV slide sharing, etc. 2021-June World Environment Day Event communications 2021- September World Cleanup Day Event Communication 2022- March- World Water Day Event Communications	Increase awareness on sustainable water management PMPKL strategies on water among stakeholders.	Increase awareness on sustainable water management through all stakeholders		Water stewardship, and beyond catchment fences. Increase awareness on sustainable water usage; indirectly will increase clean water sources for Sahiwal community		Engagement with peer organizations and relevant stakeholders (i.e., public sector such as Environment protection department, Irrigation Department, PHED) to promote water stewardship and open a catchment-based discussion and potential partnership on shared water-related risks and challenges
26	✓	✓	✓				Global Water Day and Water related initiatives campaign to be carried out	• Awareness campaign on basic Water conservation and WASH principles amongst the employees and in-house contractors, in order to provide information and divulgate best practices to reduce water consumption.	Social & Community (Internal)	Increased awareness of site employees (NCLA+CLA+Service Providers) on natural resources, water scarcity problems, water level depletion, Water risks.	3.1 Implement plan to participate positively in catchment governance 5.2 Communicate the water stewardship plan with relevant stakeholders 5.3 Disclose annual site water stewardship summary 5.4 Disclose efforts to collectively address shared water challenges 4.3 Evaluate the stakeholders' consultation feedback	Kulsoom Iftikhar/ AWS team	No Cost	No cost	Mar-23	Oct, 2023	Dec, 2023	Direct	Participation	PMPKL employees, stakeholders	PMPKL employees, stakeholders	On-Going	Water coservation related initiatives and awareness session in their communities. Awareness videos to be shared. Stakeholder sessions on plan & strategy & performnace.	GOOD WATER GOVERNANCE, Sustainable Water Balance, WATER SANITATION AND HYGIENE	Increase awareness on sustainable water management among internal & external stakeholders	Increase awareness on sustainable water management among PMPKL employees, and all stakeholders			Engagement with peer organizations and relevant stakeholders (i.e., public sector such as Environment protection department, Irrigation Department, PHED) to promote water stewardship and open a catchment-based discussion and potential partnership on shared water-related risks and challenges
27	✓			✓			World Environment Day celebration and Tree Plantation Activity to be carried out & unveiling of AWS certification with stakeholders	• Awareness campaign on basic environment preservation and ecosystem degradation amongst the employees and in-house contractors, in order to provide information. • Tree/Flower planting activity carried out at on-site green area with PMPKL employees and in-house contractors.	Social & Community (Internal)	Increased awareness on environment, water conservation through planting. Indirectly increase rain potential, reduce evaporation from soil, increase water catchment by soil. Supporting biodiversity and increasing awareness on biodegradable waste using as compost and reducing chemical fertilizer usage to save water	4.3 Evaluate the stakeholders' consultation feedback 3.1 Implement plan to participate positively in catchment governance	Kulsoom Iftikhar Waseem Ali	0.02	0.02	Jan-24	Jan-24	Jan-24	Direct	Plantation	40 flowers plantation at site & 5 tree plantation	41 flowers plantation at site	Completed	Total 40 flowers are to planted at site & 5 trees	GOOD WATER GOVERNANCE, Sustainable Water Balance, Good Water Quality	Increase awareness on sustainable water management among internal & external stakeholders	Increase awareness on sustainable water management, catchment environmental and water related problems and risks; reduce water losses due to evaporation (indirectly)			Engagement with peer organizations and relevant stakeholders (i.e., public sector such as Environment protection department, Irrigation Department, PHED) to promote water stewardship and open a catchment-based discussion and potential partnership on shared water-related risks and challenges
28	✓	✓					Water comsumption and quality related data to be requested from outsourced service and raw material suppliers	• Detailed investigation (via data request and engagement) of raw material (DIM) suppliers and outsourced service provider's: water consumption, quality compliance, exposure to water-related risks and implementation of sustainable water practices • Greater engagement with PMPKL Mardan, growth in motivation towards disclosure and Stakeholder engagement, sharing of water data as well as water safeguarding strategies	Social & Community (External)	Increased awareness of proper natural resources management, and on water scarcity problems, water risks etc. It will include our outsourced/ vendors in the AWS and seriouness of the matter will be cascaded. Responsibility & accoutabilty factors will be coming into consideration.	3.7 Implement plan to maintain or improve indirect water use within the catchment 1.4 Indirect water use via suppliers/outsourced vendors	Kulsoom/ Hassan	No Cost	No Cost	2nd July, 2024	30th Aug, 2024	Sep, 2024	Direct	Engagement	9 Outsourced service provider 3 DIM Supplier	5 Outsourced service provider 3 DIM Supplier & Leaf	On-Going	Done	GOOD WATER GOVERNANCE,	Increase awareness on sustainable water management among internal & external stakeholders	Increase awareness on sustainable water management among internal & external stakeholders		Reduce water-related costs, Improve company sustainable water system management.	Sharing of information, studies and/or gathered know-how on the importance to not overexploit and/or depend on groundwater reserves and deep well withdrawals
29	✓			✓			To check feasability of converting non-operational well to utilize Rain Water for effective ground water table recharge & watering lawn	to convert non-operational well to utilize maximum rain water, in case of heavy rain due to climate change for the future. Identified as risk and challenge	Social & Community (Internal)	• Increased recovery of rain water utility for ground water level recharge. • Promoting and leading by good examples others in the catchment.	1.3 Gather water-related data for the site 3.1 Implement plan to participate positively in catchment governance	Kulsoom/ Waris	3.76	3.76	Aug, 2023	Dec-24	Jan-25	Direct	m3	TBD	TBD	Proposed	Vendor has visited the site for survey ad PMPKL has suvmitted the site data so that vendor can share the plan. The study & cost estimation is on progress	SUSTAINABLE WATER BALANCE GOOD WATER GOVERNANCE	Sustainable water balance, Important water-related areas		Increase clean and sustainable water source availability for Mardan community.		Constructing and/or contributing to the construction of rain water collection harvestors amongst local communities (i.e., Municipalities, villages etc.) to optimize the collection of rain water
31	✓	✓	✓	✓			AWS Stewardship Report/plan & strategy/AWS organogram/Policy & stakeholder announcement sharing with stakeholders and Community & employees by conducting sessions/ personal meetings/emails/sharing on publically open PMI website for everyone to access.	• Public disclosure of AWS implementation, benefits and mitigation strategies carried out • Direct effort in reaching out to Stakeholders, local population and community • Raised visibility on water stewardship efforts	Social & Community (External)	Disclosing the work done on AWS will show our stakeholders that PMPKL is fully committed for the bettwrment of site as well as catchment. More visibility on our progress.	5.3 Disclose annual site water stewardship summary 5.4 Disclose efforts to collectively address shared water challenges 4.3 Evaluate the stakeholders' consultation feedback	Kulsoom , Sundila, Kulsum Khan	No cost	No cost	July, 2024	Sep-24	Dec-24	Direct	Engagement	PMPKL employees, stakeholders	PMPKL employees, stakeholders	On-Going	AWS stewardship report,Plan & stragtegy, organorgram for 2023 shared with stakeholders. While AWS stewardship performance report will be published publically in November, 2023 after certification completion. This is PMPKL Mardan first year for certifcation.	Good water governance Sustainable Water Balance Good water quality status IWRA Safe Water, Sanitation and Hygiene	Increase awareness on sustainable water management PMPKL Mardan strategies on water among stakeholders; communication with public & customers		Increase awareness on sustainable water management, catchment environmental and water related problems and risks among all stakeholders		Public gathering and disclosure of relevant water-related data, such as water risk assessments, catchment water balance and quality status, AWS performmace & reportsin order to increase awareness, drive transparency and synergic projects to mitigate and address common challenges
32	✓	✓	✓	✓			Engagement event with Rescue 1122, PHED (By Discussion with Irrigation/PHED & Rescue 1122 Department), there is a need on the awareness session on floods & safety precautions, spread of contagious diseases, clean drinking water & sustainable use of water and WASH in the catchment area.	conducting 02 engagements with our stakeholders in view of our project AWS, where we will be donating some PPEs and other items (first aid boxes, life jackets, portable de-wash pump, filtration unit, drinking water tests, tree plantation, installation of waste bins, R&M of washrooms & new installation of wash stations & other accessories, rain harvestor) as per the scope. This is done in view of the risks & challenges identifoed during our stakeholder meetings, data gathering and insights from govtt departments.	Social & Community (External)	Increased awareness of proper natural resources management, and on water scarcity problems, water risks etc., WASH, legal requirements,	4.3 Evaluate the stakeholders' consultation feedback 3.1 Implement plan to participate positively in catchment governance	Kulsoom, Waseem Ali, Sundila, Kulsum Khan, Rida, Rehma	0.22	0.22	Dec-23	15th Nov, 2024	30th dec, 2024	Direct	Engagement	Engage EPA Engage PHED Engage Rescue 1122 Engage 200 Local Community volunteers 30 tree plantation	TBC	On-Going	This activity will be reported on local news and shared with our stakeholders including PMI global, internal stakeholders via news paper, videos shows on factory TVs. Activity will take place as soon as PMPKL ethics & compliance and legal requirements are completed by Oct, 2023	Good water governance Good water quality status IWRA Safe Water, Sanitation and Hygiene	Increase awareness on sustainable water management PMPKL's strategies on water among stakeholders; communication with public & customers		Increase awareness on sustainable water management, catchment environmental and water related problems and risks among all stakeholders		Engagement with peer organizations and relevant stakeholders (i.e., public sector such as Environment protection department, Irrigation Department, PHED) to promote water stewardship and open a catchment-based discussion and potential partnership on shared water-related risks and challenges
33	✓			✓			TREE PLANTING CAMPAIGN - plant saplings distribution among the community of Baghicha deri at local hospital	• Joint involvement with local stakeholders EPA • Increased visibility and setting a good example for others This is done in view of the risks & challenges identifoed during our stakeholder meetings, data gathering and insights from local community..	Social & Community (External)	Increased awareness on environment, water conservation through planting. Indirectly increase rain potential, reduce evaporation from soil, increase water catchment by soil. As forests are being cut down at fast rate so making a self made forest at local area closer to PMPKL will ensure better over view.	3 Evaluate the stakeholders' consultation feedback 3.1 Implement plan to participate positively in catchment governance	Kulsoom, Waseem Ali, Sundila, Kulsum Khan, Rida, Rehma	0.22	0.22	Dec-23	15th Nov, 2024	30th dec, 2024	Direct	Installation	30 trees donation	TBC	On-Going	Total 30plant saplings will be distributed among the local community of Bachicha Dheri	Good water governance Sustainable water balance Good water quality	Increase awareness on sustainable water management among internal & external stakeholders	Building the environemnt by creating small forest and promoting the ecosystem maintenace	Increase awareness on sustainable water management, catchment, environmental and water related problems and risks; reduce water losses due to evaporation (indirectly)		1-Engagement with peer organizations and relevant stakeholders (i.e., public sector such as Environment protection department, Irrigation Department, PHED) to promote water stewardship and open a catchment-based discussion and potential partnership on shared water-related risks and challenges. 2- Execution, active participation and/or contribution to tree planting campaigns, possibly with relevant stakeholders of the territory, in order to encourage reforestation and reduction of events such as erosion, landslides and evapotranspiration rates
34			✓				Installation of hand wash basins and drain system repair at local coomunity to improve WASH	• Installation of hand-washing facilities and repair of drain system where required in local community schools to improve WASH • Promoting and leading by good examples others in the catchment This is done in view of the risks & challenges identifoed during our stakeholder meetings, data gathering and insights from govtt departments.	Social & Community (External)	Increased awareness of proper natural resources management, and on water scarcity problems, water risks etc.	4.3 Evaluate the stakeholders' consultation feedback 3.1 Implement plan to participate positively in catchment governance	Kulsoom, Waseem Ali, Sundila, Kulsum Khan, Rida, Rehma	0.6	0.6	Dec-23	15th Nov, 2024	30th dec, 2024	Direct	Installation	6 muslim shower installation 8 sink & installation 5 flush tanks 4 english commode 6 taps & 4 senor taps installation	TBC	On-Going	Handwashing station will be installed and drain system will be repaired. Inspection to ensure the health will be carried out.	GOOD WATER GOVERNANCE, SAFE DRINKING WATER SANITATION AND HYGIENE	8 hand washing facilties and drain system is repaired to improve the hyginene and increased awareness on water conservation are carried out.		Improved WASH practices; Reduce risk of health issues		Provision of sufficient and high standard facilities for toilets and washrooms & handwash for men and women, and any other relevant needs (i.e., disabilities, age, religion, etc.)
35			✓				Workers,management and female washrooms rehabilitation and female common rooms to be build at site	Workers, managmeemnt and female washrooms to be rehabilitatted to imporve the WASH at site. Female common rooms to be build to improve the WASH for females.	Social & Community (Internal)	Increased WASH practices, access to WASH	4.3 Evaluate the stakeholders' consultation feedback 3.1 Implement plan to participate positively in catchment governance	Kulsoom, Waseem	139.0	139.0	Jun-23	Nov-23	Dec-23	Direct	Installation	100% done	100% done	Completed	On-Going. Management washroom rehabilitation is in progress.	GOOD WATER GOVERNANCE, SAFE DRINKING WATER SANITATION AND HYGIENE	Workers and female washroom rehabilitation is done to improve the WASH. Female commmon rooms are built to provide better WASH facitlites for women.	Reduce risk of health issues, access to WASH at site	Position PMPKL as leader in Water stewardship in Mardan, and beyond catchment fences by giving a positiv emessage on himan rights, inclusiomn & diversity.		Provision of sufficient and high standard facilities for toilets and washrooms for men and women, and any other relevant needs (i.e., disabilities, age, religion, etc.)
36				✓			Emergency Response & preparedness Session covering Flood awareness and water cotamination is to be carried out with	A detailed emergency response & preparedness awarenss session to be cionducted with all the employees + service providers to briefly desrcibe their	Social & Community (Internal)	Increased awareness of proper management of resources, and on water scarcity problems, water risks, Giving people more idea on how AWS is also	2.2 Identify the system to maintain compliance obligations for water and wastewater management	Kulsoom	No Cost	No Cost	1at Jan 2024	July, 2024	15th Sep, 2024	Direct	Engagement	100% done	100% done	Completed	Email communication and session was conducted on internal governance & role & responsibilities by AWS team. Another session will be arranged in coordination with Rescue	GOOD WATER GOVERNANCE, SAFE DRINKING WATER SANITATION AND HYGIENE	Increase awareness on sustainable water management, emergency prepardness, water NCs among employees and service providers.	Increase awareness on sustainable water management among PMPKL employees, and service providers	People prepardness & readiness for handling water realted emergencies.		as Environment protection department, Irrigation Department, PHED) to promote water stewardship and open a catchment-based discussion and potential partnership on shared water-related risks and challenges
37	✓	✓	✓	✓			AWS performance and intiatives taken in the catchment to be published in the annual Sustainability Reporting/ yammer & pmiwebsite	• Global publication of AWS-dedicated article in annual sustianbility report for global PMI views • Increased visibility amongst employees and global PMI community • Awareness regarding on-going accomplishments related to water stewardship	Social & Community (Internal)	Increased awareness of proper management of resources, and on water scarcity problems, water risks	5.3 Disclose annual site water stewardship summary 5.4 Disclose efforts to collectively address shared water challenges 4.3 Evaluate the stakeholders' consultation feedback	Kulsoom	No Cost	No Cost	Nov, 2024	Dec, 2024	Jan-25	Direct	Engagement	PMPKL employees, stakeholders	TBC	Planned	To follo wup with communication team on the publishing in yammer and pmi website	Good water governance Sustainable Water Balance Good water quality status IWRA Safe Water, Sanitation and Hygiene		Increase awareness on sustainable water management among PMPKL employees, and service providers	Increase clean and sustainable water source availability and infrastructure safety.		Public gathering and disclosure of relevant water-related data, such as water risk assessments, catchment water balance and quality status, AWS performmace & reportsin order to increase awareness, drive transparency and synergic projects to mitigate and address common challenges
38	✓	✓	✓	✓			AWS awareness session and progress share with employees	• Internal PDCA meeting dedicated to AWS Certification project disclosure • Increased awareness amongst service providers regarding AWS Certification and sustainable water management practices	Social & Community (Internal)	Increased awareness of site employees (NCLA+CLA+Service Providers) on natural resources, water scarcity problems, water level depletion, Water risks. Disclosing the work done on AWS will show our stakeholders that PMPKL is fully committed for the bettwrment of site as well as catchment. More visibility on our progress.	4.3 Evaluate the stakeholders' consultation feedback 3.1 Implement plan to participate positively in catchment governance	Kulsoom	No Cost	No Cost	July, 2024	Aug, 2024	Dec-24	Direct	Engagement	84 employees	84 employees	On-Going	AWS update on initiaitves and action taken shared with the employees to increase their participation and egagement.	Sustainable water balance Good water governance	Increase awareness on sustainable water management PMPKL's strategies on water among stakeholders; communication with public & customers	Increase awareness on sustainable water management among PMPKL employees, and service providers			Engagement with peer organizations and relevant stakeholders (i.e., public sector such as Environment protection department, Irrigation Department, PHED) to promote water stewardship and open a catchment-based discussion and potential partnership on shared water-related risks and challenges
39	✓	✓	✓	✓	Carry out projects and activities with Stakeholders, employees, community members and local authorities in order to work together towards a sustainable water management and consolidation of AWS outcomes at catchment-level	Engage in water-related campaigns and activities in order to mitigate, anticipate, raise awareness and increase understanding of shared water challenges and risks	Separtae water meetings to be organized to increase water related concerns and shared water risks awareness and related precautions.	Separate meetings on water stewardship o be carried out to improve collaboration among all the stakeholders on water related common challenges/risks and opportunities	Social & Community (Internal)	Increased awareness of proper management of resources, and on water scarcity problems, water risks; reduce catchment water risks Planned to be organized in Mardan with the participation of farmers, Industry, University, Municipality, Schools, Regulatory bodies etc. bringing more involvelemnt, engagemnts and inclusiveness of all stakeholders.	4.3 Evaluate the stakeholders' consultation feedback 3.1 Implement plan to participate positively in catchment governance	EA / Sustainability / LR / Stakeholders	No Cost	No Cost	July, 2024	Oct, 2024	Nov, 2024	Direct	Engagement	5 industries 9 institutional 1 school 2 NGOs	5 industries 9 institutional 1 school 2 NGOs	On-Going	Feedback taken from them. Risks and challenges identofid and made part of AWS plan & strategy.	Good water governance Sustainable Water Balance Good water quality status IWRA Safe Water, Sanitation and Hygiene	Good water governance Sustainable Water Balance Good water quality status IWRA Safe Water, Sanitation and Hygiene	Increase awareness on sustainable water management among PMPKL employees, and service providers			Engagement with peer organizations and relevant stakeholders (i.e., public sector such as Environment protection department, Irrigation Department, PHED) to promote water stewardship and open a catchment-based discussion and potential partnership on shared water-related risks and challenges
40		✓	✓		Reduction of potable water consumption	Maintenance - monitoring activities	3rd Party inspection and health check of deep wells and report sharing with PMPKL	3rd party is engaged to perfrom well condition check and also	Technological	Knowing water source predications, being ready for future water related risks related tp good maintence of well, and taking actions on time.	1.3 Gather water-related data for the catchment 1.3 Gather water-related data for the site 5.4 Disclose efforts to collectively address shared	dul Waris, Asghar Khan & Kulso	1.298	1.298	July, 2023	Sep-23	Sep-23	Direct	Engagement	Test results and well videography	Test results and well videography	Completed	Well videography reports received. Detailed report shared for both wells.	Good water governance Good water quality status Safe Water, Sanitation and Hygiene, IWRA	Good water governance Good water quality status Safe Water, Sanitation and Hygiene		Increase clean and sustainable water source availability and infrastructure safety.		Periodically replace, maintain and/or monitor water-related structures, in order to avoid pipe ruptures, spills and/or contamination events
41			✓		Reduction of potable water consumption	Maintenance - monitoring activities	Washrooms accessories installation to suppot in adequacy of WASH in schools and community	As per recived information from the community and schools	Social & Community (External)	Promoting WASH in local community.	4.3 Evaluate the stakeholders' consultation feedback 3.1 Implement plan to participate positively in catchment governance	Kulsoom, Waseem Ali	0.6	0.6	Dec-23	15th Nov, 2024	30th dec, 2024	Direct	Installation	6 muslim shower installation 8 sink & installation 5 flush tanks 4 english commode	TBC	On-Going	Planning & survey is done. PO is created for execution. Implementation will satrt after go ahead from legal ,E&C team	Good water governance Good water quality status Safe Water, Sanitation and Hygiene	Good water governance Good water quality status Safe Water, Sanitation and Hygiene		Improving WASH at actchment, basic human rights and PMPKL commitment to AWS.		Engagement with peer organizations and relevant stakeholders (i.e., public sector such as Environment protection department, Irrigation Department, PHED) to promote water stewardship and open a catchment-based discussion and potential partnership on shared water-related risks and challenges
42	✓	✓			Reduction of potable water consumption	Recycle/reuse of waste water, Increased water efficiency measures , safe & improved disposal effluent	Feasability study of WWTP installation at GLT	Discussed with management and vendors & EPA. Feasibility study to install Waste water treatment at GLT & water process filtration plant. Identifed as site risk	Technological	Increased WASH practices, safe water disposal, avoid contamir	3.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities	Engineering /EHS	TBD	TBD	Jan-24	Dec, 2024	Jan-25	Direct	Installation	1 WWTP	TBC	On-Going	Expert pinion to be taken, Feasilibity study will be done Jan 2024	Safe Water, Sanitation and Hygiene Good water governance	Safe Water, Sanitation and Hygiene Good water governance	Improving the hygiene and safe disposal at site and for catchment, improving site infrastructure and water balance			Investigating on the potential installation of water-related infrastructures, such as Water Treatment Plants (WTP) and Waste Water Treatment Plants (WWTP) , oil water separators, etc. directly on-site
43			✓		Reduction of potable water consumption	Maintenance - monitoring activities	Water filtration unit installation in collaboration with PHED at local hospital/ GLT front wall (For Local Community)	A large capacity water filtration unit installation to be carried out to proivide safe drinking water to the local community as discussed in the water stewardship meeting. Identofied as catchment risk	Social & Community (External)	Increased WASH practices, access to WASH, Addessing the risk	3.9.3 Implement plan to achieve best practice for water quality 1.7 Understand the site's water risks and opportunities	EA / Sustainability / LR / Stakeholders	0.14	0.14	Dec-23	15th Nov, 2024	30th dec, 2024	Direct	Installation	1 Filter unit	YBC	On-Going	Planning & survey is done. PO is created for execution. Implementation will satrt after go ahead from legal ,E&C team	Safe Water, Sanitation and Hygiene Good water governance	Safe Water, Sanitation and Hygiene Good water governance		Improving the safe drinking water , supporting the basic human rights		Provision of sufficient supplies of safe drinking water for all workers, considering increased needs in hot weather & as backup
44	✓	✓	✓		Carry out projects and activities with Stakeholders, employees, community members and local authorities in order to work together towards a sustainable water management and consolidation of AWS outcomes at catchment-level	Engage in water-related campaigns and activities in order to mitigate, anticipate, raise awareness and increase understanding of shared water challenges and risks	Awareness Sessions that will be conducted with local community, households and farmers on daily basis engaging the NGO IRSP- Integrated Regional Support Program).	1-Awareness sessions on : 1- AWS & its 5 outcomes (Good Water governance, sustainable water balance, good water quality, important water related areas, & WASH), Need for AWS, Sustainable Water use & Saving, WASH), AWS policy. 2-PMPKL plan & strategy towards reducing the water footprint. 3-Audience to share any feedback or comments, any risks or challenges they want to share and feedback on PMPKLs initiative towards AWS. 4- PMPKL initiatives that are being done in coordination with the stakeholders towards sustainable water footprint in catchment to be shared	Social & Community (External)	Increased awareness of proper management of resources, and on water scarcity problems, water risks & Challenges, safe water usage, no wastage of water	4.3 Evaluate the stakeholders' consultation feedback 3.1 Implement plan to participate positively in catchment governance	Kulsoom & Suleman Gul	No Cost	No Cost	July, 2024	4th sep, 2024	15th Sep, 2024	Direct	Engagement	3140 session	3140 session	Completed	Sessions are in progress. This is excellent to broaden our communication to such detailed level and audience including visits to individual houses . Very well done. Besides the trainings, kids have participated in this campaign on AWS by making posters and awareness on water saving was practically demonstrated via small activities. It can be seen that hand wash activity is also conducted.	Good water governance Good water quality status Safe Water, Sanitation and Hygiene Good water quality IWRA	Good water governance Good water quality status Safe Water, Sanitation and Hygiene Good water quality IWRA	Water saving initiative awareness and saving water	People development on AWS and how it helps the catchement & people.	Water saving & people understanding on optimized usage of water will save costs	Engagement with peer organizations and relevant stakeholders (i.e., public sector such as Environment protection department, Irrigation Department, PHED) to promote water stewardship and open a catchment-based discussion and potential partnership on shared water-related risks and challenges
45	✓	✓	✓	✓	Carry out projects and activities with Stakeholders, employees, community members and local authorities in order to work together towards a sustainable water management and consolidation of AWS outcomes at catchment-level	Engage in water-related campaigns and activities in order to mitigate, anticipate, raise awareness and increase understanding of shared water challenges and risks	Sharing messages / emails / posters with government bodies so that they can share with rest of the stakeholders	World Water Day / Environment Day / Flood Awareness/ contagious diseases for all catchement communities and stakeholders to be developed and shared with PHED, Rescue 1122 & EPA for further distribiution	Social & Community (External)	Increased awareness of internal / external stakeholders on natural resources, water scarcity problems, water level depletion, Water risks.Disclosing the work done on AWS will show our stakeholders that PMPKL is fully committed for the bettwrment of site as well as catchment. More visibility on our progress.	3.1 Implement plan to participate positively in catchment governance 5.2 Communicate the water stewardship plan with relevant stakeholders	Kulsoom	0.22	0.22	Dec-23	15th Nov, 2024	30th dec, 2024	Direct	Engagement	Engage EPA Engage PHED Engage Rescue 1122 Engage Local Community volunteers 30 tree plantation	TBC	On-Going	This activity will be reported on local news and shared with our stakeholders including PMI global, internal stakeholders via news paper, videos shows on factory TVs.	Good water governance Good water quality status Safe Water, Sanitation and Hygiene Good water quality IWRA			Awareness on AWS and PMPKL commitment to AWS, site & catchment betterment		Public gathering and disclosure of relevant water-related data, such as water risk assessments, catchment water balance and quality status, AWS performmace & reportsin order to increase awareness, drive transparency and synergic projects to mitigate and address common challenges

46		✓		✓	Avoidance of contamination -environmental impacts	Maintenance - monitoring activities	• New parameter analysis to ensure best water quality	More water sample points to be identofied including Process, potable & non potable water with additional paaremters added fror water quality tests	Technological	Adding more parametrs as per risks & challenges identofied are going to help with more analysis on water quality. In case of any deviations , timely actions to take that are appropriate relavantto the problem identofied. Also, its gonna help with the root cause of the problem with stakeholders.	1.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities 1.3 Gather water-related data for the site	Kulsoom, Asghar Khan, S.M.Ali	3.71	3.71	1st Jan, 2024	1st Sep, 2024	15th Sep, 2024	Direct	Chemical, biological parameters	100 % testing	100 % testing	Completed	Test report sreceived. Analysis to be done by Oct end	Good water quality status, Safe water, sanitation and hygiene	Good water quality status, Safe water, sanitation and hygiene	More process water tests to see the outcome & ensure safe water is drained to environemnt	Providing safe drinking water to site & reducing human helath diseases.		Executing more stringent monitoring campaigns on additional water quality parameters, in order to provide a more detailed quality screening
47	✓	✓			Reduction of potable water consumption	Recycle/reuse of waste water, Increased water efficiency measures	Recycled waste water mapping to be carried out. To check the feasability of reuse of waste water and make a proper action plan.	Recycled waste water mapping to be carried out. To check the feasability of reuse of waste water and make a proper action plan. Identied as opportunity for improvement.	Technological	Increased awareness of proper management of resources, and on water scarcity problems, water risks & Challenges, safe water usage, no wastage of water	1.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities 1.3 Gather water-related data for the site	Kulsoom, Asghar Khan, S.M.Ali	TBD	TBD	Aug, 2023	Aug, 2025	Sep-25	Direct	NA	TBD	TBD	Proposed		Sustainable water balance Good water governance	Reduce water consumption, increase awareness on sustainable water conservation	Reduction in water usage by reusing water			Implementing innovative, water saving or optimizing technologies and/or settings, etc., in order to increase water efficiency and waste water reuse, and consequently reduce water consumption
48		✓			Avoidance of contamination -environmental impacts	Maintenance - monitoring activities	Waste collection & disposal	Waste collection & disposal at farmers premesis to collect, segregate and dispose off hazardous & non hazardous waste . Identofied as site and catchment risk	Social & Community (External)	Increased awareness & initaitive towards clean environemnt & avoid water pollution with hazardous & non hazardous waste	3.9.3 Implement plan to achieve best practice for water quality 1.7 Understand the site's water risks and opportunities 1.3 Gather water-related data for the site	Faiza Lodhi/Kulsoom Iftikhar	42.16	33.24	1st June, 2024	30th Sep, 2024	30th Sep, 2024	Direct	Engagement	100% coverage of farmers to ensure clean premises 371.02 KGs Hazardous & 305.03 Non Hazardous waste collected till now	371.02 KGs Hazardous & 305.03 Non Hazardous waste collected till now	Completed	Project completed.	Good water quality status, Safe Water, Sanitation and Hygiene, IWRA	Good water quality status, Safe Water, Sanitation and Hygiene, IWRA	When environment is clean so waste will not be drained in water channels rather properly diposed off so promoting clean IWRAs	Promote clean Premises and goving mressage about cleanliness of enviroment, its effects on people & surrondings		Execution, active participation and/or contribution to clean-up campaigns, possibly with relevant stakeholders of the territory, in order to avoid hazardous pollution vents and contribute to IWRA status improvement. Advocating and promoting a conscious use of pesticides, fertilizers, etc., amongst local farmers, in order to avoid the phenomena of groundwater percolation and subsequent quality deterioration. CPA safe disposal
49	✓				Reduction of potable water consumption	Reduce water footprint based on established targets by employing process improvements, re-use and recycling activities and adapt technological measures	PK leveller	Water Saving and increase in crop production by introducing land leveler mechanization. Identofied as water scarcity risk and challenge	Social & Community (External)	Save 25mio m3 of water by 2033 PK: 261K m3 (450 Ha) water saving estimated for 2024	1.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities 1.3 Gather water-related data for the site 1.4 Indirect water usage	Faiza Lodhi/Kulsoom Iftikhar	16.72	16.54	1st Jan, 2024	30th Dec, 2024	30th Dec, 2024	Direct	Engagement	261K m3 water saving for PK market for 449.2 Ha	276K m3 for 449.2 Ha	Completed	In Progress. Data is internally finalized 30th Sep, and will be sent to OC for validation by Dec 2024.	Good water governonce	Good water governonce	Water use reduction. Water use reduction. Indirect water use for tobacco and to reduce 25km3 global target til 2033			Implementing innovative, water saving or optimizing technologies and/or settings, etc., in order to increase water efficiency and waste water reuse, and consequently reduce water consumption. Defining KPIs as well.
50	✓			✓	Reduction of potable water consumption	Reduce water footprint based on established targets by employing process improvements, re-use and recycling activities and adapt technological measures	PK-Fuelwood Sustainability Study	Ensure sustainability of forest divisions from where fuelwood is sourcing.Supply of fuelwood from declared sustainable divisions and its documentation.	Social & Community (External)	To save plantation cutting, reduce flood occurance and reduce soil deplition & maintaing water levels, prmoting the IWRA i.e. forest creation	1.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities 1.3 Gather water-related data for the site 1. 5 Catchment IWRA 1.6 Shared water challenges 4.3 Evaluate the stakeholders' consultation feedback 3.1 Implement plan to participate positively in catchment governance	Faiza Lodhi/Kulsoom Iftikhar	8.71	7.81	Feb, 2024	Feb, 2024	Aug, 2024	Direct	Engagement	Fuelwood source from identified sustainable forest division	100% fuelwood sourced from selected forest division	Completed	Alignment of sustainability studies with farmers sourced fuelwood from identified fuelwood dealers	Sustainable water balance Good water governance , IWRA	Reduce water consumption, increase awareness on sustainable water conservation	To save plantation cutting, reduce flood occurance and reduce soil deplition & maintaing water levels, prmoting the IWRA i.e. forest creation		0.29 K USD saved	1-Implementing innovative, water saving or optimizing technologies and/or settings, etc., in order to increase water efficiency and waste water reuse, and consequently reduce water consumption. Defining KPIs as well. 2-Execution, active participation and/or contribution to tree planting campaigns, possibly with relevant stakeholders of the territory, in order to encourage reforestation and reduction of events such as erosion, landslides and evapotranspiration rates
51	✓			✓	Reduction of potable water consumption	Reduce water footprint based on established targets by employing process improvements, re-use and recycling activities and adapt technological measures	Saplings provision to Own woodlot farmers	Plantation of indeginous tree species in order to save plantat	Social & Community (External)	To save plantation cutting, reduce flood occurance and reduce soil deplition & maintaing water levels, prmoting the IWRA i.e. forest creation	1.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities 1.3 Gather water-related data for the site 1. 5 Catchment IWRA 1.6 Shared water challenges 4.3 Evaluate the stakeholders' consultation feedback 3.1 Implement plan to participate positively in catchment governance	Faiza Lodhi/Kulsoom Iftikhar	8.71	8.71	Feb, 2024	Feb, 2024	April, 2024	Direct	Engagement	Provision of saplings to farmers for self sufficiency to reduce forest cuttings	Distributed 200,000 saplings to selected farmers	Completed	Follow up visits done for saplings plantation	Sustainable water balance Good water governance , IWRA	Reduce water consumption, increase awareness on sustainable water conservation	To save plantation cutting, reduce flood occurance and reduce soil deplition & maintaing water levels, prmoting the IWRA i.e. forest creation			Execution, active participation and/or contribution to tree planting campaigns, possibly with relevant stakeholders of the territory, in order to encourage reforestation and reduction of events such as erosion, landslides and evapotranspiration rates
52	✓	✓			Reduction of potable water consumption	Increased water efficiency measures	Drain Integrity test of GLT & surrounding drains, tanks, pipelines	Ensure proper drainage of storm water, Drain integrity tests t	Technological	To save water and maintain sustainable water balance	1.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities 1.3 Gather water-related data for the site	Waseem Ali/ Kulsoom/ Waris	TBD	TBD	Dec-24	Feb 2-25	Dec-25	Direct	Participation	Drain integrity tests to check no water is wasted/leaked	TBC	Propsoed	Coordination with vendor is in progress. Quotation to be shared by vendor. To make PO and perform the tests	Sustainable water balance Good water governance	Sustainable water balance Good water governance	Proper water utilization and not wastage in surroinding. Maintaining good water quality in water sheds			Implementing innovative, water saving or optimizing technologies and/or settings, etc., in order to increase water efficiency and waste water reuse, and consequently reduce water consumption.
53			✓		Carry out projects and activities with Stakeholders, employees, community members and local authorities in order to work together towards a sustainable water management and consolidation of AWS outcomes at catchment-level & site level	Engage in water-related campaigns and activities with relevant stakeholders in order to mitigate, anticipate, raise awareness and increase understanding of shared water challenges and risks	Based on several analyses, Pakistan was identified as a key market to be covered by an HRIA. Pakistan is not only a country with potential human rights risks but PMI has significant operations and an important supply chain footprint. In terms of methodology, the HRIA consists of a preparation phase (desktop review) and is followed by a country visit where the consultant performs interviews with internal and external stakeholders. Then, based on the findings, an action plan is established to be implemented locally or even globally.	As a part of PMI's Human Rights Commitment and the overall human rights strategy, PMI is committed to assessing human rights risks and impacts by conducting "Human Rights Impact Assessments" (HRIA) in 10 "highest risk" markets (from human rights perspective) by 2025 as outlined in the PMI Sustainability Index.	Social & Community (External/Internal)	assessing human rights risks and impacts by conducting "Human Rights Impact Assessments and catering for the basic rights like wash, environment, water via action plans	1.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities 1.3 Gather water-related data for the site 1. 5 Catchment IWRA 1.6 Shared water challenges 4.3 Evaluate the stakeholders' consultation feedback 3.6 IMPLEMENT PLAN TO PROVIDE ACCESS TO SAFE DRINKING WATER	Suleman Gul/ Kulsoom	No Cost	No Cost	July, 2023	Dec-23	Jan-24	Direct	Engagement	Assessment completion and addition in integrated report 2023	TBC	Closed	In terms of methodology, the HRIA consists of a preparation phase (desktop review) and is followed by a country visit where the consultant performs interviews with internal and external stakeholders. Then, based on the findings, an action plan is established to be implemented locally or even globally. Sahring fuse sessions with emloyees on human right awareness, online trainings and communication sharing	Good water governance Good water quality status Safe Water, Sanitation and Hygiene Good water quality IWRA	Good water governance Good water quality status Safe Water, Sanitation and Hygiene Good water quality IWRA		Assessing the basic human rights and catering for gaps		Engagement with peer organizations and relevant stakeholders (i.e., public sector such as Environment protection department, Irrigation Department, PHED) to promote water stewardship and open a catchment-based discussion and potential partnership on shared water-related risks and challenges Engagement with peer organizations and relevant stakeholders (i.e., public sector such as Environment protection department, Irrigation Department, PHED) to promote water stewardship and open a catchment-based discussion and potential partnership on shared water-related risks and challenges
54	✓	✓	✓	✓	Carry out projects and activities with Stakeholders, employees, community members and local authorities in order to work together towards a sustainable water management and consolidation of AWS outcomes at catchment-level & site level	Engage in water-related campaigns and activities with relevant stakeholders in order to mitigate, anticipate, raise awareness and increase understanding of shared water challenges and risks	To incoporporate the vulnerabilities, opportunities, risks & challenges in the AWS master plan	To address the vulnerabilities, opportunities, risks & challenges, best practices, feedbacks from stakeholders, third party consultation report , local RA , GAin the AWS master plan.	Technological, Social	Ensuring incorporation of all do to tasks in AWS master plan	1 Data Gathering 2 Commit & Plan 3 Implement 4 Evaluate 5 Communicate & disclose	AWS Team	No cost	No cost	Dec-22	Dec-25	Jul-24	Direct	Engagement	Follow up & completion of tasks	TBC	On-Going	Follow up & completion of tasks via weekly meetings, stakeholder enagagemnts	Good water governance Good water quality status Safe Water, Sanitation and Hygiene Good water quality IWRA	Good water governance Good water quality status Safe Water, Sanitation and Hygiene Good water quality IWRA	Promotong Good water goveronance	Promoting Good water quality, IWR	Promoting value creation by cost saving	Engagement with peer organizations and relevant stakeholders (i.e., public sector such as Environment protection department, Irrigation Department, PHED) to promote water stewardship and open a catchment-based discussion and potential partnership on shared water-related risks and challenges
55	✓	✓			Improvement in Water Quality	Stignent targets for all water quality	Revise water quality targets for Process, Dirnking, Source and waste water quality Targets	Revise water quality targets for Process, Drinking, Source and waste water quality Targets.	Process	Improved water quality of site and accomplishment of water challenges	1.3, 3.4.1, 3.4.2	Junaid Shahzad	0	0	Apr-24	Apr-24	Apr-24	Direct	targets	100% done	100 % done	Completed	Done. Yearly Review of water quality targets	Improvement in water quality and shared water challenges	Improve water quanity	No contamination in water and no harm to water quality		N/A	Increasing thewater target will make sure we have the right approch towards shared water quality challenges
56	✓				Reduction of potable water consumption	Reduce water footprint based on established techniwues to reduce use of water in producion of crop	Actions taken by the farmers, such as installing water channel slabs to reduce seepage loss, using organic mulch in fields for water conservation, and comparing the efficiency of channel and pipe irrigation methods, along with rainwater harvesting	The collective actions taken by the farmers include installing water channel slabs to reduce seepage loss and improve water flow, implementing organic mulch in tobacco fields for water conservation, and conducting a project to compare the water-saving efficiency between channel and pipe irrigation methods. Additionally, rainwater harvesting was	Social & Community (External)	These measures collectively aim to enhance water management, conserve resources, and improve agricultural productivity.	1.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities 1.3 Gather water-related data for the site	Faiza Lodhi/Kulsoom Iftikhar	0	0	Feb,2024	30th Oct, 2024	Dec, 2024	Direct	Engagement		in process of data gathering	On-Going	In Progress	Good water governonce	Good water governonce	Water use reduction.			Implementing innovative, water saving or optimizing technologies and/or settings, etc., in order to increase water efficiency and waste water reuse, and consequently reduce water consumption. Defining KPIs as well.
57	✓	✓	✓		Reduction of potable water consumption	Increased water efficiency measures	Feasability of not in use water well as charging well	To study, plan and perform feasability dtudy of charging well	Social & Community (Internal)	The redundant well will be used for storing rain water and will be recharge the acquafirs	1.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities 1.3 Gather water-related data for the site	Abdul Waris			1st June, 2024	30th March, 2024	Apr-25	Direct	Installation	1 Charging Well	Proposed		In progress.	Sustainable water balance Good water governance	Sustainable water balance, Important water-related areas	Utilizing the rain water			
58	✓		✓		Reduction of waste water , Reuse of rain water	Reduce water footprint based on established targets by employing process improvements, re-use and recycling activities and adapt technological measures	Conversion of abondoned furnace tank to rain harvestor	To reduce water consumption, a water collection tank to capture rainwater and used for the watering of plants	Social & Community (Internal)	Reuse of rain water to avoid excess water usage .	3.3 Implement plan to achieve site water balance targets 1.7 Understand the site's water risks and opportunities 1.3 Gather water-related data for the site	Abdul Waris/Asghar Khan	3.76	TBC	1st June, 2024	15th Sep, 2024	20th sep, 2024	Direct	Installation	100%	100%	On-Going	Rain harvestors feasability study is completed and installation in pregress	Sustainable water balance Good water governance	Sustainable water balance, Important water-related areas	Utilizing the rain water and aiding less water consumption.		Building the systems on site in such a way that reuse of water will save money in future. As its beginning so more data sets will show the water reduction usage & its costs.	1-Constructing and/or contributing to the construction of rain water collection harvestors to optimize the collection of rain water . 2- Active engagement, collaboration and best practice sharing with stakeholders from the industrial sector, in order to encourage the implementation of technical actions related to the reduction of groundwater withdrawals
59		✓		✓	Maintenance & enhancement of IWRA	To set practice to maintain or enhance IWRA	Clean up campaigns at Kalpani & Stepa canal, Install dustbins and clean up awareness campaigns	To enhace and maintain the IWRA , clean up campaigns with installation of dustbins & slogans to be installed by involving vendors, community people and PMPKL staff.	Social & Comminity (External)	Enhancement & maintenance of the IWRA	3.5.1 To set IWRA maintenace & enhancement practi	Junaid Shahzad	0.63	0.63	1st April. 2024	15th Sep, 2024	20th sep, 2024	Direct	Installation	100%	100%	Completed	To follow up and conduct the activity next year as well	Good water quality & IWRA	Good water quality & IWRA	Enhancing the IWRA & cleaning environment by contributing towards water quality as well			Execution, active participation and/or contribution to clean-up campaigns, possibly with relevant stakeholders of the territory, in order to avoid hazardous pollution vents and contribute to IWRA status improvement
60		✓			Improvement in Water Quality	To set practice to conduct water quality tests in catchment & IWRA	Water quality tests to be conducted in local hospital and at 02 imp IWRA i.e. Kalpani & stepa	Wataer quality tests will be conducted at catchment and IWRA to check the results and trends.	Social & Comminity (External)	To set practice to conduct water quality tests in catchment & IWRA	1.3.4, 1.5.4, Water quality of the catchment and ultin	Kulsoom Iftikhar	0.2	0.2	1st April. 2024	15th Sep, 2024	20th sep, 2024	Direct	Quality Tests	100%	100%	Completed	To check the water quality of the catchemnet and conduct clean up exercises at kalpani & stepa canal	Good water quality & IWRA	Good water quality & IWRA	Examining the water quality of the catchment and ultimate receiving bodies like IWRA & ultimate waste reecining bodies will help contribute towards focusing on the parameters that require attention.			Conduct water quality tests at catchment and note the trends

WATER STEWARDSHIP

Report on Water Performance of the Philip Morris (Pakistan) Limited (PMPKL), Mardan

LAST UPDATE 10/2024

Water scarcity, the lack of sufficient available water to meet demands, is recognized by the World Economic Forum as the largest global risk in terms of potential impact for both humanity and the environment. Growing populations, economies, water-related risks as well as climate change have provoked an increase in demand, competition and conflicts over freshwater resources, that are becoming ever more limited.

Philip Morris (Pakistan) Limited ("PMPKL") is an affiliate of Philip Morris International ("PMI"). PMPKL is public listed company incorporated under applicable laws with its Head Office in Karachi, a cigarette manufacturing factory in Sahiwal and green leaf threshing unit in Mardan. As part of PMI's commitment to implement the Alliance for Water Stewardship (AWS), PMPKL is working to adopt a more sustainable water use both on-site and in the territorial context in which it operates. PMPKL's GLT factory in Mardan is working towards achieving the Core Level of the AWS Certification: PMPKL Mardan will become the second Site in the Pakistan to receive this important recognition and have formalized its commitment to water stewardship principles and outcomes.

By implementing the AWS Standard, PMPKL Mardan is working towards offering a credible, globally-applicable framework for other major water users and Stakeholders in the catchment, with the scope of encouraging their understanding of water use, impacts and shared water-related risks. The long-term aim is to join forces and set fundamental stepping stones for synergic and meaningful collaborations towards sustainable water management practices within the local territory in which we all live and operate.

Over the upcoming years, PMPKL Mardan aims to progressively implement, improve ameliorate and grow its commitment as a water steward. PMPKL Mardan's scope is to raise awareness on shared water-related challenges, such as degrading surface water quality, provision of safe Water, Sanitation and Hygiene (WASH), flashfloods and baseline water stress, and actively contribute to addressing these risks with projects, actions and campaigns in collaboration with relevant Stakeholders of the local territory.

Dealing with a shared resource, such as water, requires working in a transparent, collaborative and synergic way with relevant figures in a catchment area: actions and projects cannot be limited to a site's physical boundary alone.

PMPKL Mardan factory is proud of this journey that it is undertaking and, although the path to build a sustainable future is still ongoing, the AWS Certification and related actions have and will continue to make a significant change in the management and perception of the water resource in Pakistan.

The PMPKL Mardan Pakistan AWS TEAM

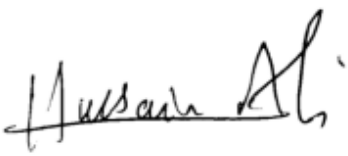
PMPKL Mardan's Commitment to water stewardship and AWS outcomes, signed by **Hussain Ali**

22nd July, 2024

PMPKL Water Stewardship Commitment

Philip Morris Pakistan Limited ("PMPKL"), as a result of its commitment to good water stewardship , undertakes to implement following measures at its Green Leaf Threshing plant situated at 22nd KM Mardan Swabi Road-Mardan:

1. Endorse, sustain and support the Alliance for Water Stewardship ("AWS") principles and 5 outcomes: i) good water governance, ii) sustainable water balance, iii) good water quality, iv) good conservation of important areas related to water, and v) safe water, sanitation and hygiene;
2. Engage and involve stakeholders in an open and transparent way;
3. Comply with any legal and regulatory requirements related to water;
4. Respect water-related rights, including ensuring appropriate access to safe water, sanitation, and hygiene for all persons at Site;
5. Support and coordinate with stakeholders (internal and external) for implementation of plans and policies, including working together to meet the right to water and sanitation;
6. Implement the AWS standard in alignment with existing catchment sustainability plans
7. Improve and continually adapt the actions and plans for water stewardship of the Site in order to mitigate shared water related risks;
8. Implement and disclose-progress on water stewardship programs to achieve improvements in AWS water stewardship outcomes
9. Maintain the organizational capacity required to successfully implement the AWS Standard, through necessary resources required to accomplish the implementation and maintenance of requirements of the AWS Standard i.e., improving water quality, water sanitation and hygiene, reduce water wastage, etc.
10. Disclose relevant information related to water.



Director Manufacturing, Pakistan

Hussain Ali

22 جولائی 2024

پی ایم پی کے ایل واٹر اسٹیورڈ شپ کا عزم

فلپ مورس پاکستان لمیٹڈ ("پی ایم پی کے ایل") پانی کی اچھی دیکھ بھال کے عزم کے نتیجے میں، 22 ویں کلومیٹر مردان صوابی روڈ۔ مردان میں واقع اپنے گرین لیف تھرشنگ پلانٹ میں مندرجہ ذیل اقدامات پر عمل درآمد کا عہد کرتا ہے:

- الائنس فار واٹر اسٹیورڈشپ ("اے ڈبلیو ایس") کے اصولوں اور 5 نتائج کی توثیق، برقرار اور حمایت: 1) اچھی پانی کی حکمرانی، 2) پائیدار پانی کا توازن، 3) پانی کا اچھا معیار، 4) پانی سے متعلق اہم علاقوں کا اچھا تحفظ، اور 5) صاف پانی، صفائی ستھرائی اور حفظان صحت؛
- اسٹیک ہولڈرز کو کھلے اور شفاف طریقے سے شامل کریں اور شامل کریں۔
- پانی سے متعلق کسی بھی قانونی اور ریگولیٹری تقاضوں کی تعمیل کریں۔
- پانی سے متعلق حقوق کا احترام کریں ، بشمول سائٹ پر تمام افراد کے لئے محفوظ پانی ، صفائی ستھرائی اور حفظان صحت تک مناسب رسائی کو یقینی بنانا۔
- منصوبوں اور پالیسیوں کے نفاذ کے لئے اسٹیک ہولڈرز (اندرونی اور بیرونی) کے ساتھ تعاون اور ، بشمول پانی اور صفائی ستھرائی کے حق کو پورا کرنے کے لئے مل کر کام کرنا؛
- موجودہ کیچمنٹ پائیداری کے منصوبوں کے مطابق اے ڈبلیو ایس معیار کو نافذ کریں
- مشترکہ پانی سے متعلق خطرات کو کم کرنے کے لئے سائٹ کے پانی کی دیکھ بھال کے لئے اقدامات اور منصوبوں کو بہتر بنانا اور مسلسل ڈھالنا؛
- اے ڈبلیو ایس واٹر اسٹورشپ کے نتائج میں بہتری حاصل کرنے کے لئے واٹر اسٹیورڈشپ پروگراموں پر پیش رفت پر ایک رپورٹ شائع کریں اور شائع کریں۔
- اے ڈبلیو ایس اسٹینڈرڈ کے نفاذ اور ضروریات کی دیکھ بھال کے لئے ضروری وسائل کے ذریعے اے ڈبلیو ایس اسٹینڈرڈ کو کامیابی سے نافذ کرنے کے لئے درکار تنظیمی صلاحیت کو برقرار رکھنا یعنی پانی کے معیار کو بہتر بنانا، پانی کی صفائی اور حفظان صحت کو بہتر بنانا، پانی کے ضیاع کو کم کرنا وغیرہ۔
- پانی سے متعلق متعلقہ معلومات کا انکشاف کریں۔

ڈائریکٹر مینوفیکچرنگ، پاکستان

حسین علی

فلپ مورس (پاکستان)) لمیٹڈ

22nd کے ایم مردان صوابی روڈ، مردان

www.philipmorrispakistan.com.pk

ALLIANCE FOR WATER STEWARDSHIP ORGANIZATION

The AWS team members are responsible for implementing the AWS Standard criteria as well as achieving the AWS outcomes by the implementation of social, community and technological actions both on-site and in the catchment territory.

Project Sponsor	Abid Javed, Head of Leaf		Hussain Ali, Director Manufacturing, PMPKL	
PMI Buddy	Haseeb Ahmed Manager Sustainability			
Coach	Chiara Rizzi Manager Global AWS certification			
Consultant	Saera Kirmani External Consultant- Geoscience			

As of Aug, 2024

AWS Project Lead			
		**Kulsoom Iftikhar** **Project Lead**	
AWS Core Team Members			
	Asghar Khan IFMS Engineer		M. Bilal Ahmad Manager Leaf, Processing & Logistics
	Syed Muhammad Ali Manager BU Processing		Abdul Waris Manager Technical Services
	Haseeb Ahmed Manager Sustainability		Hassan Zahoor Manager Procurement PK
	Rida Vaka, Manager Regulatory Affairs, EA		Basit Tufail Line Lead Processing
	Kulsum Khan Legal Affairs- Counsel		Waseem Ali Supervisor WPE

AWS Project Lead			
	Kulsoom Iftikhar **Project Lead**		
AWS Core Team Members			
	Arshad Zaman Supervisor warehousing & logistics, S&PD		M. Ikraam Warehouse executive, S&PD
	Hammad Shoaib Line Coordinator		Faiza Lodhi Manager Environment sustainability, SA
	Junaid Shahzad Sustainability Specialist		Sundila Ghanchi Internal Communications Lead
	Sana Hashmi Company secretary, Ext Communications		Waqas Ali Labour Relations Executive

Check out our Water Risk Assessment results!

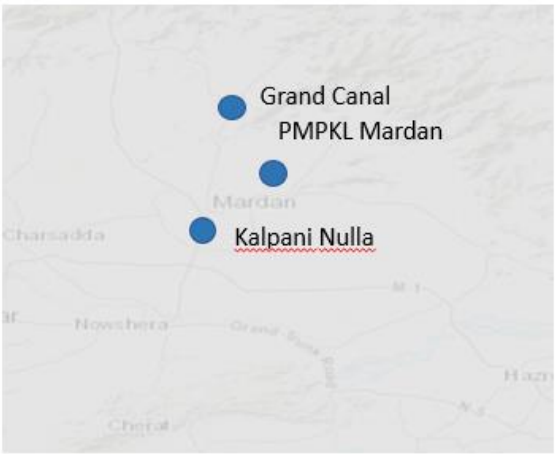
In 2024 PMPKL Mardan conducted a detailed water-risk assessment in order to identify the main water-related challenges that the factory is subjected to, as well as those shared by catchment Stakeholders!

The higher ranking risks in the catchment territory are directly linked to **surface water quality deterioration**, **increase in flashfloods** and **lack of adequate WASH availability**.

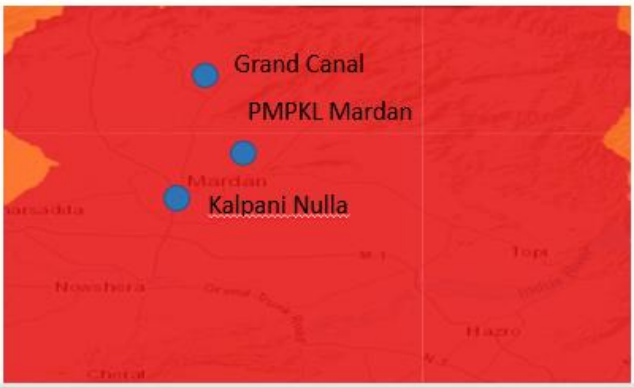
In the next few pages of this report, PMPKL Mardan will share some of the best practice actions, campaigns and projects that are aiming to make a difference.

Flood Occurrence

Drought occurrence



Water Quality



Water Risk Filter

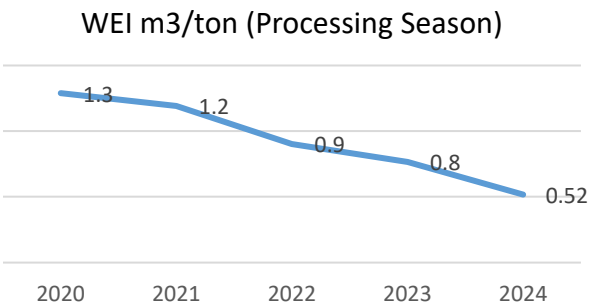
n/a Very low risk Very high risk

Map source: Water Risk Filer

The progressive and on-going AWS Standard implementation in PMPKL Mardan is leading to the implementation of two types of initiatives:

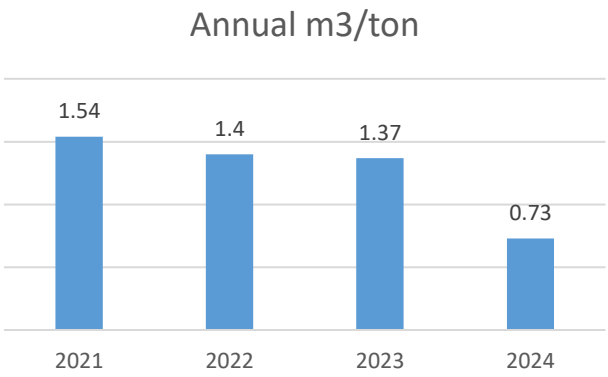
- **Social actions,** which include participation in synergic community-based projects, gathering water-related data to assess water risk hotspots and prioritize mitigation actions, as well as engagement activities with local Stakeholders, such as the execution of awareness workshops, best-practice sharing and feedback requests
- **Technological actions**, which include implementation of water saving technologies, settings and related best practices, which resulted in an immediate benefit due to the reduction of the amount of potable groundwater removed from the catchment territory

In PMPKL Mardan, improvements in water-saving performances are traced and tracked via a water-dedicated KPI, based on **m^3 per ton of packed tobacco** d (m^3/ton of packed tobacco) and WEI water efficiency index



As illustrated above, from 2019 to 2024 PMPKL Mardan has **reduced its WEI** from **1.3** to **0.52 m^3/ton packed (Processsing Season)**.

This accounts for a water consumption reduction of aproximately 0.28 m3/ton in 2023 vs 2024 (processing Season) in terms of water consumed per ton of packed tobacco .



It is evident from the figure shown that sustantial water savings are done by implementing innovative solutions ie like Condensate recovery, Closure of redundant water points, locking system of water taps at lawns, optimization of feed water tank, rain harvestors, to name a few. This has resulted in 31% reduction in water consumption in last 6 months vs 2023.

Disclaimer: Data used & updated till 31s August, 2024

Water-realted actions in PMFTC Marikina are focused on the 5 AWS outcomes of the AWS Standard:

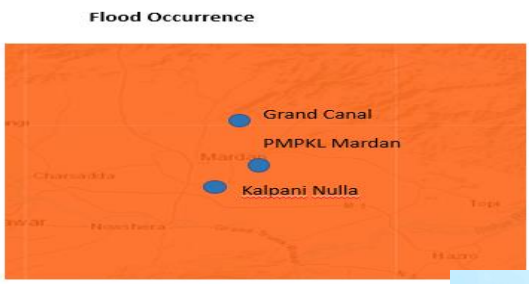
WATER RISK ASSESSMENT

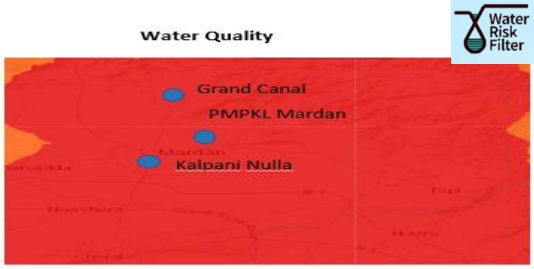
In order to better understand its local, catchment contexts and prioritize risk mitigation efforts, PMPKL Mardan carried out a water risk assessment by use of both global and local data sets.

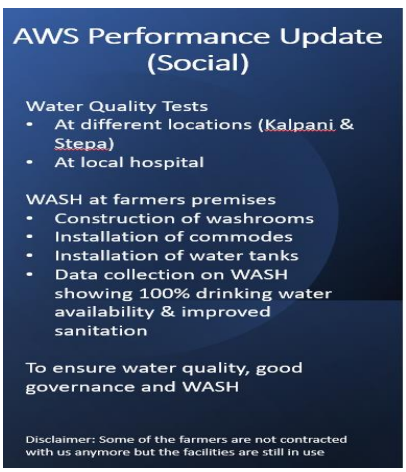
The scope was to develop a reliable and integrated water stewardship strategy plan by:

- identifying water-related risk hotspots
- focusing responsive actions to address higher water risks
- anticipating, when possible, trends and impacts

Higher and more cataclismatic water risks for PMPKL Mardan and it's catchment context appeared to be realted to flooding and predicted increase as well as degrading freshwater quality.







AWS Performance Update (Social)

Distributed 200,000 saplings to selected contracted farmers

Provision of saplings to contracted farmers for self-sufficiency to reduce forest cuttings

To ensure sustainable water balance, IWRA and good governance

RAINWATER HARVESTING FOR WATERING PLANTS

WATER-RELATED AWARENSS CAMPAIGNS WITH EMPLOYEES

PMKL Mardan conducted internal awareness campaigns on water-related themes in relation to their water stewardship Commitment and AWS Certification journey. Employees were engaged in numerous activities:

- AWS Certification Unveiling- PMPKL Mardan
- water-related information sharing via email, posters and dedicated posts
- collection of water-saving best practices and amelioration proposals.
- dedicated workshops/meetings and water-related information request to outsource service providers, infrastructural agencies
- water conservation art contest for employee children
- best practice WASH prescriptions in common areas, Sessions with Stakeholders on Indirect water usage.
- Clean up day at locations
- donation of 20000 tree sapling to promote tree planting and mitigate deforestation
- AWS Unveiling & World Environment Day Celebrations
- Plantation Activity

The scope was to disclose water-related challenges and increase employee sensibilization and responsibility regarding water-related themes, both at home and in their workplace.

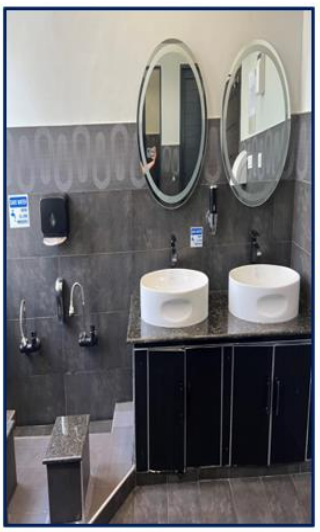
Wash at Site

AWS Performance Update (Social)

WASH at site

- Upgradation of workers washroom
- Upgradation of Office washrooms Upgradation of ablution area
- New common room with attached washroom for ladies

To ensure good WASH at site



AWS Performance Update (Technical)

- Installation of food grade taps
- Heat exchanger
- Installation of rain harvesters
- Upgradation of washrooms
- Water quality tests (new parameters & new area samples)

- To ensure sustainable water balance, good governance, water quality & quantity, requirements under applicable laws, WASH

AWS Performance Update (Technical)

- Water flow meters
- Prompt Identification and rectification of Water Leakage Points
- Closure of Redundant/Extra Water Consumption Points
- Locking system of water Taps at Lawns
- Installation of rainwater Storage Tanks
- Shutting Down of Non-Essential Areas
- New operational well
- Gemba walks
- Condensate recovery

To ensure sustainable water balance, IWRA, good governance, water quality & quantity, requirements under applicable laws, WASH








Projects/Initiatives Planned

AWS Performance Update (Social)

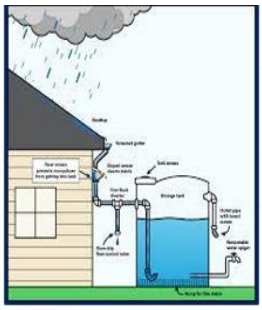
Engagements planned with stakeholders (Rescue 1122, PHED, EPA, local schools & local hospital)

- Awareness session on
  - Floods and safety measures
  - Spread of contagious diseases
  - Clean drinking water
  - Sustainable use of water
  - WASH

PMPKL contribution by donating:

- First-aid boxes, portable de-wash pump, life jackets
- PPEs (face masks, face shields, gloves, full body safety kit and aprons)
- Tree saplings
- Waste bins
- Washroom accessories
- Water filtration units & cooler
- Rain harvesters
- Anti-littering posters












GOOD WATER GOVERNANCE | SUSTAINABLE WATER BALANCE | GOOD WATER QUALITY STATUS | IMPORTANT WATER-RELATED AREAS | SAFE WATER, SANITATION AND HYGIENE FOR ALL (WASH)

AWS Performance Update (Social)- IWRA at catchment

1st & 2nd April 2024

Ensure the Safeguarding, Maintaining and Cleaning of water resources through shared efforts.

Boards with messages along with waste collection bin are installed to increase the maintenance and protect water bodies from further degradation.

Two sites were covered. Kalpani & Leo Stipa Canal were identified in IWRA and the cleaning activity along with bin installation was done by the AWS Team with local community members.

IMPORTANT WATER-RELATED AREAS

At Leo Stipa Canal

At Kalpani

GOOD WATER GOVERNANCE | SUSTAINABLE WATER BALANCE | GOOD WATER QUALITY STATUS | IMPORTANT WATER-RELATED AREAS | SAFE WATER, SANITATION AND HYGIENE FOR ALL (WASH)

AWS Performance Update (Social)- IWRA at catchment

September 20th 2024

Ensure the Safeguarding, Maintaining and Cleaning of water resources through shared efforts with community

An awareness session was held in fruit market beside the canal in which local fruit seller and member if community engaged with us for a clearing driver.

One Fixed Bin and Board was installed to spread awareness and implement best practice for maintenance of Canal and IWRA's.

IMPORTANT WATER-RELATED AREAS

At Leo Stepa – Beside Fruit Market Canal **Before**



At Leo Stepa – Beside Fruit Market Canal **After**



AWS Performance Update- Social

Land Leveler

Targeted hectares were 360 while covered 449.3 at all locations for water balance target 276km3



We hope you enjoyed a piece of our water stewardship journey towards a more sustainable future in Mardan, Pakistan

GeoScienceAssociates
Integrated GeoScience for economy safety & environmental responsibility
GSA

Report

Vulnerability Assessment

Philip Morris International
Mardan, Pakistan

July, 2023

Prepared for:	***Prepared by:***
Philip Morris International, Mardan, Pakistan.	*GeoScience Associates* *Lahore, Pakistan.*

Inogen Environmental Alliance

Table of Contents

Tables

Figures

Appendices

1.0 EXECUTIVE SUMMARY

NOTE:

This report is based on available data from PMI Mardan plant for its Alliance of Water Stewardship (AWS) Certification. The report is to support the plant in completing its criteria for achieving the AWS certification.

Water is a critically important resource. It is fundamental to both industrial and agricultural activity. However, water is a limited resource and water shortages have now become a global reality. Managing this national resource will pose some major challenges, from both an economic and an environmental standpoint, in the years ahead. Given that the most recent edition of the World Economic Forum (WEF) global risk survey found that the risk of an emerging "global water crisis" was regarded as the third highest ranked risk, in terms of overall impact, there is a clear need for the implementation of better practices and more holistic measures that can rectify this issue (WEF, 2017).From the view of the International Water Stewardship Landscape, the use of water that is socially equitable, environmentally sustainable and economically beneficial, achieved through a stakeholder inclusive process that involves site and catchment-based actions (AWS, 2017a).

Mardan is bounded by Malakand Division towards North-West, District Buner towards North-East, District Nowshera towards South-East, District Swabi towards East and District Charsada towards South-West. The district lies from 34° 05' to 34° 32' North latitudes and 71° 48' to 72° 25' East longitudes. The total area of the district is 1,632 square Kilometers. Mardan is the second largest city after Peshawar in the Khyber Pakhtunkhwa Province.

Site water samples are to be strictly analyzed for a comprehensive understanding of the condition of the tubewells specially based on seasonal variances. No data is maintained at the plant for a trend analysis of raw water. Similarly, no data is available for treated water and effluent discharge quality and quantity.

The city is supplied by municipal water. The water is sourced from groundwater. The municipal supply is only supplying the urban area. Outside the city, in more rural area, potable supply is sourced from individual private wells. Several potential contamination sources are present in the project area (waste dumps, waste water, industries, agriculture etc.) and can be threat to the water quality. Upon reconnaissance the general public in the area informed of water borne diseases. The risk of contamination to the local aquifer is considered as high.

NOTE:
Throughout the report we have flagged the vulnerabilities in red font and with the symbol:

We have flagged replenishment opportunities with the symbol:

These vulnerabilities have subsequently been summarized in chapter 7.0.

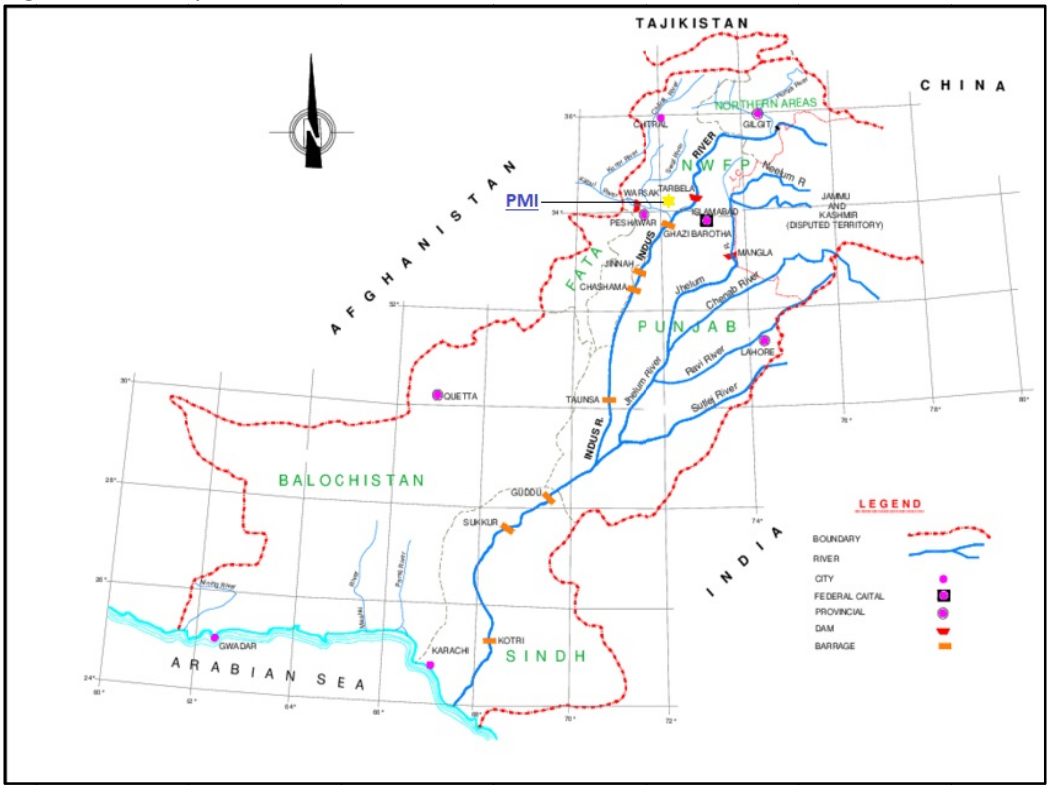
2.0 CATCHMENT

2.1 Regional Water Resources

Ground Water in Pakistan

Groundwater has gradually acquired a vital role in the development of agricultural and rural economy in Pakistan. Majorly because agriculture is the single largest sector of Pakistan's economy. It contributes about 24 percent of the Gross National Product, directly accounts for about 70 percent of the export earnings and employs more than 50 percent of its civilian labor force (PWP, 2001). Because of arid and semi-arid conditions prevailing in most parts of Pakistan, direct rainfall contributes less than 15 percent of total crop demand. Therefore, irrigated farming is the most economical and remunerative form of agriculture. Irrigated lands supply more than 90 percent of agricultural production and are major user of the water resources. The surface water resources of Pakistan are finite and the potential for increasing water supplies is limited. There is also likelihood of reduction in surface supplies through capacity losses in the reservoirs due to siltation. The difference between crop water requirements and surface supplies is met through exploitation of groundwater.

Figure 2.1a –Map of Rivers in Pakistan



Groundwater Basin – Indus Basin

Pakistan's major groundwater resource is in the irrigated areas of the Indus Basin. Pakistan has one of the largest contiguous irrigation systems in the world, known as the Indus Basin Irrigation System (IBIS). The System comprises six major rivers, that is, the Indus, Jhelum, Chenab, Ravi, Sutlej and Kabul, and their catchments.

Figure 2.1b – Groundwater Basin – Indus Basin

Groundwater Recharge – Mardan

Seepage from rivers, lined or unlined channels, rainfall and agricultural fields is vital to recharge groundwater, which is the major source of drinking water for most cities including Mardan. According to Water and Power Department Authority (WAPDA)about 50 percent of total average rainfall infiltrates the soil and 50 percent of this infiltrated rainfall recharges the groundwater.

Figure 2.1c: Groundwater Recharge

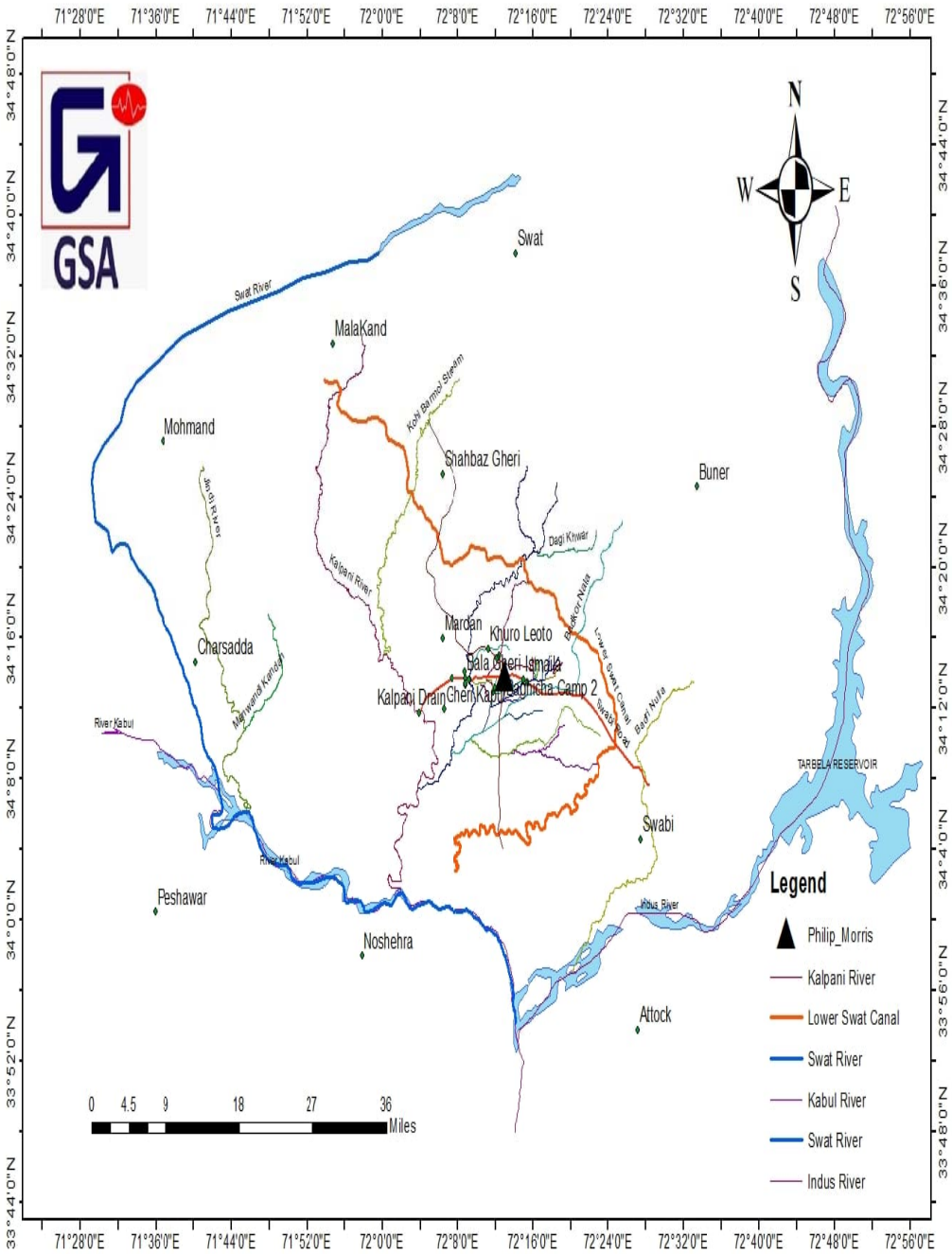
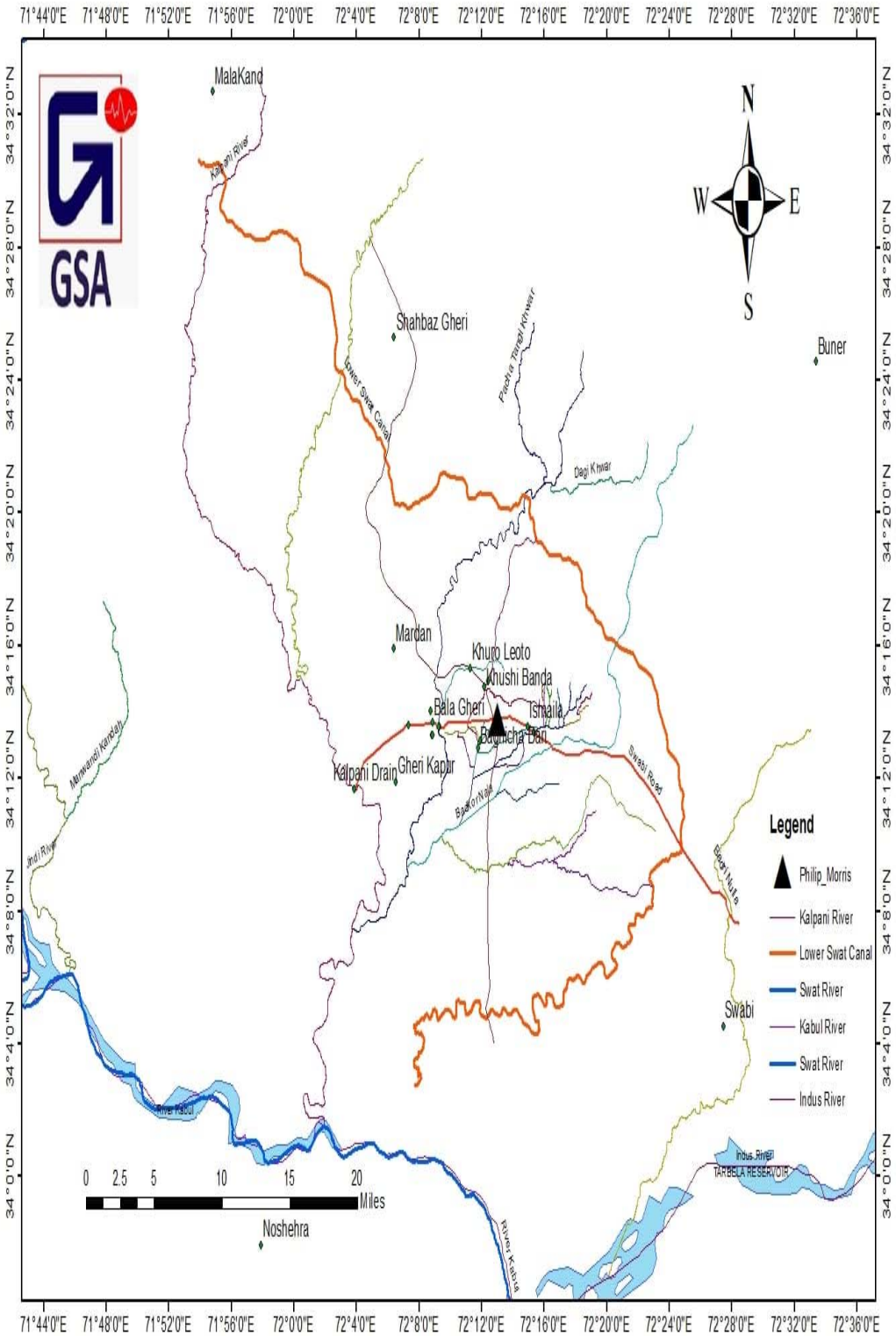


Figure 2.1d: Local Streams and Canal Network.



2.2 Regional Geology and Hydrogeology

Local Geological Setting of the Area

The project site comprises part of District Mardan which is located in Province of Khyber Pakhtunkhwa (KPK), Pakistan.

The Geographically the project site lies in Gadoon Plain. The area comprises a mountainous area in the north and an alluvium filled plain, in the south. It lies between latitudes 34°05' and 34°20' N and longitudes 72°32' and 72°45' E. The plain, which covers an area of 48 km2, is part of the Tehsil Swabi of Mardan District. The catchment covers 155 km2. The Gadoon plain is bordered in the south by the Peshawar Vale, in the west by the Totali area); in the north its catchment stretches all the way to the catchment of the Chamla river, and in the east a mountain range separates it from the Tarbela reservoir.

The Gadoon Plain is situated in the broad Valley of Peshawar or Peshawar Basin. Peshawar Vale is located between latitudes 33°40' and 34°35' N and longitudes 71°15' and 72°45' E. It is 6270 km2 in area. Administratively the Vale includes most of the Peshawar and Mardan Districts. The Valley comprises the Charsadda, the Nowshera and the Peshawar Tehsils in Peshawar District, and the Mardan and the Swabi Tehsils in Mardan District.

The area now covered by the Peshawar Vale was originally part of the Indogangetic fore deep. Some 2.3 million years ago it became an intermontane basin, when the uplift of the Attock ridge cut off the northwestern corner of the Indogangetic plain (Burbank and Tahirkheli, 1985).

The Peshawar intermontane basin lies at the southern margin of the Pakistan Himalaya. It is bounded on the south by the Attock-Cherat Range and on the east and west by Gandghar and Khyber Ranges respectively, both of which contain rocks transitional between meta sediments of the lesser Himalaya and unmetamorphosed foreland basin sediments of Kohat-Potwar Plateau of the outer Himalaya. To the north and northwest of the Peshawar basin the strata includes meta sediments intruded by the granitic rocks belonging to the marginal mass of the Indian plate. The tectonic setting of the basin is transitional between a sedimentary fold-anti-thrust belt to the south and metamorphic terrane to the north. The unlithified sediments of the Peshawar basin are predominantly lacustrine silts with fluvial sand and gravel, the basin came into existence in Plio-Pleistocene time when more than 300 meters of sediments were deposited in response to ponding of drainage by the rising Attock-Cherat Range (Burbank &Tahir kheli, 1985). Exposures of the Paleozoic and older strata are limited to small outcrops within the basin.

The first geological account of the rocks of the southern Peshawar basin was given by Coulson (1936) who included these rocks in the 'Attock Slate' sequence and assigned Precambrian age. Martin and other (1962) subdivided the rock

sequence of the northeastern Peshawar basin into "Swabi-Chamla Sedimentary Group" and "Lower Swat-Buner Schistose Group". Davis and Ahmed (1963) described or thoconicnautiloids from the hills south of Swabi indicating a Paleozoic age. Teichert and Stauffer (1965) made in first discovery of Siluro-Devonian reef rocks near the town of Nowshera. Stauffer (1968a) described the reef complex and also reported other probable localities of Paleozoic rock from northern Pakistan. Ali and Anwar (1969) described the stratigraphy of the Nowshera reef complex. Latif (1970) collected corals from the Nowshera Formation at PirSabak hillock and suggested the possibility of Carboniferous age. Fuchs (1975) described the stratigraphy of rocks exposed near Swabi and Nowshera area. Pogue and Hussain (1986) established a revised stratigraphy and modified the previous stratigraphic nomenclature of the southern Peshawar basin based on systematic geological mapping and discoveries of trilobite trace fossils of Early to Middle Ordovician age. As a result of their work the revision of stratigraphy of Peshawar basin became apparent. To establish the stratigraphic and structural setup, the area was remapped and fossiliferous horizons were sampled. Bulk samples from the rocks units were also processed for conodonts studies

Geological Formations and their water bearing properties

The alluvial fill mainly consists of alternate beds of clay, gravel and boulders. Only gravel and boulder layers have significant permeability when they are free from finer material. Due to the heterogeneous character of deposits, it is practically not possible to delineate individuals beds. However, from the analysis of resistivity survey results and archived data analysis on drilling record previously drilled in the area, it appears, in most of area clay predominates with sporadic gravel beds whereas few VES locations indicate that coarser material dominates. Groundwater occurs between pore spaces of granular particles called interstices in which it is sorted and also acts as conduit through which water can move. The hydrogeological investigations show that groundwater occurs in the saturated portion of the alluvium of quaternary age which comprises of gravel, boulders, silty clay and silt. Gravel beds are the principal aquifer of the area and occur relatively with clay beds. The area is generally covered with piedmont deposits and promising

Hydrogeology and Surface Water Resources

The Peshawar Valley is surrounded by hills on all sides, except in the southeast where it is bounded by the Indus River. Most of the Valley is fairly flat with gentle slopes; the average elevation is 300 m above msl. Near to the mountain the land is more undulating and here the elevation rises to 500 or 700 m above msl. Some slopes are very steep and most are bare and sometimes severely eroded.
The following physiographical units are distinguished:

Piedmont plain

Piedmont deposits are exposed in the southwestern part of the Valley. Near the boundaries of the plain they consist of coalesced alluvial fans, which are often deeply dissected by hill torrents.

Floodplain

Floodplain deposits are predominant on the Daudzai Doab between the Kabul and Swat rivers, along certain stretches of the Kabul River, and along the Indus River.

Loess plain

Loess deposits cover the piedmont deposits in the central part of the plain west of Charsadda and north of the Kabul River.

Main Rivers in the Basin

There are four important rivers in the Valley. The main one is the Kabul River that drains almost the whole Valley. It enters the plain near Warsak in the west and discharges into the Indus, 4 km downstream of Jehangira. It divides the Vale into a northern and southern part. The Swat River enters the plain in the northwest near the village of Munda Qila and discharges into the Kabul River, near the village of Charsadda. The Bara River flows from the south and near Jhansi Post it enters the Valley, whose southwestern part it drains. The flow of the Bara River is diverted by private canals and is used as drinking and irrigation water. Any excess water discharges near Charsadda into the Kabul River. In winter it carries little water. Kalpani Nala/River arises in the Valley itself, and drains a large area in the north of the Valley; finally, it discharges into the Kabul River 5 km downstream of Nowshera (Figure 1b). Besides these four rivers there are several perennial and non-perennial nalas that contribute to the drainage of the Valley. Most discharge into the Kabul River. In the east some nalas drain directly into the Indus.

Network of canals in the Basin

Surface water irrigation depends on rivers. It began centuries ago when farmers started to dig small canals, locally known as Kathas, close to the rivers. The Jue Seikh canal, constructed in the 17th century by the Moghul Emperors, was the first large canal in the Valley. In that period several more were constructed, tapping the Kabul, Swat and Bara rivers. All these canals only carried water during periods of high river discharges in summer. In the 19th century the construction of perennial canals was started. Head works were built in the river to control the water level. The Lower Swat Canal (1885) takes off from the left bank of Swat River at Munda Qila headworks in the northwest of the Valley. It's commanded area (CCA) lies between Charsadda and Mardan town and is 54,200 ha (135,500 acres). The Upper

Swat Canal (1914) takes off from the left bank of Swat River at Amandara Canal headworks in the Swat Valley. It enters the Vale through a 3400 m long tunnel near Dargai. There it bifurcates into the Abazai branch, which commands 28,000 ha (70,000 acres) in the northwest of the Vale and the Machai branch, which commands 84,000 ha (210,000 acres) in the north and east. The Kabul River Canal (1895) takes off from the right bank of the Kabul River near Warsak. It feeds the Jue Seikh Canal, and together they have 31,200 ha (78,000 acres) under command between Peshawar and the Kabul River. The Warsak High Level Left Bank Canal (1968) takes off from the left bank of Kabul River just upstream of the Warsak Dam. It enters the Vale through a 600 m long tunnel and its command area lies in the Doaba between the Kabul and Swat rivers. The Warsak High Level Right Bank Canal (1969) takes off from the right bank of the Kabul River opposite the Left Bank Canal and flows through a 5700 m long tunnel to the Vale. At the end of the tunnel part of the water is lifted 48 m to feed the Lift Canal while the rest flows through the Gravity Canal. The CCA of 108,300 ha (271,000 acres) lies between the Lift Canal and the Kabul River Canal.

The Pehur Main Canal (1956) takes off from the right bank of the Indus River 8 km downstream of Tarbela Dam. It has a CCA of 17,870 ha (45.700 acres), lying on both sides of the canal. The private canals and Kathas are situated in the south and west of the Valley. They irrigate the area between the Kabul and Swat rivers, certain areas on the right bank of the Kabul River, and a command area of 46,000 ha (115,000 acres).

Main Drains/Streams in the study area

Kalpani drain and few small local drains are in close proximity to project site however, the main nalas/drains rise in the northern catchment area, and are, from west to east: Sargari Khwar, Badgai Khwar, GajaiKhwar, Jammu Khwar, Wuch Khwar and Polah Khwar. They coalesce and leave the area as one river, the Kundal Khwar, which eventually discharges into the Indus. The Kundal Khwar is ephemeral in its upper reaches but becomes perennial near Babinai village because of groundwater exfiltration. Badland erosion is prominent east of the Badgai Khwar.

Surface Water Resources

Since time immemorial wells have been dug, and later drilled, at places in the Valley with a shallow water table. In dug wells the water is raised by centrifugal pumps and in tube wells by turbine pumps or underwater pumps/submersible for small-scale irrigation. The use of groundwater for irrigation is still largely privately controlled and restricted to locations where the water table is at a shallow depth. Most of the innumerable open wells used for irrigation are found in Mardan District. Their exact number is unknown, because no recent inventory of the dug wells in the Peshawar Valley is available.

Some of the areas (Qasmi, Shahbaz garhi, Gumbat and Dheri) have artesian condition due to the hydrostatic pressure created by the nearby topography and the nature of the aquifers. The aquifers in the Northern and Eastern part comprised of coarse-grained gravel, whereas the Central and Western part have fine grained sand aquifers. The average potentiometric surface depth below ground in the District Mardan is found to be 12 meters. Groundwater flow net furnished that the general flow direction of groundwater is from the North to South with localized variations due to topography and discharge. The main recharge source of the aquifers are rainfall infiltration, streams and canal network seepage. It is estimated that recharge due to seepage loss is greater than infiltration from precipitation and discharge through domestic wells is greater than community bore wells.

Water Quality Data and Known Water Quality Issues

The alluvial fill is 40 - 60 m thick near the mountains, but it may be as much as 100 - 200 m in the center of the plain. The borehole data shows the following lithological sequence:

- A dry top layer, composed of clay and silty clay in the upper part and of silt and sand intermixed with boulders and gravel beds in its lower part.
- the upper part of the saturated zone, which in some areas may consist of silt and sand and in others of gravel and boulders.
- the lower part of the saturated zone, which consists of sand, gravel, cobbles and boulders, with few intercalations of clay. It probably forms an extended unconfined aquifer of variable thickness.

Analysis of archived data reveals Transmissivity values obtained through pumping tests range from 800 - 1800 m^2/day, and the specific capacity of the wells ranges from 37 - 320 m^3/h per meter drawdown (50 - 430 gpm/ft dd.). The depth to the water table ranges from 2.13 m to 12.19 m in the catchment. The estimated specific yield varies from 0.08 in badly sorted coarse deposits to 0.20 in well sorted coarse sand and fine gravel beds. The groundwater quality is fair to good; TDS values range from 330 -550ppm. Annexure 3 & 4 provide the Electrical resistivity Survey report of the surrounding area and pumping test conducted at the tubewell of the plant.

Land Use and Vegetation in The Watershed

Mardan has less groundwater infiltration due to extensive industrialization and increasing heavy construction trends. Consequently, the number of irrigation fields has been reduced, which reduces the groundwater recharge from irrigated fields. This factor is playing an indirect but a significant role in aquifer depletion because a large part of the land has become impermeable. Urbanization affects the quality as well as quantity of the groundwater.

2.3 Description of Source Water - Groundwater

Type of Source Water

Philip Morris International, Mardan plant is supplied entirely with groundwater as its raw water source. The plant is not dependant on Municipal raw water supply. The plant has 02 operational groundwater well whereas one older well is not operational. All the wells are located within the plant's premises.

Catchment

The main source of irrigational water in Mardan District is the canals; the upper Swat canal irrigates most part of the district and lower Swat canal irrigates south-western part of the district. The other sources are tube wells and lift irrigation (DCR, 1998). The main drainage system comprises of surface drains which also provide water for irrigation; particularly the Kalpani Nullah, and eight canals, and tube wells which draw ground water from the Aquifer. The aquifer is fed and recharged by the rainwater close to the hills. Generally, streams flow from north to the south. Most of the streams drain into Kabul River. Kalpani, an important stream of the District Mardan rises in the Baizai and flows southwards to join Kabul River. Other important streams which join Kalpani are Baghiari Khawar on the west and Muqam Khawar, coming from Sudham valley and Naranji Khawar from the Narangi hills on the left.

Figure 2.3a – Catchment Area

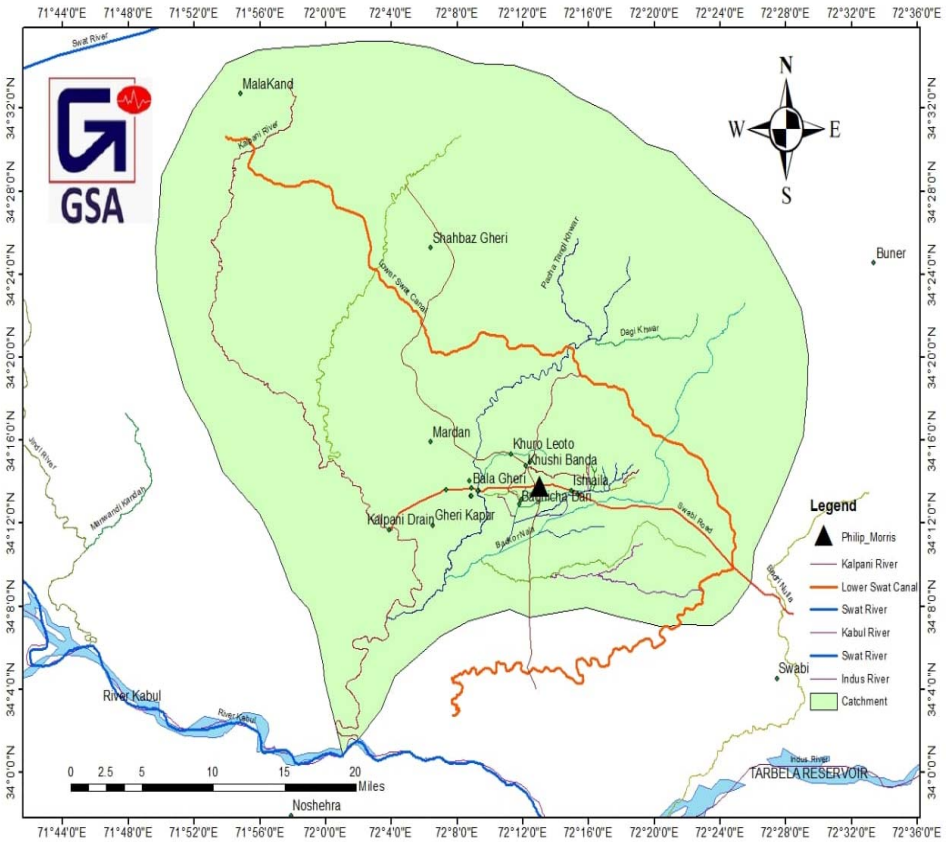


Figure 2.3b – Most Effective Catchment of the Area

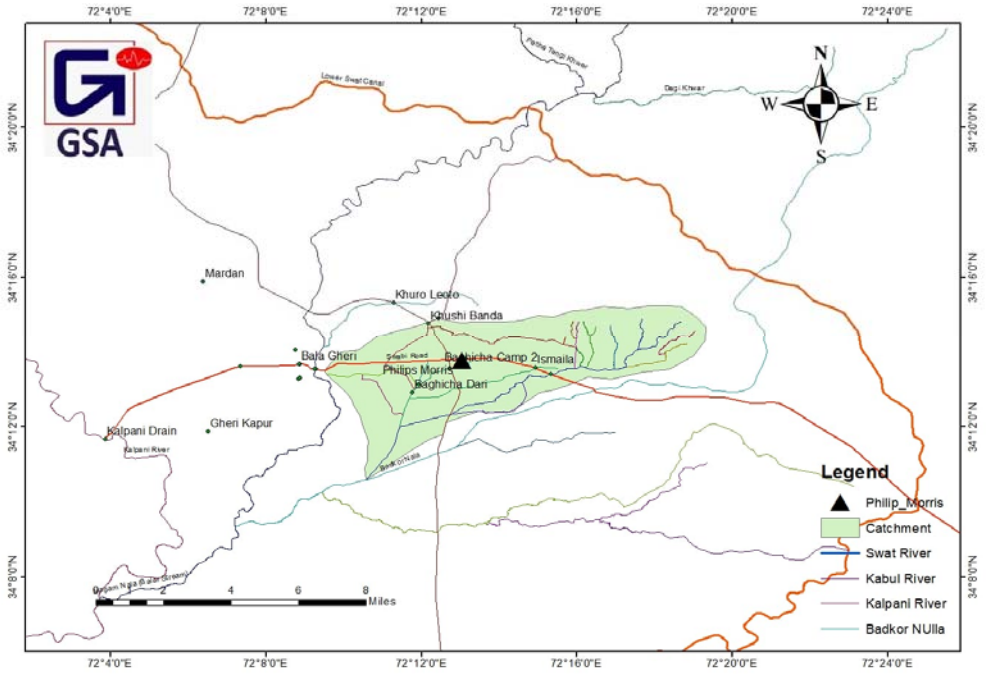
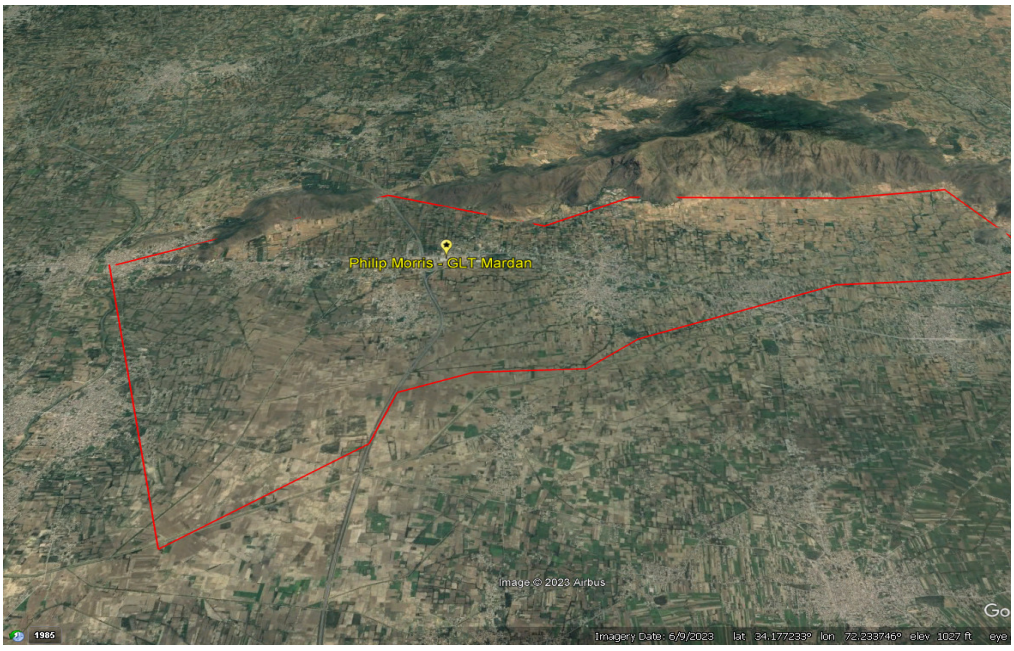


Figure 2.3c – Google Map Showing the Catchment Area.



2.4 Physical Water Resource System – Groundwater

Raw water intake/extraction structures and systems

The raw water intake is obtained from groundwater via the one operational turbine installed at the plant. Well no. 2 is an old well with no previous record. A well videography was conducted to understand the present condition of the well. A comprehensive report for well videography is attached as Annexure 1. It is deemed necessary for the plant to have an alternative supply as a standby option in case of any unforeseen interruption. Furthermore, the plant must set a protocol for monitoring and maintenance including seasonal record keeping of the existing well. This has been further discussed in the vulnerability section. The installation report of Well number 1is available and attached as Annexure 2. As per raw information provided by the client the new tubewell drawing has been also provided in Annexure 2. Its step wise installation procedure and allied services are unknown.

	Well 1	Well 2	Well 3
Status	Operational	Not Operational	Operational
Depth (ft.)	256.25	163 ft (As per Well videography)	525 ft
Yield (cusecs)	0.25	0.12	Unknown
Year Installed	2010	Not Available	2023

Supply Interruptions

As per plant records, it has not in the past nor in present faced any supply interruptions.

Current water quality and related trends within the watershed and groundwater basin

There is a growing awareness of increasing levels of pollution and consequent reduction of water quality in rivers and water distribution systems. This is taking place against a backdrop of declining reserves of water. The unsystematic/unevenly distributed large scale groundwater abstraction caused concerning lowering of the water table. Whereas saline water intrusion is increasing in the fresh areas caused by excessive pumping. A consistent alarm is the steady increase in Arsenic, Silica Dioxide and the increase in bacteriological contamination i.e., Pseudomonas Aeruginosa. The untreated waste water eventual discharges in the Rivers which is a clear indication of contamination as it travels downstream and is a pressing concern. Awareness sessions and rapid actions must be taken up by regulatory authorities to support quality of raw water be it surface or groundwater.

It was investigated that the old tube well is rusted and has outlived pipes which shows presence of contamination by the effluent in the surface water sources. Investigations are suggestive that deeper groundwater is relatively of good quality. Nevertheless, A more comprehensive investigation is still required.

The World Research Institute (WRI) developed the Aqueduct Water Risk Atlas, using 12 global indictors including water quantity, water variability, water quality, public awareness of water issues, access to water, and ecosystem vulnerability. The data used for the study were developed in consultation with experts and are publicly available. Figure 2.4a presents the "Overall Water Risk" ranking map. As it can be observed, the plant falls into the high-risk category.

Figure 2.4a - Overall Water Risk, Aqueduct

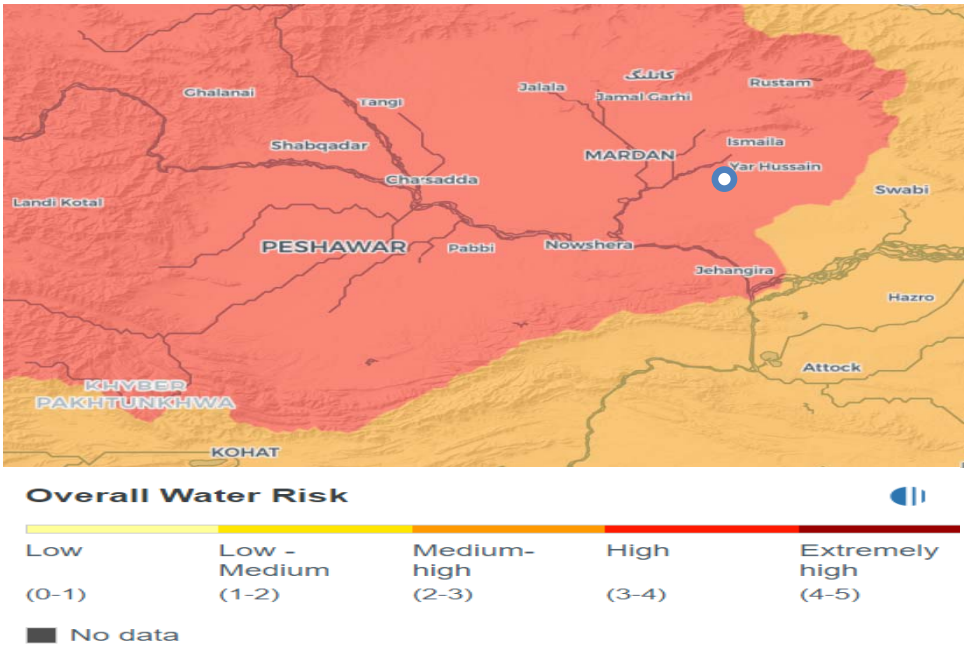
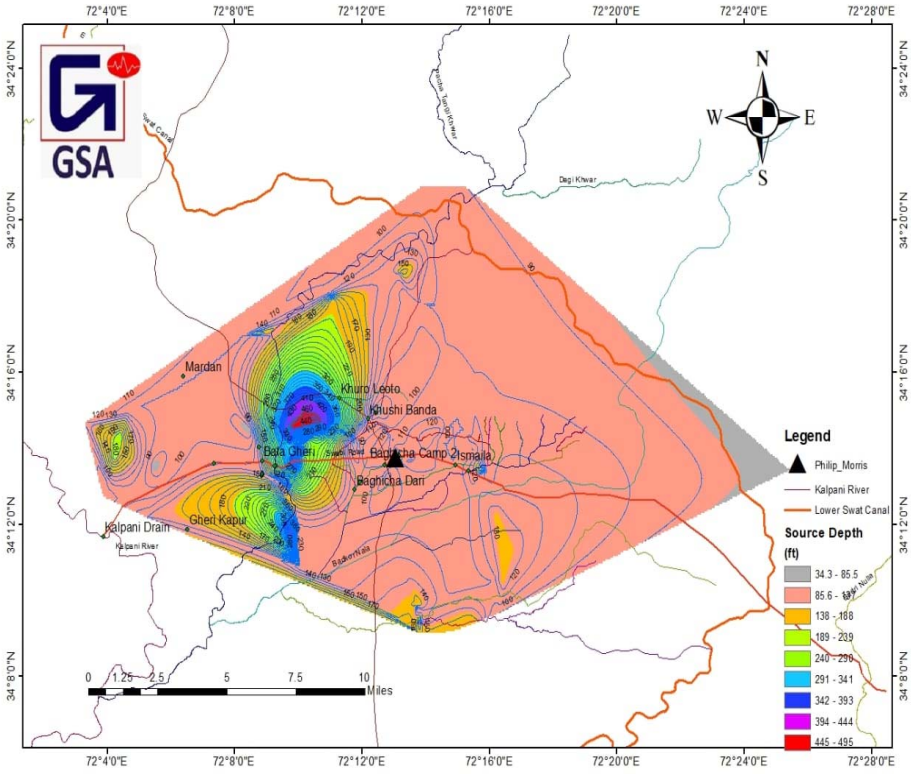
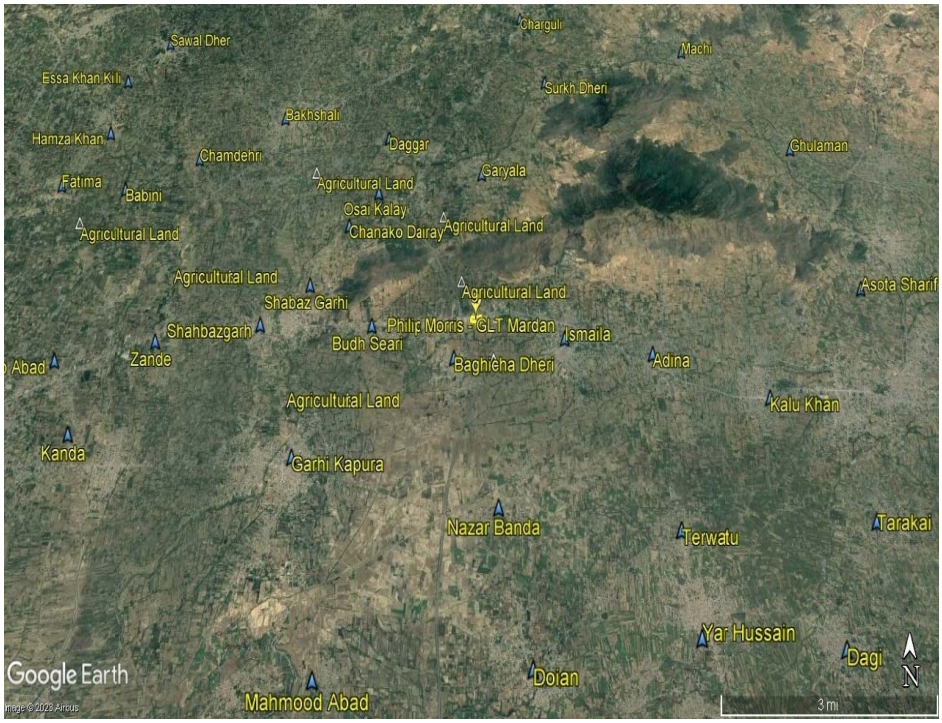


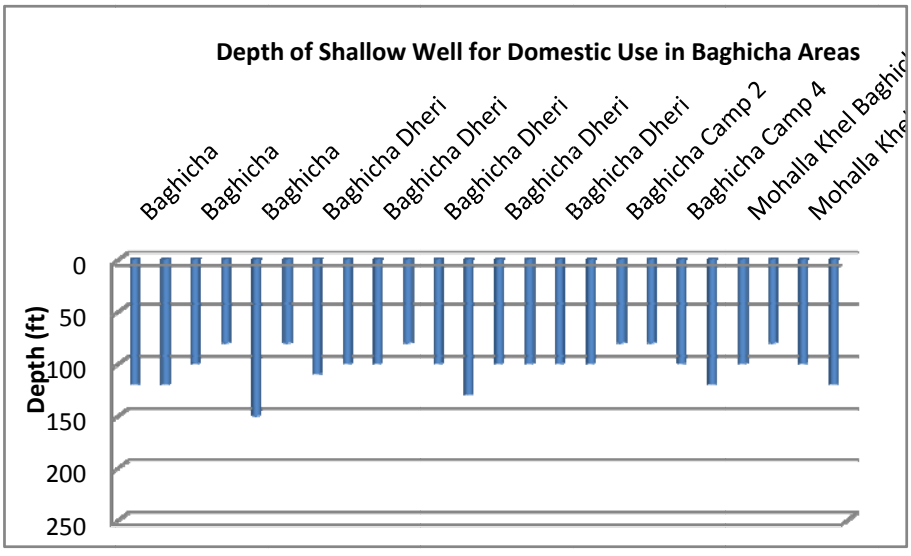
Figure 2.4b – Depth to Water Table

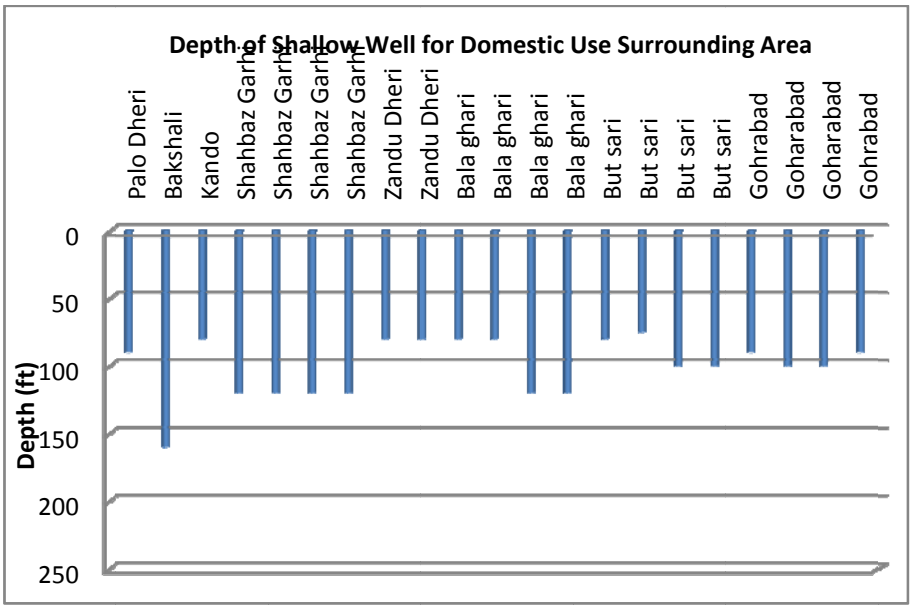


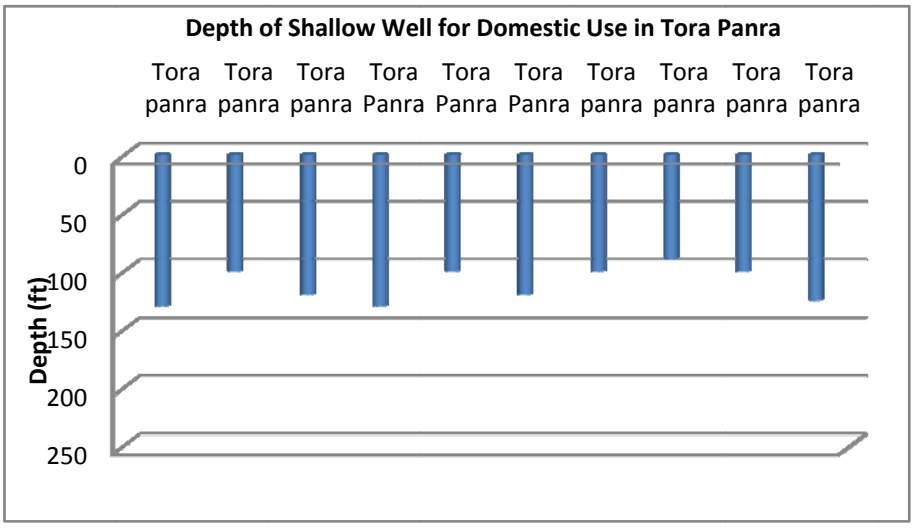
Neighboring Land Uses	The neighboring land is home to housing schemes, industrial use and patches of agricultural use. The land has carpeted roads and waste water drainage channels along the main road and are partially paved.
Depth of aquifer tapped for domestic use	A substantial amount of groundwater is being abstracted for different uses in the area through shallow wells depth(80-200ft). During the site visit allied details collected for the same which can be found in Annexure-v of report.

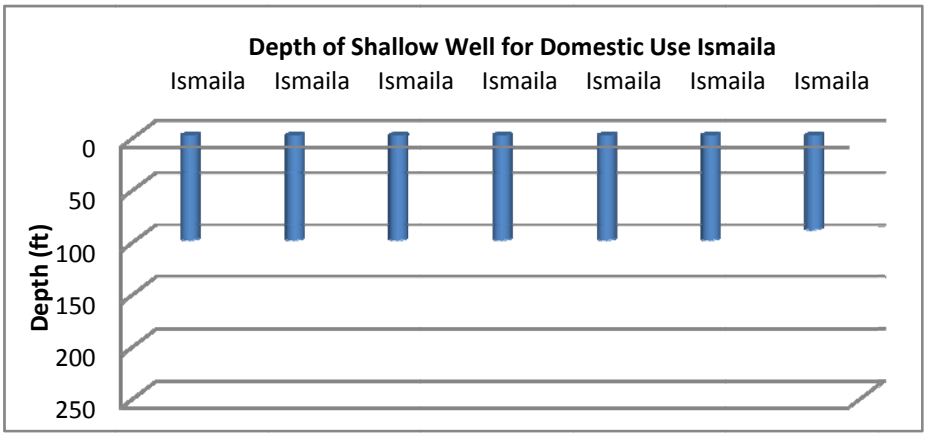
Figure 2.4c – Neighboring Land Use

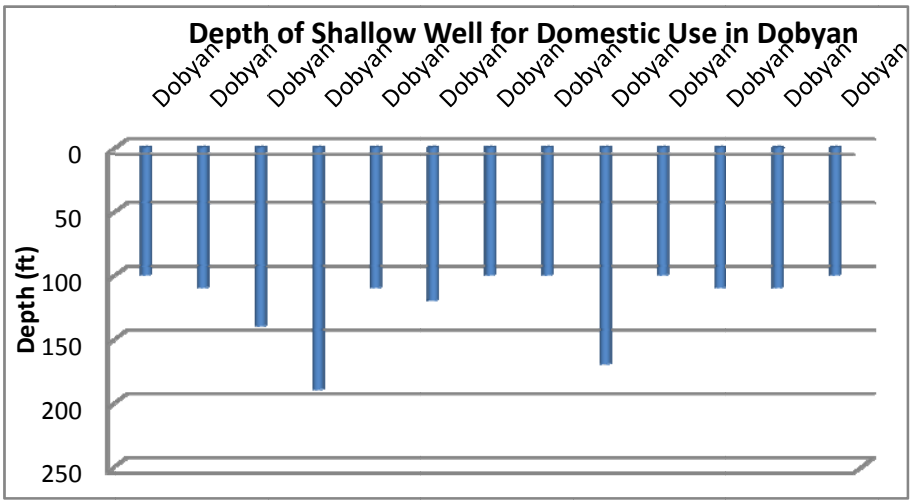


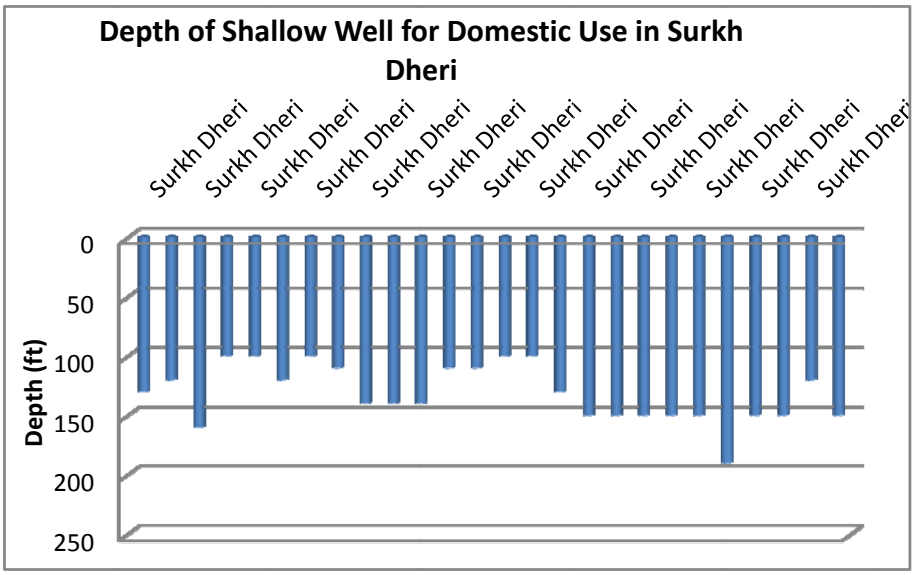


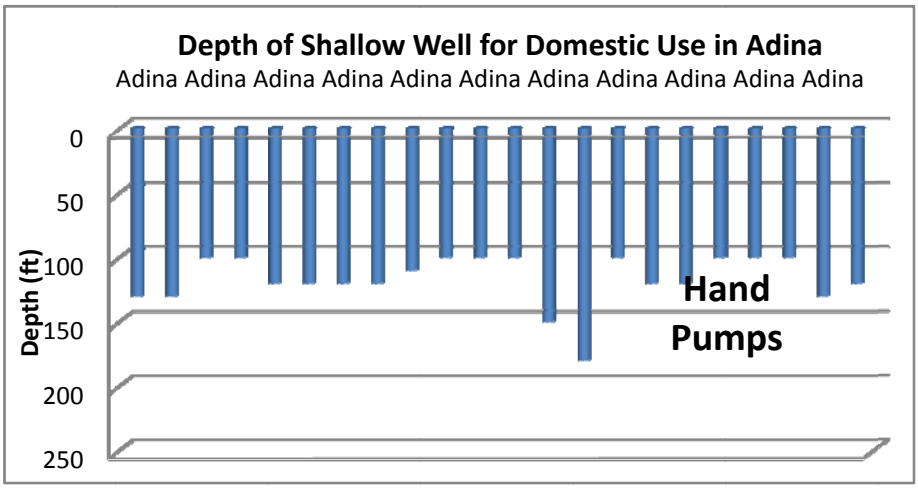


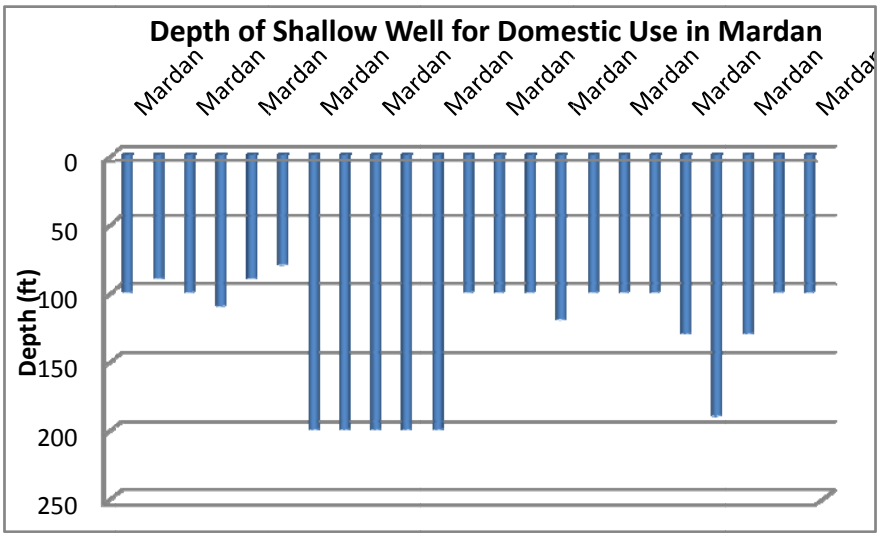












Contamination of Water in the Catchment

Upon investigation the catchment area shows contamination. The area has waste landfills. Even though a landfill is covered, leachate may be generated by the infiltration of precipitation and surface runoff. Fortunately, many substances are removed from the leachate as it filters through the unsaturated zone, but leachate may contaminate groundwater and even streams if it discharges at the surface as springs and seeps. Furthermore, pesticide usage in agricultural areas is not recorded for and it stands plausible that contamination can be present. Specifically, a pressing concern for down steam areas.

3.0 SITE DESCRIPTION

3.1 Plant Summary

Plant Name	Philip Morris International, Mardan Plant.
Location of Country	Pakistan is located within the latitude and longitude of 30° 00 N, 70º 00 E. The Islamic Republic of Pakistan is located in South Asia and the Greater Middle East.
Location of Plant	Plant is located at Ismailia, Swabi, district Mardan.
Geographical Coordinates	The location of the plant is 34º 13´ 47.57" N and 72º 13´ 01.79" E.
Date Established	The plant was not constructed by Philip Morris International henceforth it's old records of year of establishment is not in record.
Premises Area	The total premises area is 420,798 Sq. Ft, whereas the Covered area is 215,820 Sq. ft.
Brands Produced	Processing of raw tobacco for consumption at cigarette manufacturing facilities.
Main Water Consuming Operations	The main water consuming operations are Steam Production and Boiler Operation.
Expansion Plans	No expansion plans are available.
Internal Water Recycling	No internal water recycling is being conducted.
Working Hours	48 Hours during off Season (8 - 9 Months) and 152 Hours during Processing Season (3 - 4 Months).
Current security measures to prevent unauthorized access and protect associated equipment	In order to prevent unauthorized access, the management at the plant has the wells under lock and key.
Potential off site pollutant sources 	Major off site pollutant source is the untreated waste water being drained openly. The plant must maintain a proper waste water treatment setup which is effective in making NEQs parameters within compliance. The waste water eventually drains into the Indus River. This has been further discussed in the vulnerabilities section of the report. Figure 2.3 illustrates the discharge of waste water from the plant and the possible path it takes and eventually joins the Kabul River which finally joins the Indus River.

Throughout this path no waste water treatment setup is in operation by the government to treat waste water prior to its disposal. A plausible problem which must be brought into discussion with the governing body.

Potential on-site pollution sources

Potential on site pollution may be caused by chemical spills or oil leakages from fleets. No integrity report for sewerage, process or storm water drains is available.

The plant has expressed to make integrity report as a part of its master plan in coming days. This will help the plant to be aware of any unwanted leakages which can lead to compromised seepage of untreated water within the catchment. At the same time, it can support in wastage of raw water based on any plausible leakage from its raw water drains.

Supporting Data

Figure 3.1a – Site Overview

Figure 3.1 b – Layout Drawing of Plant

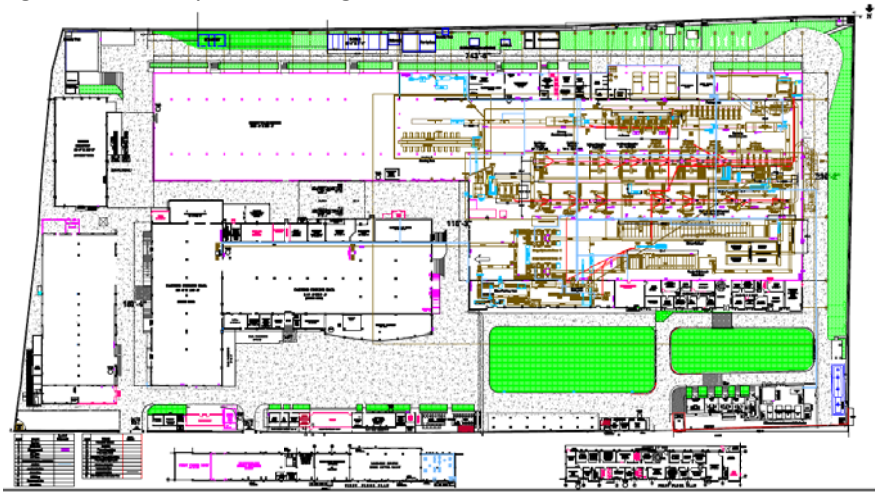
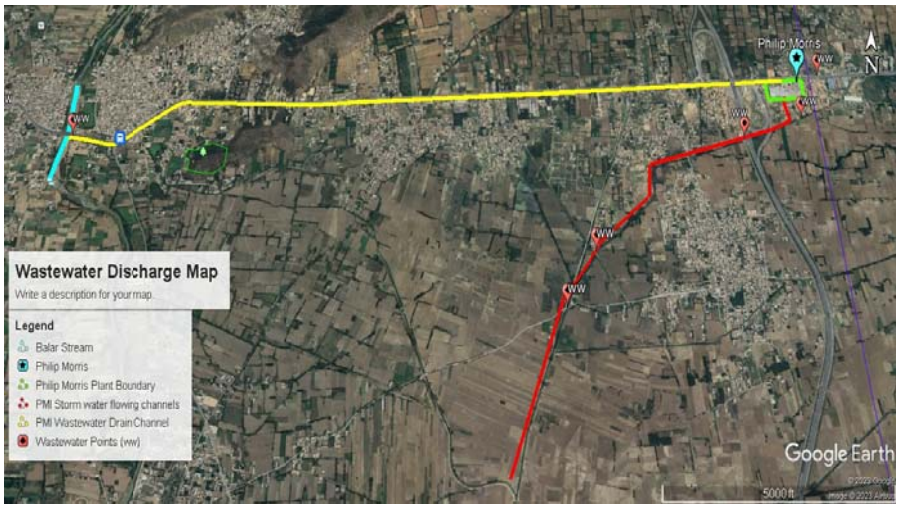


Figure 3.1c - Site Boundaries

Figure 3.1d – Waste Water Discharge Map



3.2 Water Treatment by Philip Morris International, Mardan Plant

Water Treatment System

The plant has an Ozone Unit for drinking Water only and does not have any Reverse Osmosis plant installed.

There is no data to determine the water treatment system's effectiveness. The plant must have third party test results of treated water. This shall ensure the effectiveness of the water treatment system and provide time to deal with any corrective measure required to ensure well treated water. This has been addressed in the vulnerabilities section of the report.

Figure 3.2 – Water Treatment System

No detailed diagram for water treatment system as provided.

3.3 Water Use by Philip Morris International, Mardan Plant

Past, present and future Water Use 	The plant has not provided sufficient data for review. The plant must make a plan to maintain data of total consumption of raw water, its usage in production and waste water discharge data. This data will enable to determine the water use ratio and help to reduce the water use ratio which is of major importance on being a water steward. This has been narrated further in the vulnerabilities section of the report.
Water Use Limitations	No present water use limitations are being faced by the plant. The ground water scarcity aspect is raising alarm bells in Pakistan. The probability of industrial water use limitation may emerge in the near future. Henceforth, the plant must take up opportunities to not only replenish water resources but also make plans for internal water recycling. This has been further discussed in section replenishment opportunities in the report. As the plant is not engaged in an effective internal water recycling it stands marked in vulnerabilities section of the report.
Storm Water Management	Storm water drain system has been constructed. Its effectiveness is yet to be measured by the plant. The drainage integrity testing will help to determine the effectiveness of storm water drain.

3.4 Replenishment Opportunities

In-House Water Saving Projects 	The plant is actively participating in creating water saving projects within the plant. These activities will provide opportunity to the plant to lower its raw water consumption and water use ratio.
Boreholes Project 	This is mandatory in terms of addressing future production increase. As municipal support for providing raw water remains without prospect.
Artificial Aquifer Recharge 	Recharging in and around the plant periphery is important since it can provide surrounding communities awareness of the positive steps taken by plant and simultaneously decreasing the net amount of ground water pumped at the plant.
Water Saving Awareness 	Community engagement water projects can be initiated by working in partnership with local water related research organizations. NGO's can be beneficial in protecting the legislation for Water code of Pakistan henceforth creating a better resource management and long-term availability.
Rainwater Harvesting 	Measures have been taken up by the plant to successfully carry Rainwater Harvesting at the plant. This will provide support and lessen the amount of groundwater pumped by plant. The harvested rainwater can be further used to support artificial recharge. In order to achieve that the plant can install a recharging well.

Water Treatment Units 	Philip Morris International (PMI) can play a pivotal role by providing surrounding areas with small-sized water treatment units. This is also critical to ensure the key role Philip Morris International plays for safeguarding groundwater resource and the major agenda behind having a Water Protection Plan.

3.5 Water Supply to the Community

Supply to the Community 	The plant is not providing any support of supply to the community. Being a water steward requires support to the surrounding community. The community requires fresh water sources and awareness on clean drinking water. The plant can play an important role by being a support for the community.

3.6 Site Water Balance

Water Balance 	As the data for past, present and future raw water abstraction, production and effluent discharge was not available the site's water balance cannot be created. This has been marked in the vulnerabilities section of the report.

3.7 Impact to Watershed Quality

Wastewater Treatment System 	The plant does not have any waste water treatment plant. The untreated waste water's discharge will be affecting the water quality of not only the immediate catchment but also downstream. This is eventually resulting in a negative impact on the watershed quality. Being a water steward requires the plant to play its part by having an effective wastewater treatment system in place and encourage the stakeholders of the same. Specifically, the governing authority. This has been addressed in the vulnerabilities section of the report.
Waste Water Discharge data 	No waste water discharge data is available. This has been addressed in the vulnerabilities section of the report.
	The plant can make targets of achieving zero waste water discharge. In doing so an effective waste water treatment plant is of utmost importance.

3.8 Impact of Surrounding Area Water Use

Neighbouring Water Users	The neighboring water users are normally various industries, housing societies, hospitals, Farmhouses and Educational Institutions. Each has a direct and indirect impact on the water use of the area. The entire surrounding area is populated.

3.9 Sustainability of the Community's Source of Water

Population and Population Density of Pakistan	The population of Pakistan is estimated at 223.40 million. The population density in Pakistan is 287 people per km^2. The country's population is equivalent to 2.83% and is now ranked as number 5^{th} in the list of countries by population.
Population in Mardan	The population of Mardan district as per last available record is 2.373 million.
Current Water Supply System	The current water supply system in Mardan remains to abstract groundwater as its main source. The city has seen an uprising in the number of installed tubewells. The water supply system still needs good government management to be successful in providing water to the community in Mardan and surrounding areas.
Limits to the availability and quality of water for the Local Community 	Many areas within Mardan yet have lack of clean drinking water and are still requiring support from the government. Nevertheless, lots of miss-management by such authorities is creating difficulty for maintaining groundwater quality. They must be engaged to provide helpful feedback and improve the service for the betterment of the community. Stakeholder engagement plan must include such authorities.
Other Large Water Users	Municipal corporation, food and beverage industries, chemical or textile industries and agricultural areas are among the large water users in Mardan.
Local and Regional Water Resources Management Planning Documents 	The governing authorities have poor data management and planning facilities. It is very important to maintain data and records must be kept in computerized format. Plans must be created with the governing body to help maintain data for timely actions.
Economic Development and Water Resource Allocation Priorities of Local and Regional Planning Authorities 	Most development priorities are given as per the governing party of the province or country. Henceforth economic development and water resource allocation are mostly with every new political party stepping up to govern the country.
Annual variance in Water Usage	The 15 barrages and associated canals, in conjunction with the 3 reservoirs Tarbela and Mangla and Chashma form the key operational infrastructure of the Indus used to manage the distribution of water. Making this distribution equitable and ensuring that seasonal variability is managed is the role of the forecasting and allocation system. As the volume of storage in the Tarbela, Mangla and Chashma is small relative to the mean annual flow in the Indus

(approximately 10% of mean annual flows which can ensure up to 30 days of supply), considerable seasonal planning takes place to equitably maximize the future use of water. The way in which this is currently achieved is a result of:

- Seasonal forecasting of flow quantities and flow patterns at Rim Stations which are the flow gauges on the largest rivers upstream of all major Pakistan infrastructure;
- Forecasting major storage operations,
- Water sharing between Provinces using the Water Apportionment Accord (1991); and
- Water distribution within the command canals in provinces.

4.0 CLIMATE OF THE STUDY AREA

4.1 Climate

Climatic Conditions	Mardan, KPK is classified as a semi-arid hot climate.
Rainfall	The climate is of the sub-humid subtropical continental lowland type. The average annual rainfall in Tarbela, which is the nearest meteorological station, is 868 mm; more than half of it falls in the summer period. It is assumed that the rainfall in the catchment area is 20 per cent higher, i.e., 1040 mm.
Temperature	Mardan District has severe climatic conditions with hot summers and cold winters. Winter in Mardan starts in mid-November and ends in late March. The coldest months are December and January. The lowest minimum temperature recorded for the month of January is -4°C and the mean minimum temperature recorded for the month of January, the coldest month is 2.1°C. Summer months in District Mardan are May to September. The highest maximum temperature recorded is 49.5°C for the month of June and the mean maximum temperature is also recorded in the month of June, which is 40.2° C. The maximum temperature in summer generally surpasses 45 °C during the hottest month and the minimum temperature goes below 1 °C during the coldest month. Range and monthly distribution of temperature from the past 10 years (2000-2010) for District Mardan.
Climate Change	Climate change in Pakistan is expected to increase the frequency and intensity of extreme weather events, coupled with erratic monsoon rains causing frequent and intense floods and droughts, which will also increase the siltation of major dams. Rising temperatures will likely cause a recession of the Hindu-Kush-Karakoram-Himalayan glaciers threatening water inflows into the Indus River system. Rising temperatures will also result in enhanced heat and water-stressed conditions, particularly in arid and semi-arid regions, leading to reduced agricultural productivity.

Figure 4.1: Rainfall distribution in Mardan

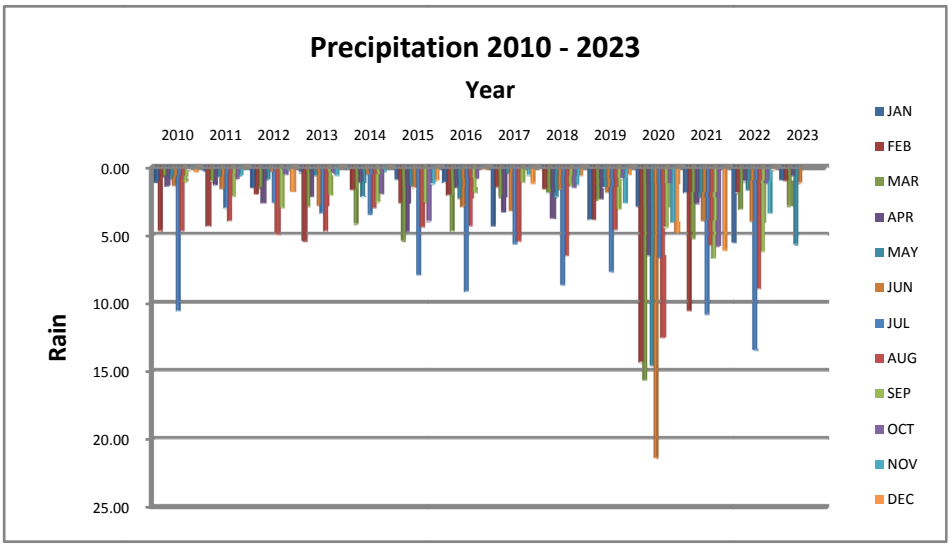
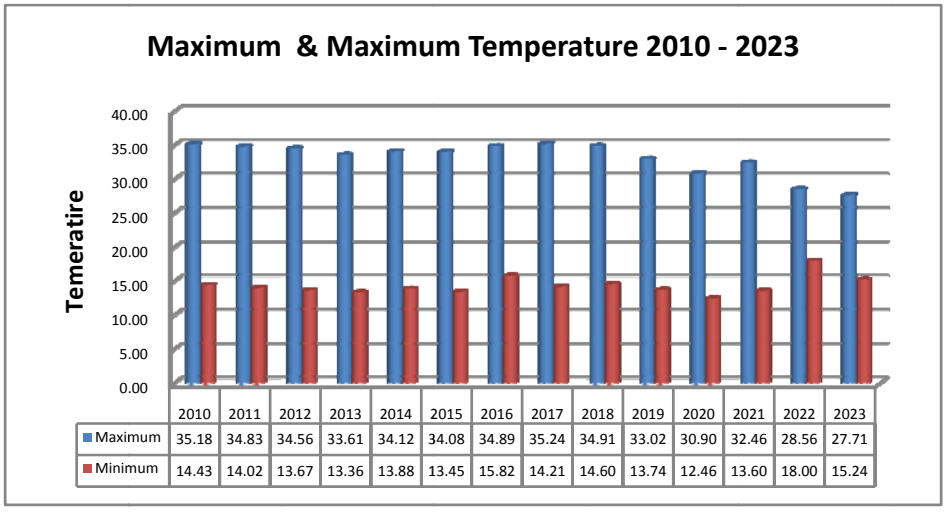


Figure 4.2: Minimum and Maximum Temperature



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Maximum	35.18	34.83	34.56	33.61	34.12	34.08	34.89	35.24	34.91	33.02	30.90	32.46	28.56	27.71
Minimum	14.43	14.02	13.67	13.36	13.88	13.45	15.82	14.21	14.60	13.74	12.46	13.60	18.00	15.24

5.0 WATER RESOURCE REGULATORY FRAMEWORK

5.1 Agencies

Water and Sanitation Services Company Mardan (WSSCM)	This is the regulatory agency for water projects and sanitation programs in Pakistan.
Public Health and Engineering Division (PHED)	This division is responsible for managing water supply development projects i.e.; tubewell development at every district.
Tehsil Municipal Authority (TMA)	TMA is equally responsible for tariff revenue collection procedures.
Mardan Development Authority (MDA)	MDA is responsible for the development services in Mardan District. It plays a major role in demarking areas for industrial, housing and other infrastructure development projects in Mardan District.
Irrigation Department	The irrigation department is responsible for the rivers flows management within the region.

5.2 Policies and Regulations

Legislations Pertaining to Water Tariffs	The tariff revenues of Water and Sewerage Services Company Mardan (WSSCM) and Tehsil Municipal Authority (TMA) do not even cover current operating costs due to poor collection rates and low tariff levels. Service providers respond to financial shocks by reducing service quality (e.g., reducing hours of service to reduce electricity costs). Poor maintenance and poor operating efficiency lead to existing resources being poorly employed, thus contributing to the vicious circle of poor performance, poor service, poor collection rates, insufficient funding (GoP, 2007).
Legislations Pertaining to Waste Water Tariffs	There seems no national policy, in effect, on sustainable use of wastewater in this country. No tariffs are observed for waste water. Laws and regulations have been formulated for wastewater in this country but their implementation due to lack of resources and skilled manpower is the real issue. The result is that, while an appropriate and necessary administrative capacity exists on paper, its effectiveness is seriously curtailed in practice due to these shortcomings. For example, the National Environmental Quality Standards (NEQS) under the Pakistan Environmental Protection for industry and municipal discharges were originally formulated in 1993 revised in 2016, but even voluntary compliance and reporting have yet to be instituted because of a lack of practical monitoring ability in the Environmental Protection Agency (EPA); the Environmental Impact Assessment (EIA) system is mandatory but seldom followed in the public sector; and environmental laboratories have been established in all provinces but function with skeletal staff and budgets inadequate even for their routine equipment and chemical needs. Similarly, environmental tribunals have been created but their capacity to deal with reported cases is extremely restricted, as minimal personnel have been deputed in only two provinces to collectively oversee the entire

	country (WB-CWRAS Paper 3, 2015).
Water Supply	Uneconomic water pricing exacerbates the problem in urban areas, where a flat rate is charged or water is provided free of charge, a policy that both encourages the wasteful use of water and eliminates incentives for suppliers of water services to upgrade their water supply, treatment, and disposal facilities.
Water Infrastructure Funding	Funding for water infrastructure although are present but have been given very scarce funding. Such scarce funding for infrastructure planning has resulted in many problems.
Water Rights	Legislations are present for water rights in Pakistan but majority of the time such rights are revoked resulting in mismanagement of water resources.
Municipal and Industrial Wastewater Management	Economic incentives have not been introduced for industries to acquire environment friendly technology. Problems of wastewater disposal tend to stem from distortions due to economy wide policies, failure of targeted environmental policies, and institutional failures.
Drought and Flood Management Policy	Drought and Flood management policy although exists but is not followed by officials. Implementation of such policy is a necessity. For instance, during flood season a huge resource of water is wasted since no proper management plan exists for capitalizing on such quantity of water.
Watershed Management, including Water Quantity and Biological Health of the Natural System	At present no proper watershed management is practiced. This has directly affected the water quality and biological health of the natural system. Ignorance in the proper waste disposal has resulted in poor watershed management and quality issues have further risen.
Land Use / Land Planning	The Mardan Development authority (MDA) reserves the rights for any land use. Regardless of such regulatory body no proper planning on land use was ever carried out. In recent time the regulatory authority has become much more vigilant in its duties and is restricting improper use of land in Mardan and surrounding areas.

5.3 Water Resource Management Planning Priorities and Regulation Enforcement Activities

At present water resource management planning priorities and regulation enforcement activities are not created in great detail and seldom so created are not followed. Major change in the governing bodies is required to create strict water resource management policies and proper check and balance to ensure its usage. Earlier in the report the rivers mentioned are an important source for Mardan but they are not being managed properly. If necessary, steps are taken up immediately not only, will we be able to save our natural recharging source, we would be even able to bring down the deteriorating quality of ground water.

5.4 Legislation and Regulation Summary Table

At present the plant has provided NO relevant legal permits.

6.0 Conceptual Hydrologic Model Indus Basin

Precipitation

The mean annual precipitation (MAP) in the watershed has huge fluctuations and as such is difficult to assess. Also melt water in the mountains play a big role in maintaining the river flow. Most of the precipitation falls in the upper parts of the Indus watershed, where the MAP rises to more than 1800 mm. Towards the middle part the MAP is close to 400 mm and towards the bottom it is close between 0-200 mm. The MAP in 2007 the Indus Basin was an average 415 mm according to a study from Hydrology and Earth System sciences. This equates to 483,475 millionm^3/a.

Evapotranspiration

Most of the evapotranspiration happens over the irrigated lands with very little actual evapotranspiration happening outside of these parts due to the low precipitation occurring in these parts. According to a study conducted from Hydrology and Earth System sciences the total annual evapotranspiration from natural rain was estimated at 344,000 million m^3/a in 2007. The study does not account for evapotranspiration from irrigated water and includes the irrigation figure in diverted water.

Surface Water Flow

According to a hydrological cycle over South and Southeast Asian River Basins conducted from Hydrology and Earth System sciences the runoff amounts to a total of 178,300 million m^3/a, of which 21,300 million m^3/a flowed into the Arabian Sea while 157,000 million m^3/a was diverted using the canal system.

Groundwater Flow

The rainfall in the watershed being scarce, very little contribution is made to groundwater reservoir by it. Under natural conditions, groundwater discharge occurs largely as transpiration and evaporation.

Consumption

The definition of consumption is the water that is transferred out of the watershed by human activity. We assume that water taken from the rivers in the watershed for use in the cities and towns is returned to the watershed through discharge of (un)treated sewage.

Water Balance combined Watershed

$\Delta S = P - (Et + Qsw + Qgw + C)$, where:

ΔS	=	Change in storage of water in the basin
P	=	Precipitation
Et	=	Evapotranspiration
Qsw	=	Flow of surface water out of the basin
Qgw	=	Flow of groundwater out of the basin
C	=	Consumptive uses

P	483,475	million m^3 per year
E_t	344,000	million m^3 per year
Q_{sw}	178,300	million m^3 per year
Q_{gw}	0	million m^3 per year
C	0	million m^3 per year
ΔS	-39,665	million m^3 per year

Table 6.1 – Water Balance Table Indus Watershed

Water Scarcity Analysis for Watershed

The water demand in 2007 was negative; this is likely due to a under evaluation of the precipitation as the data available did not fully take snow melt into account. Another possibility is that the runoff of 2007 was less than the value stated as this figure varies greatly from year to year. Nonetheless this calculation further enforces the view many studies have concerning the water situation in Pakistan which is that the water stress levels are starting to reach critical levels and that ground water levels are dropping. The lack of good water storage infrastructure means that even in years of abundant rain this causes extreme floods of which a major chunk simply drains into the Arabian sea.

Risk Level: Very High
More than 60% of available fresh water is used.

Although this will probably be slightly offset by the effects of climate change, the renewable water resources in 2050 are estimated to reduce to below 750m^3/pp/a.

7.0 Potential Vulnerabilities and Opportunities

Vulnerability	Pollutant/Issue	Mitigation Strategy	Goal and/or Objective
Development of a water stewardship Commitment in the light of water stewardship policy	Water Saving Projects	A designated Water Management team must be identified for internal and external projects identification under AWS umbrella to show case best water saving practices.	Ensure Best Water Saving Projects
Potential contamination of groundwater from surface water pollution	• Discharges to surface water of: industrial and municipal wastewater • Land Fills	Engage municipality, NGOs, community, academy in water stewardship. Implement spill and waste management plans for prevention of environmental release.	Ensure a continuous supply of high-quality groundwater.
Deficiency of regulations and groundwater modeling tools	There are currently no regulations concerning groundwater and there is no functional model in use for prediction of current actions on long term sustainability and testing of alternate approaches for managing the resource.	• Engage municipality, NGOs, Stakeholders and water using communities to campaign for groundwater regulations. • Support NGOs, stakeholders e.g., PHED, Watershed Management Plan, Aquifer monitoring and data collection.	Ensure a sustainable supply of groundwater to all stakeholders.
Weak institutional framework in the water sector	The institutional framework in the water sector is understaffed and underfunded.	Support the development of the National Water Policy	Ensure a sustainable supply of groundwater to all stakeholders.
Increasing groundwater demand	Increasing groundwater demand due to increasing population	Rain water harvesting and recharge activities need to be part of governing byelaws for all the stakeholders during monsoon.	Avoid excessive long-term depletion of groundwater resources
Groundwater Depletion& Insufficient water storage capacity.	• Increasing use of groundwater due to increasing population. • The country has less than 30 days of water storage capacity and is unable to store surplus water during the monsoon.	The development of groundwater recharge in wet years using rainwater harvesting techniques in urban and rural areas	Ensure a continuous supply of high-quality groundwater.
Public Relations& Public perception as a Water steward	Water Issues Facing the community	• Engagement with local media to disseminate water related information to the public. • Media Staff, bloggers must visit local community to show case the best water practices by the plant. • Water projects story of drip field	Ensure Media coverage for show casing water related information to community as a water steward.

Vulnerability	Pollutant/Issue	Mitigation Strategy	Goal and/or Objective
Water Stewardship Plan	Development of water stewardship plan to address water issues facing the community	The plant must engage in discussion on water related issues on regular intervals on which internal and external issues are discussed at several external forums.	Ensure best practices as a Water steward
Environmentally sustainable activities	Environmentally effecting activities	Develop AWS related projects agreement with EPA to sponsor environmentally sustainable activities dealing with climate change, water conservation.	Ensure better practices with EPA for community at large
Engagement with Stakeholders	Stakeholders' engagement on consensus on current water stewardship work and future development	Consultative meetings / online sessions to be hosted by plant inviting relevant stakeholders to discuss and get feedback on sites water stewardship commitment.	Ensure continuous engagement with Stakeholders
Raw Water Sampling	Timely detection of bacterial issues.	Annually lab analysis of raw water samples must be taken from each raw water source point.	Ensure the data availability to analyze changing trends of raw water in timely manner.
Treated Water Sampling	No data is available of treated water	Laboratory testing if treated water samples must be taken for record keeping.	Ensure the data availability to analyze changing trends in timely manner.
Maintenance and Monitoring of Source Water Wells	Inspection of screen slots and sudden breakdown. Inspection of any rusting of installed pipes.	Proper monitoring records, Timely repair and Maintenance	Ensure wellbeing of tubewells.
Internal Water Recycling	No internal recycling	A internal water recycling plan must be adopted for the plant.	Ensure water conservation practices.
Waste Water Treatment	No waste water is treated prior to discharge outside the plant.	A waste water treatment plant must be installed to support effective treatment of waste water prior to its disposal.	Ensure protection of water sources from contamination,
Storm Water Drains	No measures taken to inspect the drains effectiveness.	Drains must be tested to understand its effectiveness.	Ensure proper drainage of Storm water.
Pseudomonas, Arsenic, E. coli, Total Colony Count presence	The surrounding area data shows the presence of such parameters	Ensure lab results to assess the parameters	Ensure quality of raw water abstracted.

8.0 STAKEHOLDERS

8.1 Relevant Stakeholders

There are a number of stakeholders operating within MARDAN that have the potential to impact PMI - MARDAN at varying levels and through varying means. The following list of stakeholders at the constitutional, regional, and local levels having the most relevant potential to influence PMI - MARDAN.

Table 8.1: Summary of Relevant Stakeholders

Stakeholder	Interest	Membership	Geographic Scope	Potential Impact to Plant Operations
Ministry of Water and Power, Government of Pakistan	Provide funding from the federal government and policy formulation	Government agency	Country wide	Establishment of water use regulation that could both positively and negatively impact PMI.
World Wildlife Fund (WWF)	To provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nationsand people.	Advisory body providing guidance regarding particular issues in the community	Global	Can have positive impact by guiding the communities and government for a careful use and disposal of the fresh water respectively.
Indus River System Authority	Interprovincial division of available water resources	Federal government agency	Country wide	Establishment of water use regulation that could both positively and negatively impact PMI.
Water and Power Development Authority	Executing agency on behalf of federal government for planning and execution of river water management projects	Federal agency	Country wide	Establishment of water use regulation that could both positively and negatively impact PMI.
Mardan Development Authority	Responsible for fresh water and waste water management in Mardan.	Provincial agency	City wide	Establishment of water use regulation that could both positively and negatively impact PMI.
Pakistan Council of Research in Water Resources (PCRWR)	Conduct applied research in water sector	Government agency	National	Can develop and regulate water quality standards to be followed by all stake holders at national level.
Pakistan Council for Scientific and Industrial Research (PCSIR)	Conduct applied research in industrial sector with vide scope that includes water quality issues	Government agency	National	Can offer water quality analysis for the industry with respect to raw and waste water. Can also handle studies with respect to waste water management at city scale.
KPK Irrigation Department	Canal water management and development of related infrastructure	Provincial	Provincial	Establishment of water use regulation thatcould both positively and negatively impact PMI.
Pakistan Environmental Protection Agency	Develop and enforce environmental standards for industries and government agencies	Provincial	Provincial	Provides a basis for water quality standards and requires waste disposal to meet the established standards, could both positively and negatively impact PMI.
Private Industry	At association level for their own interests but at present have no interest in managing and sharing cooperatively the water resource.	Local	Local	Can have both positive and negative impacts by adopting or otherwise of the standards set by various agencies
Farming Community having tubewells	Local in the Kissan Board, without any association with regard to groundwater use and development	No membership with regard to groundwater use	Local	Can have both positive and negative impact on their lands as well as the groundwater by misuse or otherwise of the available fresh and waste water sources.

9.0 LIST OF REFERENCES

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- www.worldometers.info/world-population/pakistan-population/
- FAO Aquastat
- Aqueduct
- GSA Achieved Data
- https://power.larc.nasa.gov/data-access-viewer/

Appendices

Appendix - 1 Tubewell Number 01 Installation Report

GEOSCIENCE ASSOCIATES

GSA

Integrated GeoScience for economy safety & environmental responsibility

LAKSON TOBACCO COMPANY LTD

Leaf Division Complex, Mardan

REPORT

DRILLING & INSTALLATION OF TUBEWELL

June, 2010

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ACKNOWLEDGEMENT

GeoScience Associates is highly thankful to m/s LAKSON TOBACCO COMPANY Ltd. in extending their full co-operations and support to its team members during their stay in connection with the drilling & installation of tube well at their Leaf Division Complex, 22- KM Swabi Road, Mardan.

In this regard, we salute all the officers and staff of the Leaf Division particularly Factory Manger Mr. Khan Muhammad, Factory Engineer Mr. Shaukat Rehman, Boiler Engineer Mr. Azhar Ahmed, Admn. Manager Mr. Wilayat Ali and Mr. Naseem Khan.

PREFACE

Groundwater has been an important resource throughout human history. It is a hidden treasure and remains of little value unless unearthed and brought to surface.

Groundwater is the most important natural source which is widely used in Agricultural Production, Industrial Development and Municipal or Domestic Supplies in rural and urban areas throughout the world. To meet this increased demand of water supplies, the ground-water source has been tapped by sinking wells at various locations. For uninterrupted economic supply of groundwater at any place; knowledge of occurrence of suitable water in geological formations, design and construction of wells, development, pumping equipment and maintenance of water wells alongwith groundwater management is essential.

The Leaf Processing Complex of m/s Lakson Tabacco Company Ltd. at Mardan, Khyber Pakhtoon Khwa is already having two tubewells. Out of these, one is non-operational on account of pumping or filled with sand and the other is yielding around 75 USGPM.

Now in consideration of its need of additional fresh groundwater, m/s Lakson Tabacco Company Ltd, after evaluating the competency & resources, knowledge & know-how, expertise & experience of GeoScience Associates, hired its services to explore & exploit water for them.

Initially, drilling and installation of 1 No. tubewell was assigned to GeoScience Associates which has been accomplished by adopting modern techniques and practicing state of art methodology. In this regard, a detailed report of the tubewell construction is presented for record and reference or guidance in future.

Lahore, June 30, 2010.

Akhtar Jamal
Director Engineering & WR

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GLOSSARY OF ABBREVIATION

%	Percent
^{0}c	Degree centigrade
Cusec	Cubic feet per second
Ft, ft	Feet
GSA	GeoScience Associates
ID	Internal dia
KPK	Khyber Pakhtoon Khwa
LTC	Lakson Tobacco Co
m^3/hr	Cubic meter per hour
MBT	Main boundary thrust
MCT	Main central thrust
mm	Millimeter
OD	Outer dia
T/W	Tubewell
TDS	Total dissolved solid
USGPM	U.S gallons per minute
WHO	World Health Organization

CONTRIBUTORS TO THE PROJECT & THE REPORT

SR.#	NAME	DESIGNATION	INPUTS
1.	Syed Mosoof Hussain	C.E.O	Overall Command
2.	Mr. Akhtar Jamal	Director Engineering & WR	Incharge of the project, technical guidance and management. Also scrutiny and finalization of the report
3.	Mr. Sajjad Haider	Director Geophysics	Managing ERS, Electrical Log and finalization of tubewell design
4.	Mr. Riaz Ahmed Khan	Hydrogeologist	Execution and supervision of field work. Also preparation & compiling of preliminary report
5.	Mr. Muhammad Haroon	Geophysical Officer	Electric logging of the borehole
6.	Mr. Muhammad Khalid	Driller / Operator	Drilling, development & testing activities
7.	Mr. Haroon Shaukat	Field Assistant	Drilling, development & testing activities
8.	Mr. Khawer Abbas	I.T Coordinator	Publication of report
9.	Mr. Muhammad Kashif Jaan	I.T Officer	Publication of report

1.0 INTRODUCTION

The Leaf Division Complex of M/s Lakson Tobacco Company Limited is located at 22-KM, Swabi Road, Mardan, Khyber Pakhtoon Khwa. To meet their demand of fresh ground water through drilling and installation of tube well, they acquired the services of GeoScience Associates (GSA) Lahore.

To achieve the demand of the client, GSA initiated the activities in a systematic and scientific manner. First of all, one of its Hydrogeologists visited the project area to collect informations regarding geology & topography of the area, water quality & quantity within the project premises or neighbouring tube wells, general ground water practices, collection of record of earlier drilled tube wells, selection of T/W site etc.

In consideration of informations gathered, it was evaluated that a tube well of about 300 feet depth and having safe yield around 0.25 cusecs could be installed any where in the project area.

2.0 SCOPE OF WORK

The installation of the tube well having optimum but safe discharge, following scope of work was involved:-

- Geology and other physiographic features of the area
- Selection of tube well site
- Site Preparation and drilling of borehole
- Collection of lithologic samples
- Grain size distribution of selected sand samples
- Geophysical well logging
- Design of the tubewell
- Lowering of tubewell assembly
- Gravel packing
- Development and testing of tubewell
- Placement of sanitary seal
- Construction of pedestal
- Compilation of report

2.1 GEOLOGY AND PHYSIOGRAPHIC FEATURES OF THE AREA

2.1.1 Geological Setup

The Swabi area lies on eastern side of Peshawar. It is well connected with Mardan & Char Sadda cities through metalled roads. It is located in a broad valley occupied by scattered outcrops of low lying heights. These rocks are of different lithologies originated from the surrounding source rocks.

The plain area is covered by sand, silt and loessic clay deposits. Indus River flows on eastern & southern sides.

The Quaternary deposits forming the main valley are that of unconsolidated gravel, sand, silt and clay.

The strata exposed in the surrounding area are mainly composed of Paleozoic rocks and partially of the Pre-cambrain rocks. The Paleozoic rocks consist of Shewa, Ambela and Warsak Complexes, Swat and Mansehra granite Complex**,** and other undivided Paleozoic rock. The Pre-cambrian suit of rocks is represented by the Tanawat and Manglaor formations and Karora complex and Gandaf formation.

Structurally, the area lies between the Main Boundary Thrust (MBT) and the Main Central Thrust (MCT).

Geological map of the area which is attached as Fig -2 depicts the details of the geology.

2.1.2 Topography

Mardan district may broadly be divided into two parts, North-Eastern hilly area and south western plain. The entire Northern side of the district is bounded by the hills. In the district, the highest points in these hills are Pajja or Sakra, 2056 meters high and Garo or Pato, 1816 meters high. The southwestern half of the district is mostly composed of fertile plain with low hills strewn across it. This plain once formed the hills. From the foothills the plain runs down at first with a steep slope, which carried the rainwater to the lower levels and ultimately to the Kabul River.

2.1.3 Rivers and streams

Generally stream flows from North to the South. Most of the streams drain into Kabul River. Kalpani, an important stream of the district rises in the Baizai and flowing southwards joins Kabul River. Other important streams join Kalpani, such as Baghiari Khawar on the west and Maqam Khawar, coming from Sudham valley and Naranji Khawar from the Narangi hills on the left.

2.1.4 Climate

The summer season is extremely hot. A steep rise of temperature occurs from May to June, and July, August and September record high temperatures. During May and June dust storms are frequent at night. The temperature reaches its maximum in the month of June i.e, 41.5 ^{o}C. Due to intensive cultivation and irrigation, the area is humid. A rapid fall of temperature occurs from October onwards. The coldest months are December and January. The mean minimum temperature recorded for the month of January is 2.1 ^{o}C.

Most of the rainfall occurs in the months of July, August, December and January. Maximum rainfall for August is 125.85 mm. Towards the end of cold weather, there are occasional thunderstorms and hail storms. The relative humidity is quite high

throughout the year while maximum humidity has been recorded in December at 73.33%.

2.2 SELECTION OF TUBEWELL SITE

The informations gathered had indicated that similar subsurface hydrogeological conditions prevail within the project area and therefore, the tube well site could have been selected anywhere. However, keeping in view the constructed buildings, sheds and roads, factory activities, utilization of existing pipe lines and most importantly sufficient distance from neighbouring tubewell/s, a site at 310 ft East of old tube well # 1 (Fig – 3) was selected jointly by the representative of GSA and engineers of m/s Lakson Tobacco Company Ltd.

2.3 SITE PREPARATION AND DRILLING OF BOREHOLE

Before starting the drilling operation, all the material to be used for tubewell construction was arranged at the site, and got checked by M/s. Shaukat Rehman Plant Engineer and Mr. Azhar Ahmad Boiler Engineer. GSA Hydrogeologist remained present at the site till end to supervise & manage the completion of the project.

The shrouding material i.e., pea gravel was arranged from Attock quarries. It was clean, hard, well rounded, carbonate free and of water borne origin. A pit of 20 x 20 x 5 ft was dug by labors to store water for drilling purpose and to collect the drilled subsurface lithologic material coming out of the borehole. Reverse rotary rig was deployed for drilling of the borehole. The drilling was started at about 0060 hrs on 19.06.2010 and completed upto a depth of 305 ft at 0006 hrs on 20.06.2010.

2.4 COLLECTION OF LITHOLOGIC SAMPLES

Subsurface lithologic samples coming out of the borehole were collected at 10 ft interval or at the depth where the lithology was changed. Lithologic samples were properly preserved in the polyethylene bags for classification of sand samples through physical examination and sieve analysis. The lithologic samples indicated that subsurface borehole strata mainly constituted clay of light brown colour up to 160 ft depth and below 160 ft, clay of grey colour, with few intervening layers of medium to fine sand. Lithologic log of the borehole is given as Fig- 4.

2.5 GRAIN SIZE DISTRIBUTION

Selected sand samples of different depths were dried and their sieve analysis was performed to determine grain size distribution so that the filter could be placed against the available aquifers. The results are attached in the Annexure-1.

2.6 GEOPHYSICAL WELL LOGGING

After the drilling was completed, the drill pipes were pulled out for geophysical well logging of the borehole filled with water. The aim of such logging was to confirm the exact boundary and thickness of the potential aquifer zones besides estimating groundwater quality profile within the drilled depth, so as to prepare an optimal design for the installation of the tubewell. For this purpose, WIDCO USA Geophysical well logger was used to record the required subsurface hydrogeological information. Composite (lithologic and electric) log of the borehole is given in Fig-5.

2.7 DESIGN OF THE TUBEWELL

Based on the grain size analysis of the soil samples, the defined boundaries of the aquifer zones alongwith the general water quality profile observed from the geophysical well logging, the design of the tubewell was prepared and shown in Fig- 6.

2.8 LOWERING OF TUBEWELL ASSEMBLY

Once the well design was finalized, the bore below 260 ft was filled with sand and than reamed with 18 inches dia cutter, cleaned, washed and set ready for the lowering of tubewell.

The tubewell assembly was lowered to the depth of 254 ft with a total strainer length of 46 ft. The strainer was placed against dominantly medium textured sand that constitutes relatively better aquifer. Lay out of the tubewell assembly is given below;

Component	Material	Wall Thickness	Dia (inches)	Length (ft)		
Stickup above g/l	Mild Steel	4.5mm	10		=	2
Pump housing pipe	Mild Steel	4.5mm	10	0.00 to 158	=	158
Strainer	Mild Steel	4.5mm	10	158 to 164	=	6
Blank pipe	Mild Steel	4.5mm	10	164 to 168	=	4
Strainer	Mild Steel	4.5mm	10	168 to 170	=	2
Blank pipe	Mild Steel	4.5mm	10	170 to 172	=	2
Strainer	Mild Steel	4.5mm	10	172 to 192	=	20
Blank pipe	Mild Steel	4.5mm	10	192 to 206	=	14
Strainer	Mild Steel	4.5mm	10	206 to 216	=	10
Blank pipe	Mild Steel	4.5mm	10	216 to 222	=	6
Strainer	Mild Steel	4.5mm	10	222 to 226	=	4
Blank pipe	Mild Steel	4.5mm	10	226 to 228	=	2
Strainer	Mild Steel	4.5mm	10	228 to 232	=	4
Bail plug	Mild Steel	4.5mm	10	232 to 254	=	22
				TOTAL DEPTH OF LOWERING	=	**254**
				TOTAL LENGTH OF PIPE & STRAINER ASSEMBLY	=	**256**

Tubewell assembly was lowered to 254 ft depth and 2 ft of the housing pipe was left above the ground as stickup. Centralizers were placed at 155 ft and then approximately 50 ft intervals below the housing pipes in order to keep the tubewell assembly in the centre of the borehole.

2.9 GRAVEL PACKING

In order to stabilize the borehole formation and to restrict the movement of sand in the tube well, the annular space between the tubewell assembly and the wall of the borehole was filled with shrouding material already stored near the drilling site. The gravel was poured in the annular space slowly and steadily to avoid bridging, segregation and any possible damage to the tubewell structure. The top 25 ft depth of the bore was left blank for proper settlement of gravel and emplacement of sanitary seal. It took almost 18 hours to complete the gravel packing.

2.10 DEVELOPMENT AND TESTING OF TUBEWELL

After the gravel packing phase was completed, turbine pump alongwith columnar pipes were lowered in the pump housing upto 96 ft depth to develop the tubewell. The gear head pulley of the turbine pump was coupled with an engine. The engine was run at a constant speed to operate the turbine pump for the development of the tubewell.

Initially, the muddy water gushed out of the tubewell. After half an hour the pumping was stopped for 5-6 minutes and then restarted. This process which is called back washing was continued for days till the pumped water became crystal clear and sand free. The discharge rate of the tubewell was gradually enhanced to 0.25 cusec capacity.

Once the tubewell was developed fully, it was run at a constant rate (145 USGPM) for hours to check the sand particles (if any), draw down and recovery time.

After the development phase of the tubewell, a step test was performed. The tubewell was run at different discharge rates without stopping and measured the drawdown in the water level to determine the specific capacity of the tubewell, which is defined as gallons per minute per ft of drawdown.

The tubewell was run at three different discharge rates i.e, 93 gallon/minute, 145 gallon/minute and 162 gallon/minute. The water level, total dissolved solids & electrical conductivity and the temperature of water at each discharge rate was measured and is given in the table below;

Depth to water table or static water level = 12.23 ft

Sr. No	Discharge (GPM)	Pumping Water Level (feet)	Draw down (feet)	Total Dissolve solids (ppm)	Temperature C°
1	93	78.71	66.48	425	27
2	145	82.84	70.61	418	27
3	162	94.23	82.00	416	27

During the testing of the tubewell, Mr. Azhar Ahmad Boiler Engineer, witnessed all the steps involved in step test. Before the pumping stopped, two water samples were collected for chemical analysis. These samples were sent to Central Research Laboratory, Public Health Engineering Department Punjab for testing. The chemical analysis results of the water sample indicate that the percentage of anions and cations lies within the desired level of W.H.O and the water is fit for human consumption.Chemical analysis results are givin at Annexure - 2.

The total time required for setting / lowering /operation / adjustment of turbine pump as well as development and testing of the tubewell was from 22-06-2010 to 26-06-2010.

2.11 PLACEMENT OF SANITARY SEAL

After development & testing of tubewell, the left over annular space between 0 – 25 ft depth was sealed with cement, sand and bentonite slurry (1:1: ½) for blocking the seepage /entrance of sewage water from surroundings.

2.12 CONSTRUCTION OF PEDESTAL

After pouring and settlement of sanitary seal, a pedestal having dimensions of 3 ft x 3 ft x 2 ½ ft was constructed around the tubewell with concrete & brick masonry.

It may be noted that a heavy-duty m.s clamp and pair of m.s girders, utilized to hang the tubewell in ordered to avoid any slipping down of it, were buried in the pedestal.

3.0 RECOMMENDATION

- In consideration of groundwater potential of the area, sub surface lithology, aquifer conditions and pumping test results, the tubewell should be run around ¼ cusecs (26m^3/hr) discharge with lowering depth of pump to 130 – 140 ft. It may be noted that an over pumping may results blowing of sand and damage to tubewell & pumping machinery.
- It has been reported that bacterial problems are there in the area. Basically, bacteria does not survive below water table. It always flourish above water table and in pumping machinery, delivery line and reservoir. To tackle the problem, periodical check may be carried out and if found positive, necessary chemical treatment made. In this connection, a water circulation system back into the tubewell has been installed. Once, the required chemical is added into the tubewell through priming tank or other means, turbine pump may be run and circulation made for 8 – 10 minutes. This process is repeated 2 – 3 times, each having a gap of 4 – 6 hours. Finally, the pump may be run to fill the reservoir with addition of chemical (if any) and should be emptied after 4 – 5 hours.

FIGURES

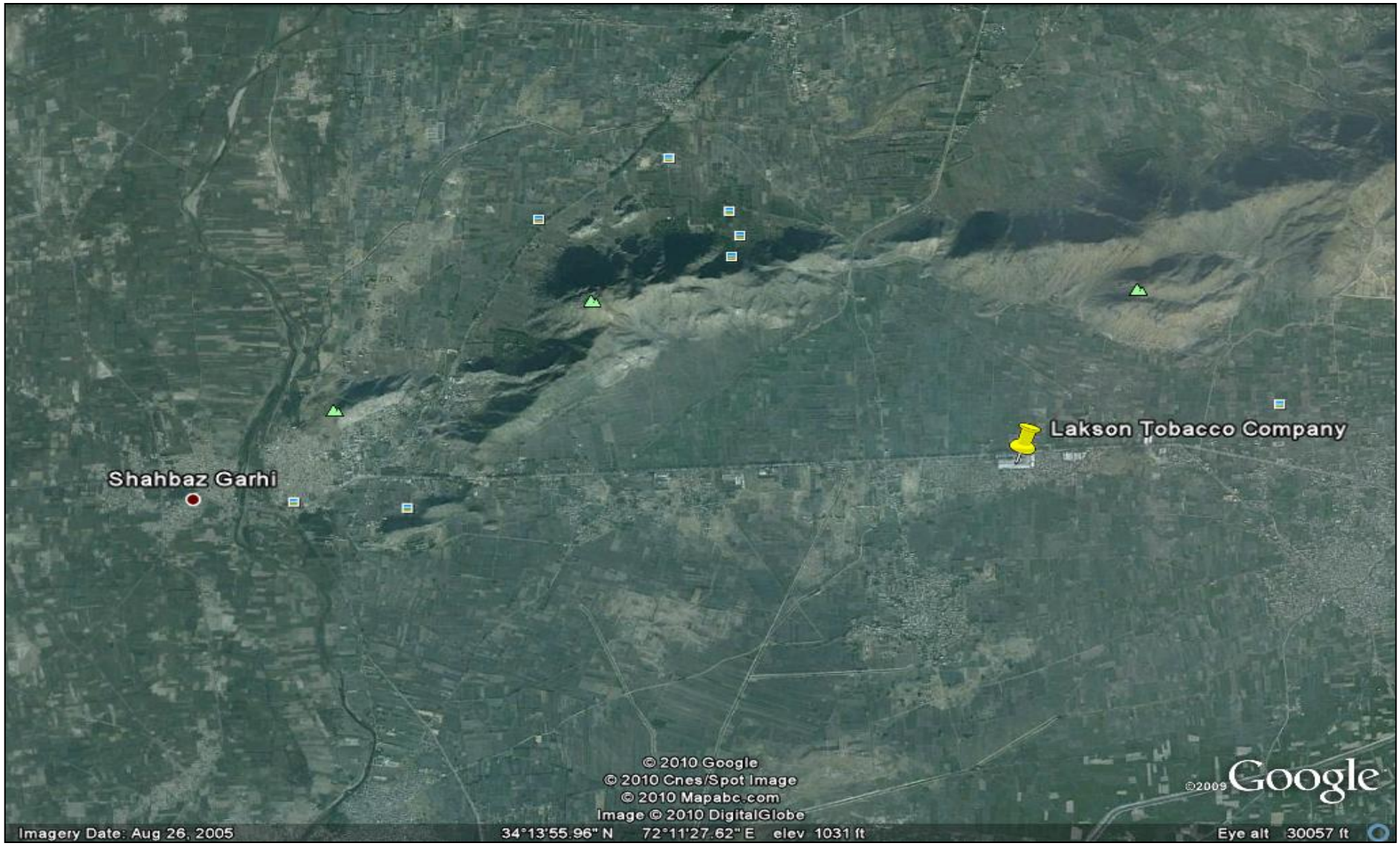
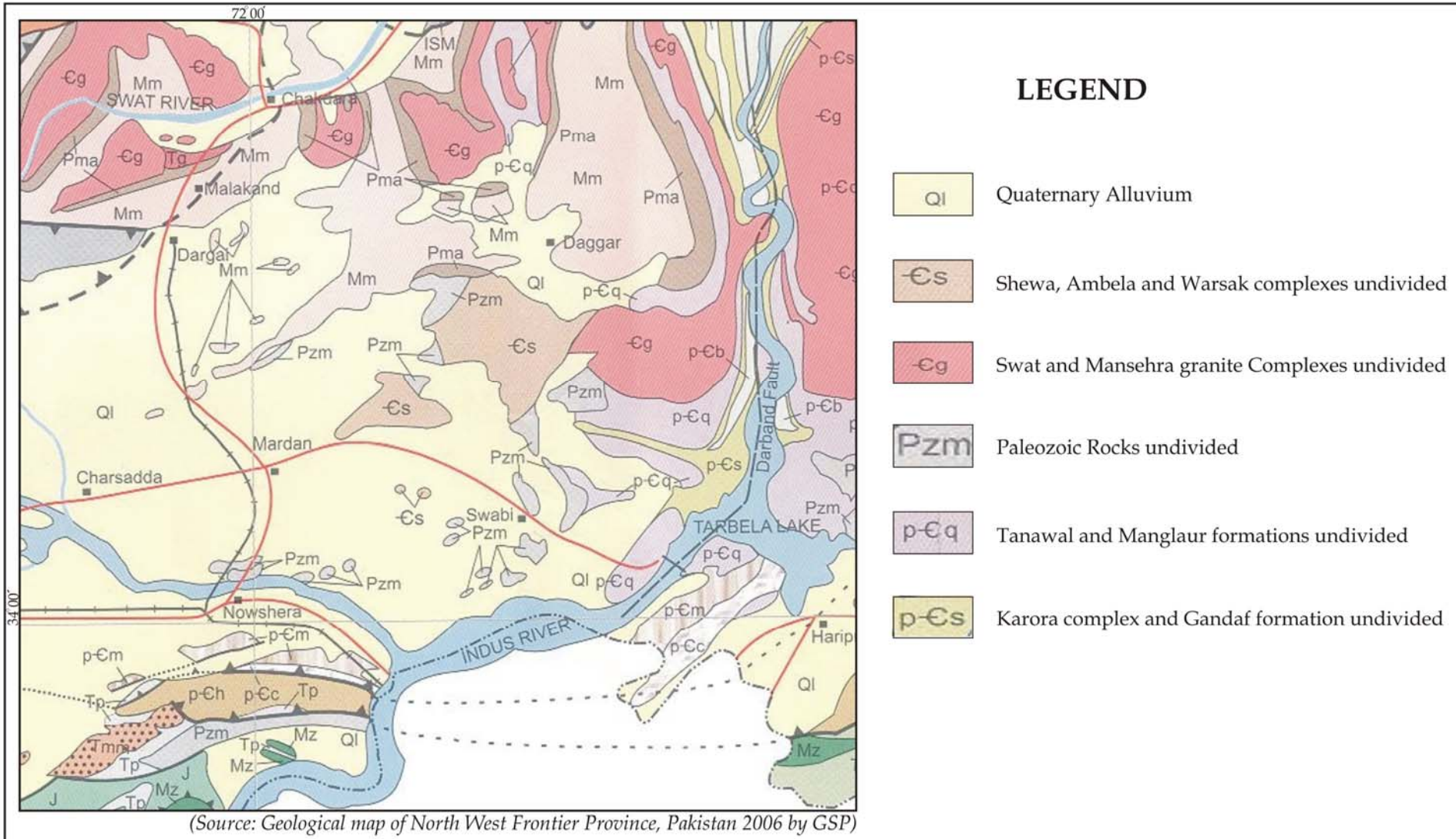


Figure – 1: Location map of project site.



(Source: Geological map of North West Frontier Province, Pakistan 2006 by GSP)

Figure - 2: Geological map of Mardan & Swabi area

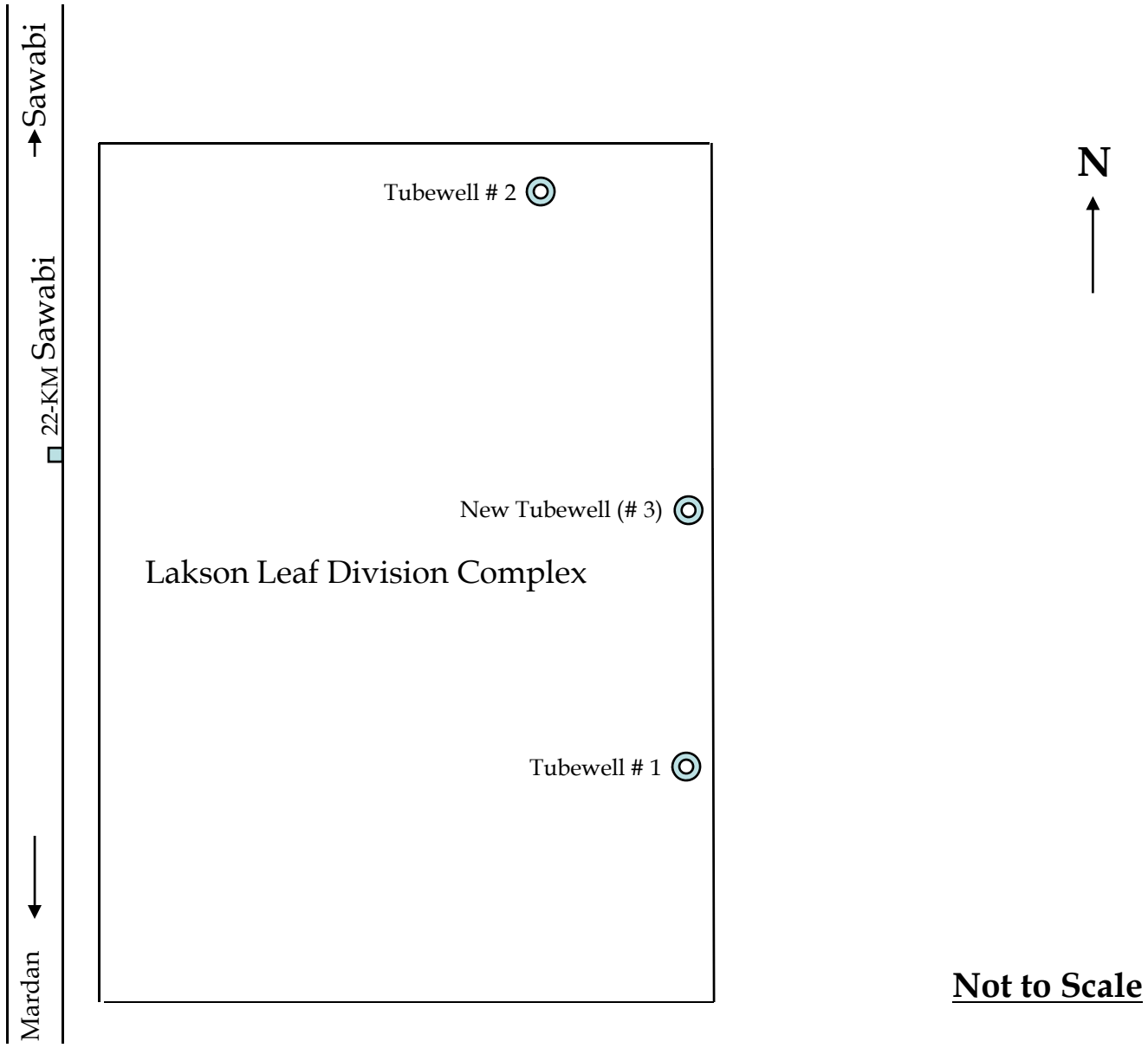


Figure – 3 : Field Sketch showing the location of tubewell site

Figure - 4: Driller Borehole Lithologic log

SUBSURFACE EXPLORATION LOG

LITHOLOGIC DATA

Client	:	Lakson Tobacco Company Ltd, Mardan	**Contractor**	:	GeoScience Associates Lahore
Project	:	Installation of new tubewell	**Borehole No.**	:	New tubewell (# 3)
Location	:	310 East of tube well # 1, LTC - Mardan	**Water table**	:	12.23 ft
Date Started B/H	:	19-06-2010	**Drilling Depth**	:	305 ft
Date Completed B/H	:	20-06-2010	**Drilling Type**	:	Reverse Rotary
Geologist	:	Riaz Ahmad Khan	**Drilled dia**	:	12 inches

Depth (ft)	Major formation	Strip Log	Description
25	Clay		Clay with Kankars, Brown in colour
50			
75			
100			
125			
150			
175	Clay + Sand		Clay with kankars + Coarse sand, brown in colour
	Clay + Sand		Clay + Coarse to medium sand, brown in colour
	Sand		Medium sand, Grey in colour
	Sand		Medium to fine sand, Grey in colour
200	Clay		Clay, Grey in colour
	Sand		Medium sand, Grey in colour
225	Clay + Sand		Clay with minor kankars + Medium sand, Grey in colour
	Clay + Sand		Clay + Medium sand, Grey in colour
250	Clay		Clay, Grey in colour
275			
300			
325	End of borehole		

Figure-5: Composite (lithologic & electric) log of borehole

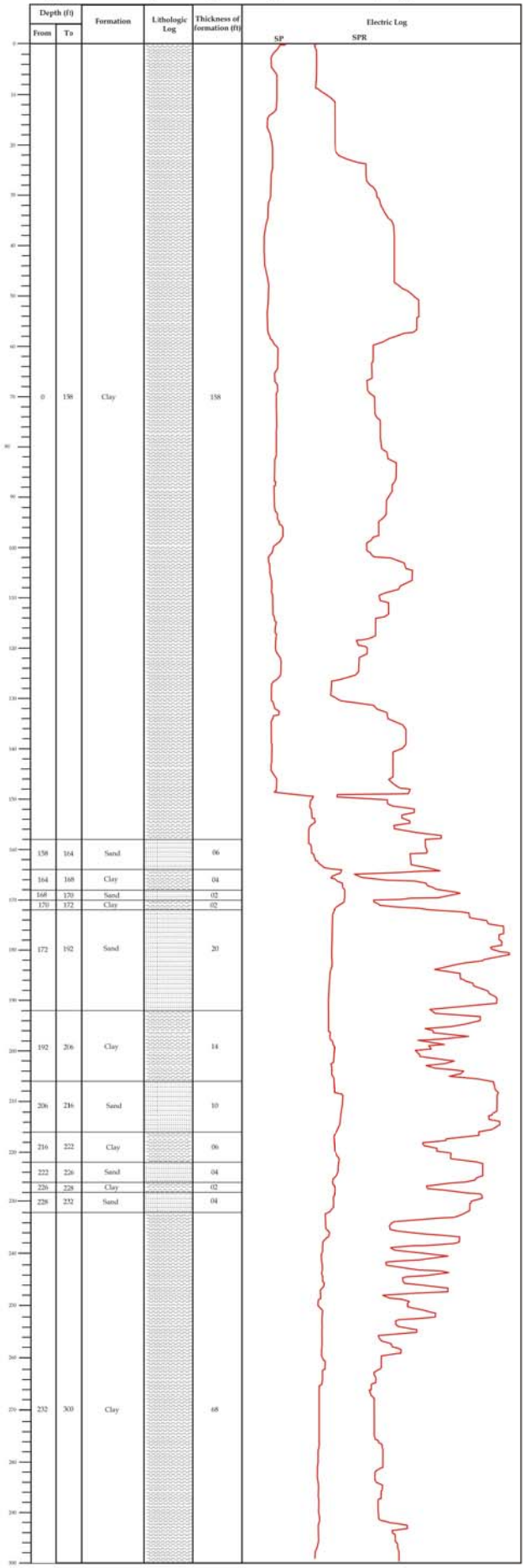
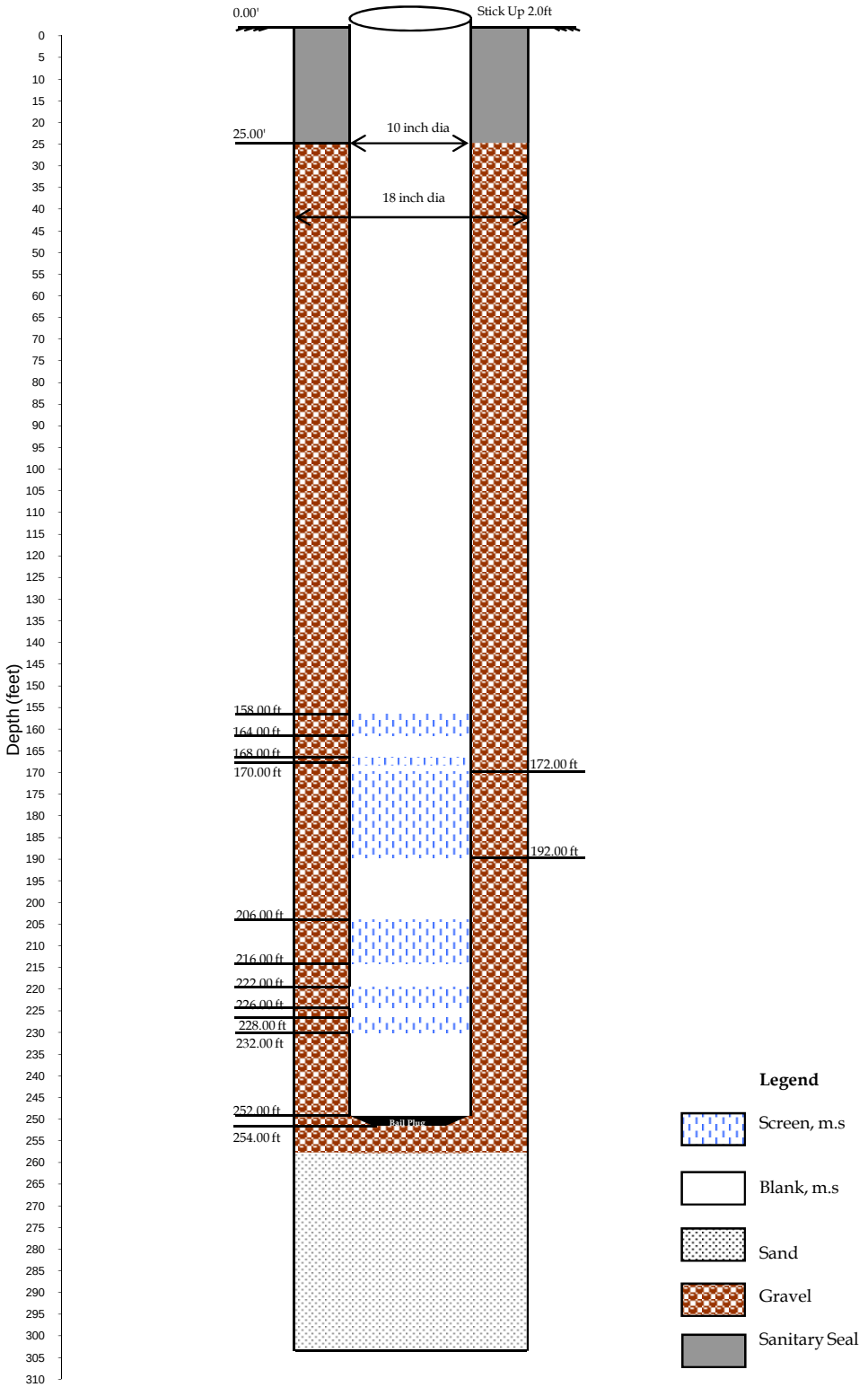


Figure 6: DESIGN OF THE TUBEWELL



GSA

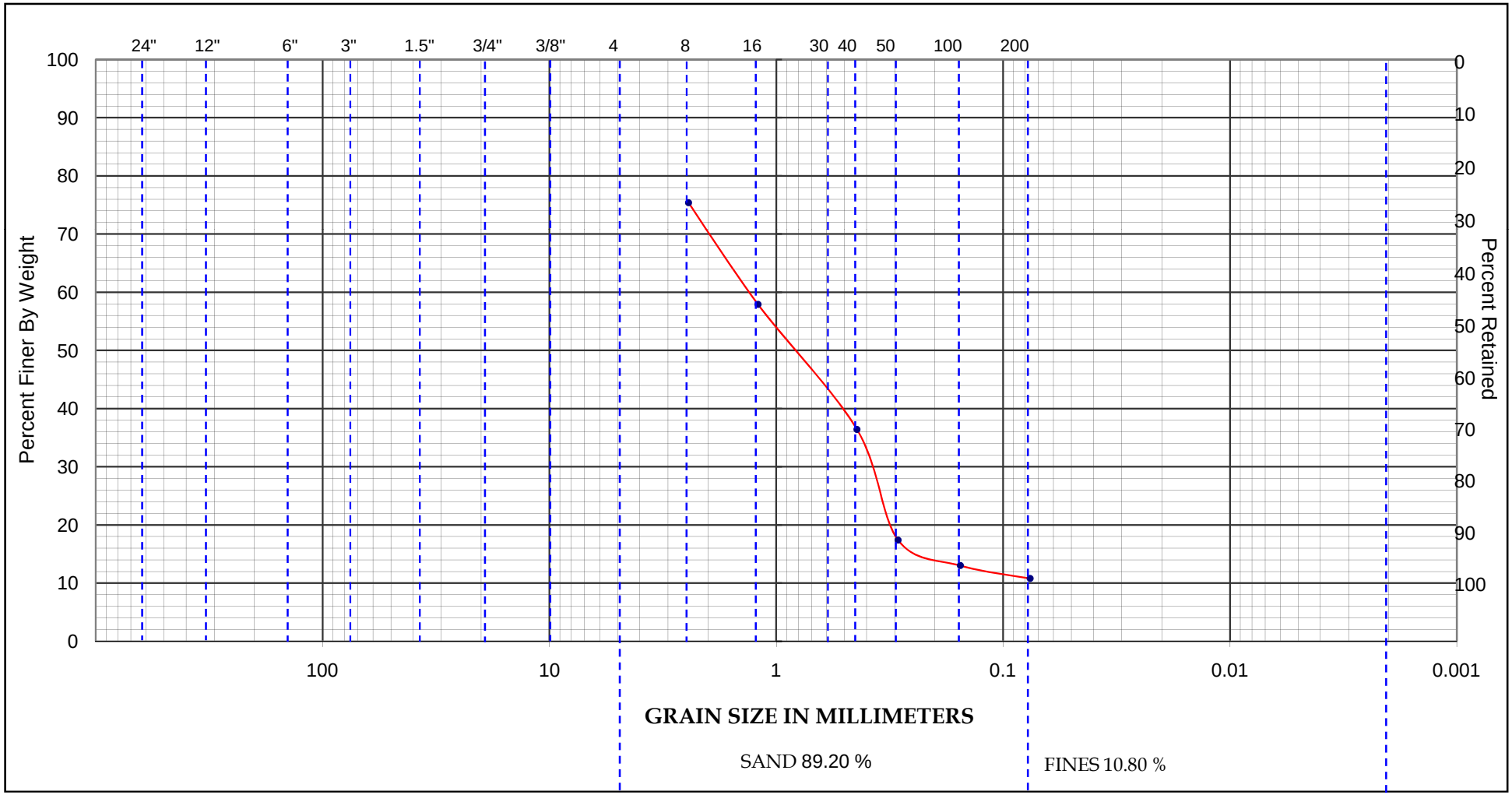
ANNEXURES

GeoScience Associates

PARTICLE SIZE ANALYSIS

PROJECT: Lakson Tobacco Company
LOCATION: 310ft East of T/W # 1
BOREHOLE NO: 1
SAMPLE NO: 1
DEPTH: 165 - 175 ft

TESTED BY: Riaz Ahmed Khan
CHECKED BY:
DATE: 19-06-2010



GeoScience Associates

PARTICLE SIZE ANALYSIS

PROJECT: Lakson Tobacco Company
LOCATION: 310ft East of T/W # 1
BOREHOLE NO: 1
SAMPLE NO: 2
DEPTH: 175 - 185 ft

TESTED BY: Riaz Ahmed Khan
CHECKED BY:
DATE: 19-06-2010

GeoScience Associates

PARTICLE SIZE ANALYSIS

PROJECT: Lakson Tobacco Company
LOCATION: 310ft East of T/W # 1
BOREHOLE NO: 1
SAMPLE NO: 3
DEPTH: 185 - 195 ft

TESTED BY: Riaz Ahmed Khan
CHECKED BY:
DATE: 19-06-2010

PHOTOGRAPHS

Tubewell Material

Drilling in Operation

Tubewell Lowering

Lowering with Centralizer

Impact of Gravel Packing

Lowering of Turbine Pump

Starting Phase of Development

Middle Phase of Development

Final Development of Tubewell

Pumping Test

Collection of Water Samples

Tubewell with clamp, girders & cap

Appendix - 2 Tubewell Number 01 Pumping Test Report

GeoScience Associates

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GSA

Report on

PUMPING TEST OF TUBEWELL # 01

AT

Philip Morris International GLT - Mardan

PROJECT

Aquifer Testing

Client:
Philip Morris International

March, 2023

SD-191, PAF Falcon Complex Gulberg-III, Lahore-Pakistan. ☎ +92-42-35854628-29,
Fax: 042- 35917828 E-mail: info@geoscience.com.pk URL: www.geoscience.com.pk

TABLE OF CONTENT

TABLES

ANNEXURES

FOREWORD

Groundwater has been an important resource throughout the human history. It is a hidden treasure and remains of little value unless unearthed and brought to surface. It is the most important natural source which is widely used in Agricultural Production, Industrial Development and Municipal or Domestic Supplies in rural and urban areas throughout the world. To meet this increased demand of water supplies, the ground-water source has been tapped by sinking tube wells at various locations. For uninterrupted economical supply of groundwater at any place; knowledge of occurrence of suitable water in geological formations, design, and construction of wells, development, pumping equipment, maintenance of tube well and groundwater management is essential.

1.0 INTRODUCTION

1.1 Background

In Pakistan- groundwater is the major source of clean water with potable quality and is being extensively used for domestic, agricultural and industrial purposes through more than one million tubewells installed under the public and private sectors.

M/s Philip Morris International Mardan is located at 22-KM, Swabi Road, Mardan, Khyber Pakhtoon Khwan

1.2 Objective and Scope of work

The technical objective of this pumping test was to assess aquifer performance and to check the local aquifer characteristics which will be used to ascertain local ground water behavior & the potential for further development of the project.

The following works were to be conducted by GeoScience Associates.

- Marking the exact static water level depth with the Dip meter.
- For data recording and evaluation, conducting of 2-hrs pumping test at 100% flow rate and recovery test with the deployment of a hydrogeologist.
- Reporting of all data and findings/recommendations in an understandable and presentable format.

1.3 Field Activities

GeoScience Associates shifted its field staff and testing equipment's at the project area on 11-03-2023. Initially, static water level of tubewell was monitored before the pump running. The constant rate pumping test of well at 100% rated capacity followed by water level recovery was started under the supervision of Client's representatives on 11-03-2023 respectively and the entire activity was completed on the same day. In the beginning and end of test Flow meter reading was noted to calculate total water abstraction during the test.

1.4 Field monitoring device

M Scope or Dip Meter Instrument was used as a monitoring device for this study, which has a graduated cable (battery operated) so that the indicator bulb gets on as soon as the sounder end touches the water table.

The data collected can be used to manage water resources and other aquifer conditions.

1.5 Location, Site Description and Borehole Detail

The Project area is situated at 22-KM, Swabi Road, Mardan, Khyber Pakhtoon Khwan. The well was drilled up to the depth of 254ft below ground level. The construction details and the installed pumping unit detail are provided in Table 1

As built data of tubewell # 01 is shown in Table # 1

Table - 1: Detail of Tubewell Construction

DESCRIPTION	TW#01 (ft)
Depth Drilled.	260.00
Depth of Logging.	256.00
Stick up above NSL.	2.00
Depth installed below NSL.	254.00
Mild steel Housing Pipe 10 inch dia (Below NSL).	158.00
Mild steel Blind pipe 10 inch dia.	50.00
Mild steel Screen 10 inch dia.	46.00
Total tube well installed	254.00

2.0 FINDINGS

2.1 Continuous pumping test

The pumping test at an average constant discharge rate of 12m3/hr. of TW#01 was performed for continuous 2 hours. When conducting the pumping test, water was pumped from well whilst discharge and drawdown was measured/recorded. The total drawdown observed in well during the test was 16.41m in TW#01 which shows the high permeability of the aquifer. The results of continuous pumping tests and data on aquifer recovery are provided in Annexure A.

2.2 Recovery Phase after Continuous Pumping

Drawdown during operations was low which shows that water was pumped out the same as it replenishes, restores, and refilled. Moreover, after the stoppage, the pumping operations in pumping well the recovery of drawdown was very fast and recovered 70-75% within 5 minutes in the start, and the rest of the water will take 4 hours fully recover to its existing level. The recovery data indicates high yielding aquifer behavior.

Data of pumping and Recovery tests are attached as Annexure – A.

2.3 Groundwater Quality

2.3.1 Field Measurements

During the pumping phase - a continuous check was made on the groundwater quality for parameters i.e. Total Dissolved Solids (TDS), pH Value and Temperature at the discharge point.

Perusal of the values indicate;

- Salinity of groundwater in the form of TDS (total dissolved solids) ranged from 280 - 300 ppm of TW #01 marginal as per WHO permissible limit.
- pH value – found slightly alkaline and ranged from 7.1 to 7.4 of TW # 01
- Temperature of groundwater ranged from 26.5°C to 28.6°C of TW # 01

3.0 CONCLUSIONS & RECOMMENDATIONS

3.1 Synopsis

Production well have been installed up to 256 ft depth by the client to explore the aquifer potential and groundwater quality for ascertaining the long-term availability of potable water. An elaborate pumping test was conducted on the well to determine:

- The "on site aquifer parameters" governing the storage and flow of groundwater; and
- Capacity of the well along with the selection of suitable pumping equipment – keeping in view the short and long-term drawdown.

Based on the analysis of the pumping test data the results are very briefly described below:

- Chemical quality of ground water marginally is not fit (with TDS value of about ranged from 280-300ppm of TW #01, which is not marginal as per WHO permissible limit.
  - Test results show that the drawdown in the pumping well was 16.41m with average discharge of 12 m^3/hr in 2 hours, which recovered 70-75%in 5 minutes and rest of the water recovered in 1.5 hours to its initial water table – showing a very good response.

3.2 Recommendations

The installed productions wells can have a safe discharge of 20m^3/hr. However, to avoid any stress on the tube well and having other problems, it should not be run at more than the prescribed limit.

3.3 Limit of Daily Pumping

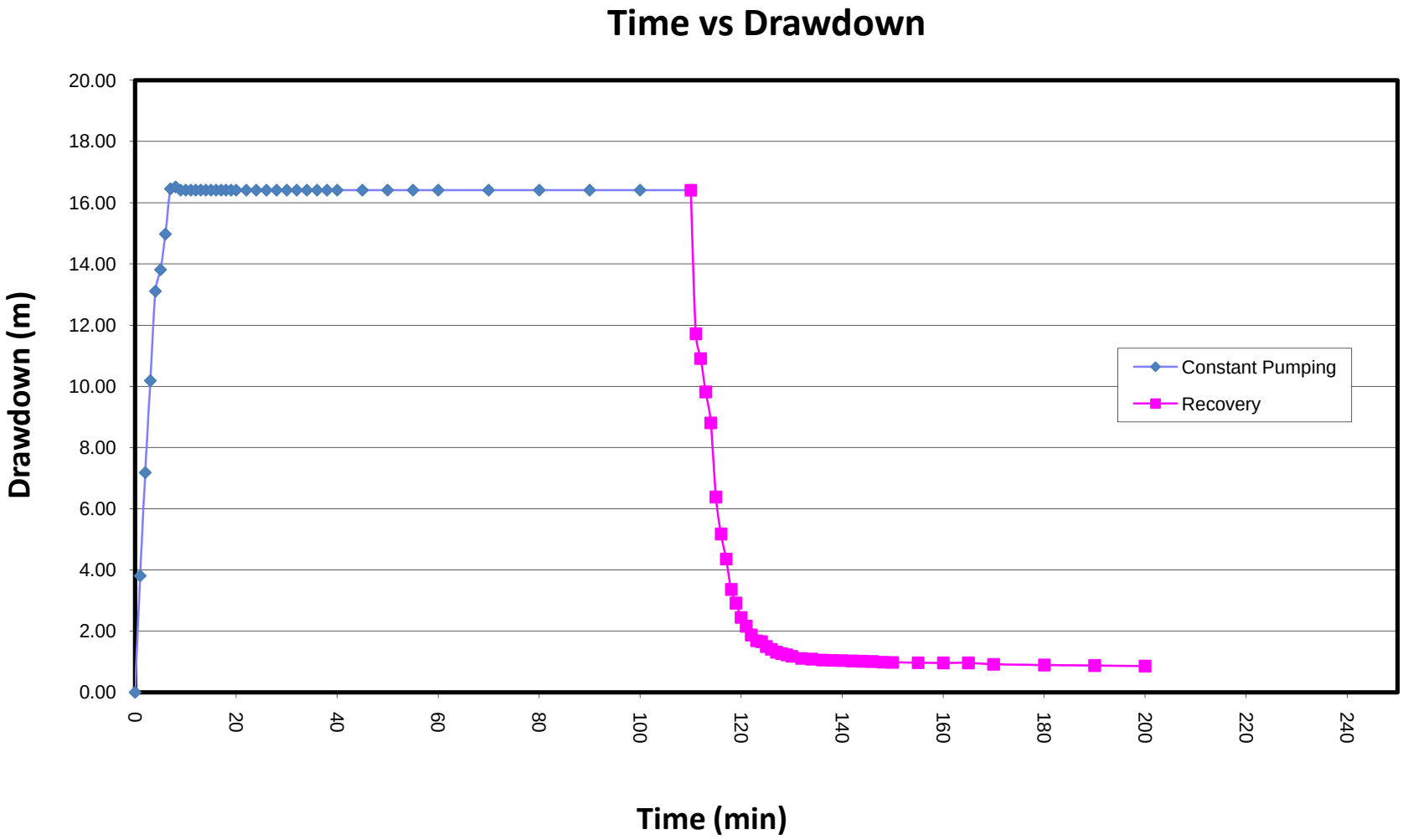
Production well may not be operated for more than 8hrs a day.

ANNEXURES

Annexure – A

Data of Constant Flow Rate Test and Recovery Test

Constant Drawdown Test (TW # 01)



GSA	Philip Morris International Mardan	Tubewell - 01

Constant Pump Test (12m^3/hr)

Client Nme:	Philip Morris International Mardan	**Started Date:**	11 March, 2023
Started Time:	09:40 am	**Completed Date:**	11March, 2023
Completed Time:	11:40 am	**Dia Of Delivery Pipe:**	2 Inch
Conducted by:	Tajammul Hussain	**Test pump type:**	Submersible Pump
Indicate static water level measured from. TOP:	2.19 m		

Test Duration: 5 Hours

Time		Discharge	Water Level (Mtr)	Draw Down (Mtr)	TDS (ppm)	pH	Sand Contents PPM	Temp (C^0)	Remarks
Elapsed Time (min)	Clock Time (Hrs)	M^3/Hr							
0	09:40	0.00	2.19	0.00					
1	09:41	12	6.00	3.81					
2	09:42		9.37	7.18					
3	09:43		12.37	10.18					
4	09:44		15.30	13.11	280			26	
5	09:45		16.00	13.81					
6	09:46		17.16	14.97					
7	09:47		18.64	16.45					
8	09:48		18.70	16.51					
9	09:49		18.60	16.41					
10	09:50		18.60	16.41					
11	09:51		18.60	16.41					
12	09:52		18.60	16.41					
13	09:53		18.60	16.41					
14	09:54		18.60	16.41					
15	09:55		18.60	16.41					
16	09:56		18.60	16.41					
17	09:57		18.60	16.41					
18	09:58		18.60	16.41					
19	09:59		18.60	16.41					
20	10:00		18.60	16.41					
22	10:02		18.60	16.41					
24	10:04		18.60	16.41	300			26	
26	10:06		18.60	16.41					

Time		Discharge	Water Level (Mtr)	Draw Down (Mtr)	TDS (ppm)	pH	Sand Contents PPM	Temp (C^0)	Remarks
Elapsed Time (min)	Clock Time (Hrs)	M^3/Hr							
28	10:08		18.60	16.41					
30	10:10	11.98	18.60	16.41					
32	10:12		18.60	16.41					
34	10:14		18.60	16.41					
36	10:16		18.60	16.41					
38	10:18		18.60	16.41					
40	10:20		18.60	16.41					
45	10:25		18.60	16.41					
50	10:30		18.60	16.41					
55	10:35		18.60	16.41					
60	10:40		18.60	16.41					
70	10:50		18.60	16.41					
80	11:00		18.60	16.41					
90	11:10		18.60	16.41					
100	11:20		18.60	16.41					
110	11:27		18.60	16.41					

GSA	**Philip Morris International Mardan**	**Tubewell - 01**

Constant Pump Test (12m^3/hr)

Client Nme:	Philip Morris International Mardan	**Started Date:**	11 March, 2023
Started Time:	11:40 am	**Completed Date:**	11 March, 2023
Completed Time:	02:08 pm	**Dia Of Delivery Pipe:**	2 Inch
Conducted by:	Tajammul hussain	**Test pump type:**	Submersible Pump
Indicate static water level measured from. TOP:	2.19m		

Test Duration:

Time		**Discharge**	**Water Level (Mtr)**	**Draw Down (Mtr)**	**TDS (ppm)**	**pH**	**Sand Contents PPM**	**Temp (C^0)**	**Remarks**
Elapsed Time (min)	**Clock Time (Hrs)**	**M^3/Hr**							
0	11:27	0.00	18.60	16.41					
1	11:28		13.90	11.71					
2	11:29		13.10	10.91					
3	11:30		12.00	9.81					
4	11:31		11.00	8.81					
5	11:32		8.57	6.38					
6	11:33		7.36	5.17					
7	11:34		6.55	4.36					
8	11:35		5.55	3.36					
9	11:36		5.10	2.91					
10	11:37		4.64	2.45					
11	11:38		4.35	2.16					
12	11:39		4.06	1.87					
13	11:40		3.88	1.69					
14	11:41		3.84	1.65					
15	11:42		3.68	1.49					
16	11:43		3.60	1.41					
17	11:44		3.50	1.31					
18	11:45		3.46	1.27					
19	11:46		3.41	1.22					
20	11:47		3.37	1.18					
22	11:49		3.30	1.11					
24	11:51		3.27	1.08					
26	11:53		3.25	1.06					

Time		Discharge	Water Level (Mtr)	Draw Down (Mtr)	TDS (ppm)	pH	Sand Contents PPM	Temp (C^0)	Remarks
Elapsed Time (min)	Clock Time (Hrs)	M^3/Hr							
28	11:55		3.24	1.05					
30	11:57		3.23	1.04					
32	11:59		3.21	1.02					
34	12:01		3.20	1.01					
36	12:03		3.19	1.00					
38	12:05		3.18	0.99					
40	12:07		3.17	0.98					
45	12:12		3.16	0.97					
50	12:17		3.15	0.96					
55	12:22		3.15	0.96					
60	12:27		3.11	0.92					
70	12:37		3.08	0.89					
80	12:47		3.06	0.87					
90	01:07		3.04	0.85					

Appendix - 3 Tubewell Number 02 Well Videography Report

GEOSCIENCE ASSOCIATES

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GSA

REPORT ON

BOREHOLE CAMERA INSPECTION OF TUBEWELL

May 2023

AT

PHILIP MORRIS MARDAN.

CLIENT:

PHILIP MORRIS INTERNATIONAL

CONTRACTOR:

GEOSCIENCE ASSOCIATES

SD-191, PAF Falcon Complex, Gulberg-III, Lahore-Pakistan. ☎ +92-42-35854628-29,
E-mail: info@geoscience.com.pk URL: www.geoscience.com.pk

TABLE OF CONTENTS

1.0 INTRODUCTION

This report describes the condition of casing and screen lengths of tube well No.1 installed at Philip Morris, Mardan through PASI Well-Camera lowered into tube well on dated 03 May 2023 respectively.

2.0 SCOPE OF WORK

The technical objective of the study was to detect the construction characteristics of the wells, the blank and screen pipes, the respective installation depths. Any anomaly may not only be highlighted at a certain depth from ground level but may also be filmed during the investigation. The borehole camera is used to determine the causes of the most common problems that can affect a well in the course of its productive life, such as the presence of sand and a decrease in water flow. Furthermore, the borehole camera detects abnormalities such as deterioration, deformation, corrosion, cracks and excessive deposit on the bottom. The borehole camera can assess situations of risk from degradation and the appropriate measures needed to repair the tube well.

3.0 EQUIPMENT USED

A complete PASI WELL-CAMERA system consists of:

1. Camera Head waterproof up to 35 bars (approx. 350m of freshwater column).
2. Wide angle lens 120° and 90° view option.
3. Reel up to 200 m cable length.
4. Control unit with integrated LCD, USB 2.0 grabber board and microphone.
5. Laptop

4.0 PROCEDURE

The borehole camera is attached with reel which is then connected with control unit to view video (output) from the camera. The camera is waterproof and resistant to the pressure generated by the water column above it and is equipped with a special wide-angle lens, allows detailed diagnosis of the coating. Control unit is connected with laptop to get video on laptop. When all the connections are properly made, camera is lowered into the borehole and switched to video recording mode.

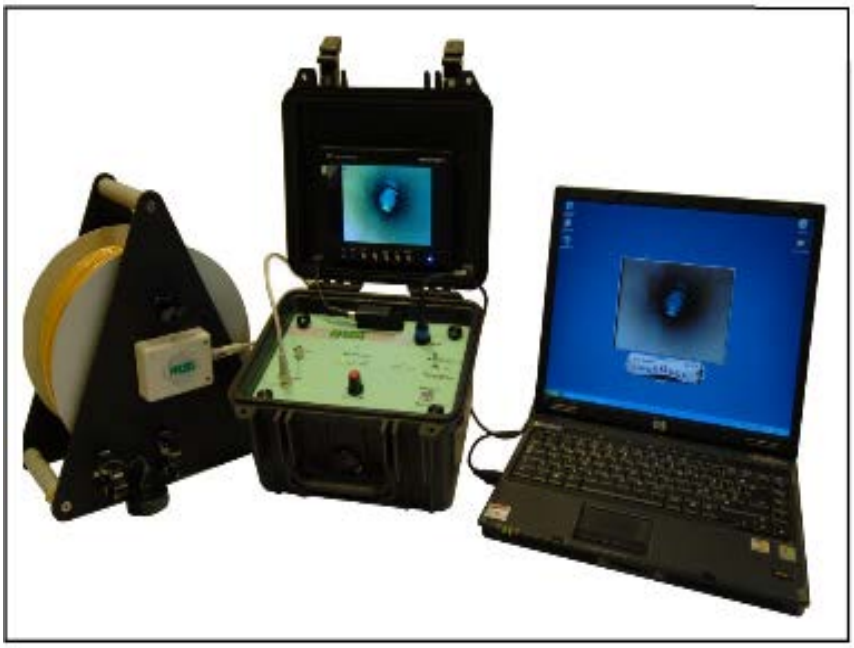


Figure 01: PASI WELL-CAMERA with Accessories.

5.0 OBSERVATIONS

5.1 Turbine Pump 1

Based on the inspection of recorded video following observations are made;

- Water table lies at 7.18 feet.
- Position of blank pipe is 0 – 163.13 feet.
- Total explored depth 163.13 feet.
- No damage portion is observed.
- Foreign material is observed at the bottom of the tube well.
- Keeping in view the tube well design and explored depth by video inspection there is no screen observed up to the explored depth.

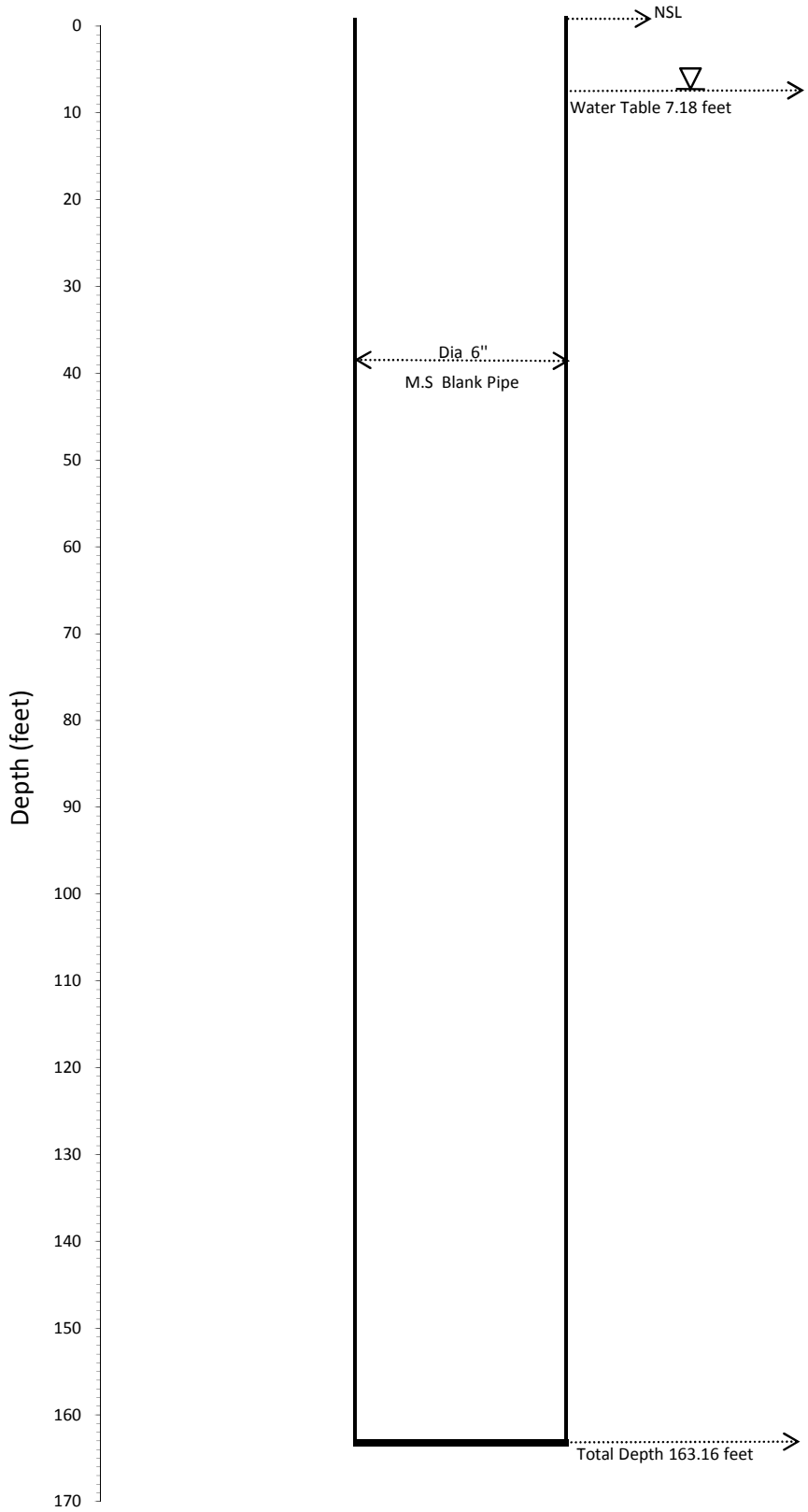
ANNEXURE - A

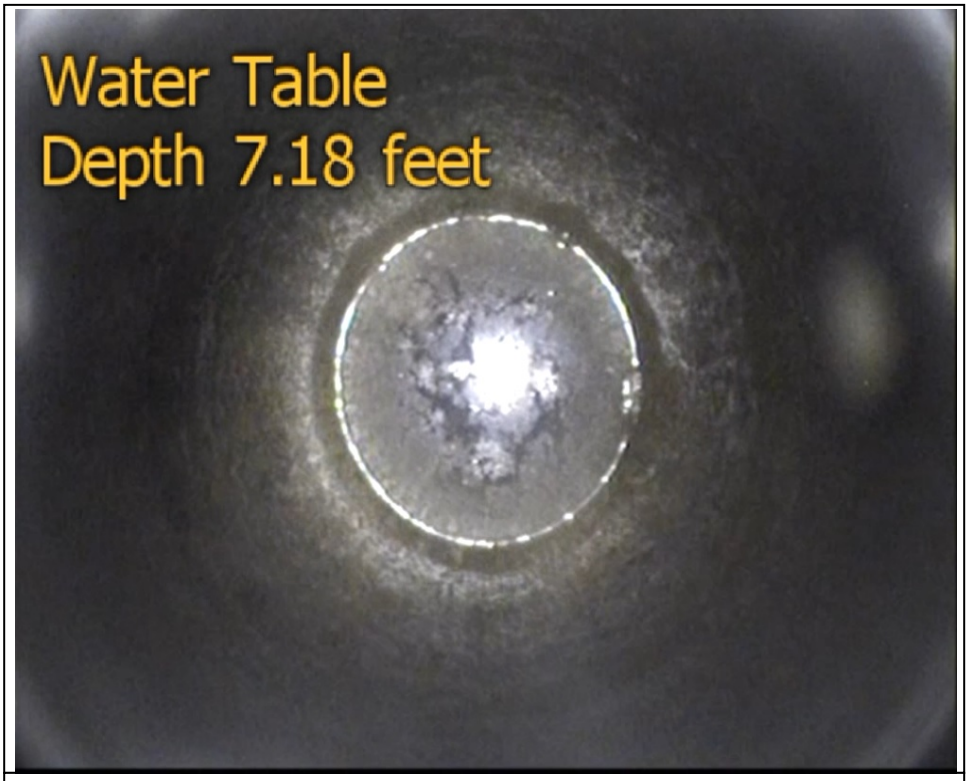
Tubewell Design

ANNEXURE - B

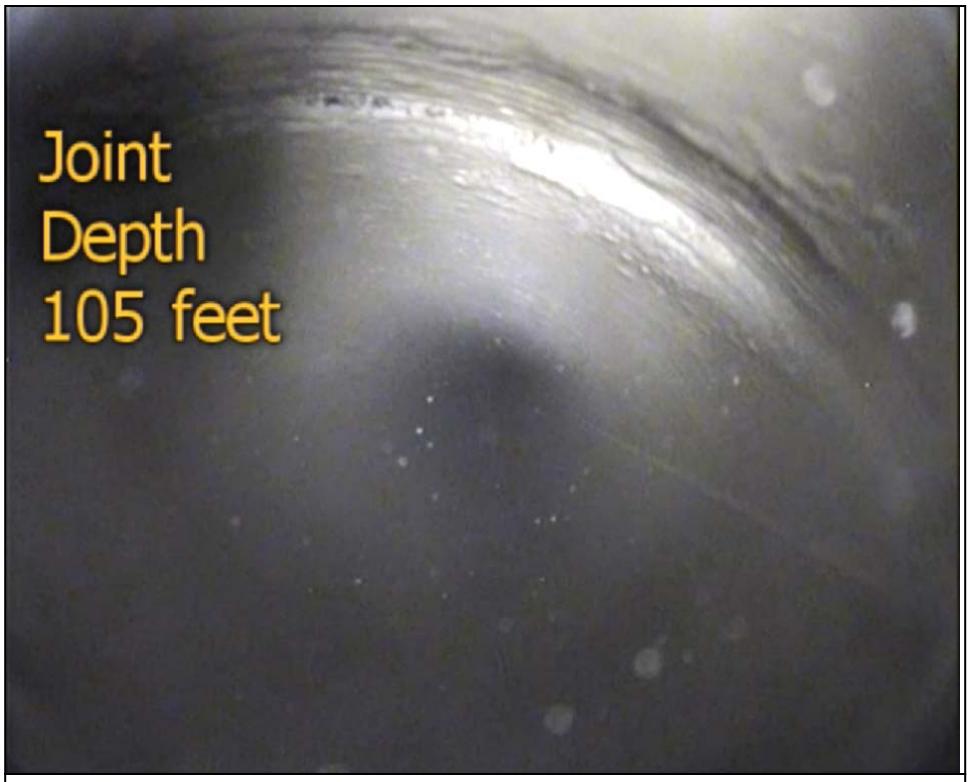
Camera Inspection Photographs

Tubewell Design - GLT - Mardan

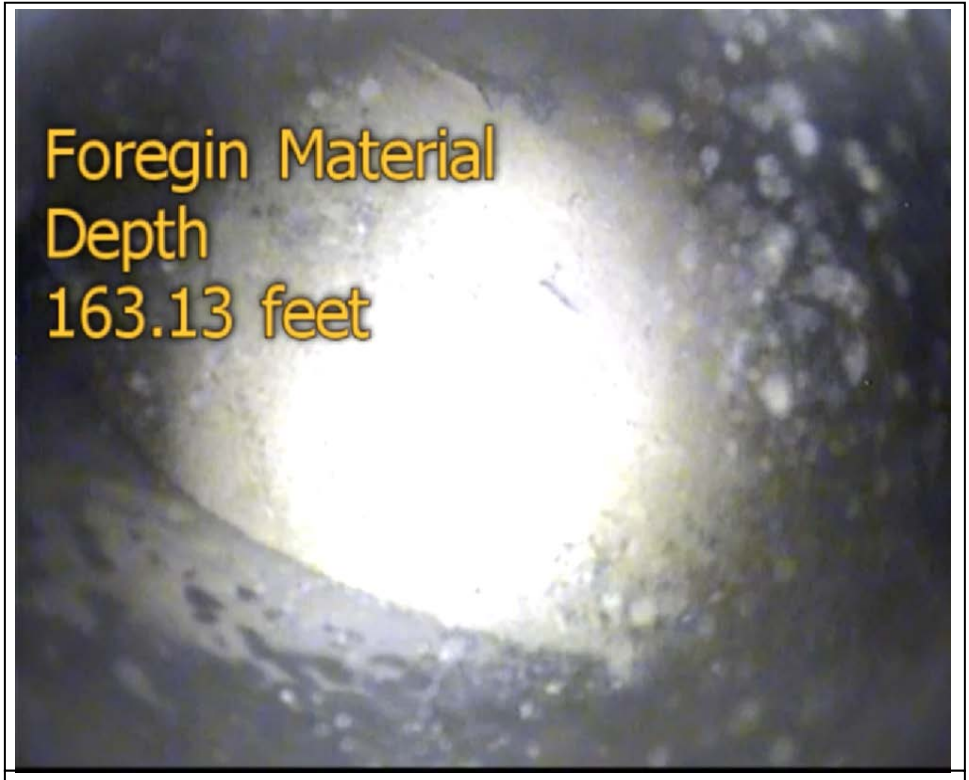




Videography at Philip Morris, Mardan.



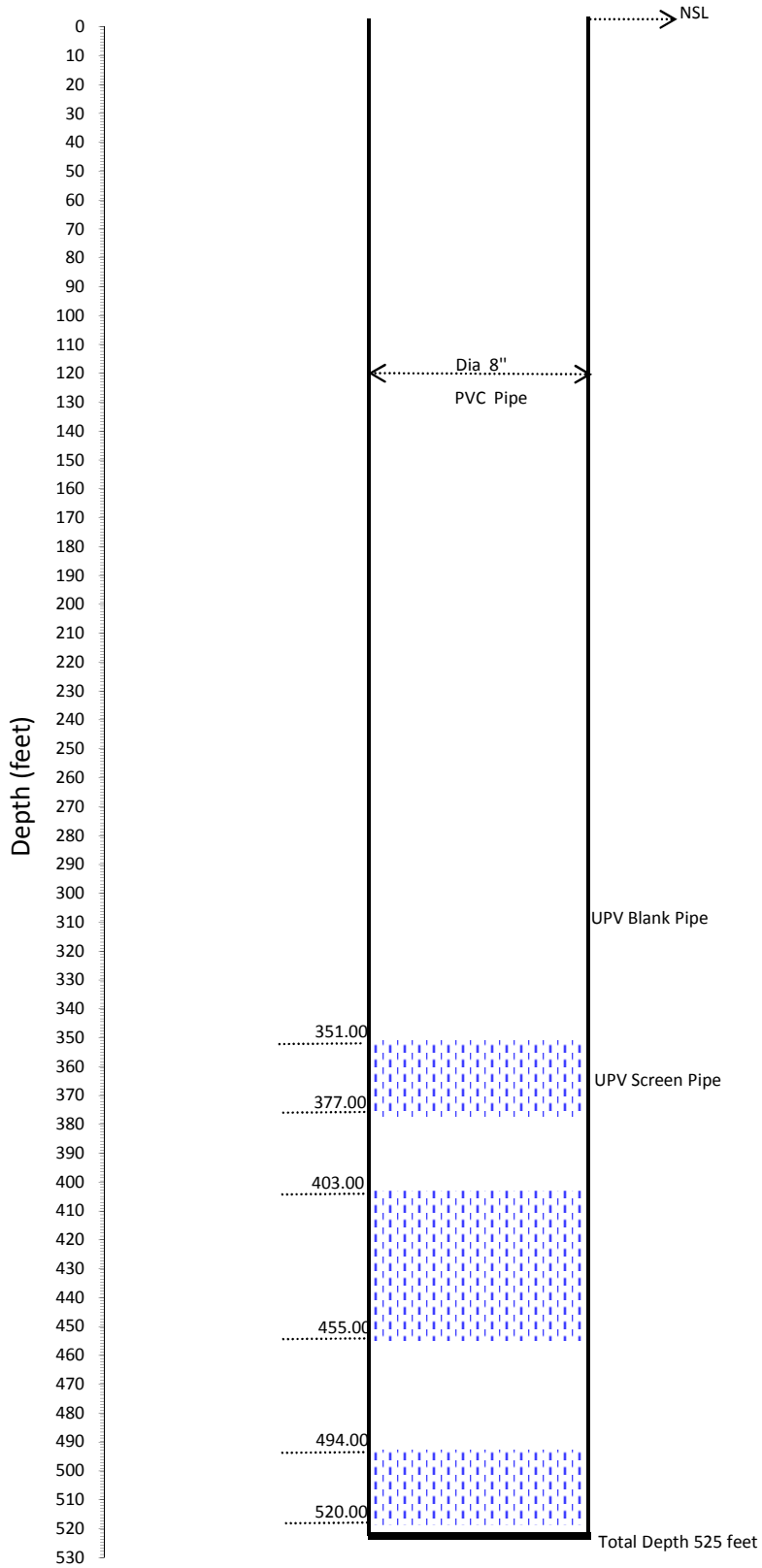
Videography at Philip Morris, Mardan.



Videography at Philip Morris, Mardan.

Appendix - 4 Tubewell Number 03 Installation Report

Tubewell Number 03 Design - Report by the Client



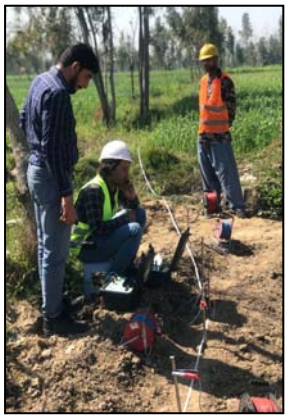
Appendix - 5 Electrical Resistivity Survey Report

GeoScienceAssociates
Integrated GeoScience for economy safety & environmental responsibility
GSA

REPORT ON

GEOPHYSICAL INVESTIGATION

(Electrical Resistivity Survey for Groundwater Investigations)



AT

PHILIP MORRIS INTERNATIONAL, MARDAN-SWABI ROAD, KPK, PAKISTAN.

CLIENT:

PHILIP MORRIS INTERNATIONAL, PAKISTAN.

MARCH, 2023

SD-191, PAF Falcon Complex, Gulberg-III, Lahore-Pakistan. ☎ +92-42-35854628-29,
E-mail: info@geoscience.com.pk URL: www.geoscience.com.pk

TABLE OF CONTENTS

1.0 INTRODUCTION

Electrical Resistivity Survey was conducted around the site's most effective catchment of the plant Philip Morris International, Mardan-Swabi Road, KPK, Pakistan. This part of report furnishes the results of Electrical Resistivity Survey conducted to ascertain the hydrogeological conditions prevailing in the area.

GeoScience Associates (GSA) carried out electrical resistivity survey at ten (10) suitable locations in the supervision of Client's representative to ascertain the general subsurface hydrogeological conditions with special emphasis to the quality of ground water in the project area.

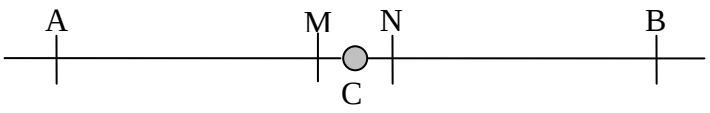
Vertical Electrical Soundings (VES) were used to an estimated depth of about 300 meters by deploying Schlumberger electrode configuration. The location of sounding points is shown in Figure-1 and is also mentioned in the appended computer interpreted results.

In addition to the findings of the resistivity survey, a brief account of field operations and data processing has also been given in the report to provide the basis of the method. It includes the interpretation of VES data presented in the form of columnar section, depicting interpreted sub-surface hydrogeological conditions (Figure-1A). Based on the interpretation of the resistivity data, the sub-surface material has been classified into different resistivity zones as abridged in the legend. Each resistivity zone signifies dominant hydrogeological conditions of that zone. Based on the results of resistivity survey, conclusions and recommendations are drawn for planning in respect of ground water development.

2.0 PRINCIPLES OF RESISTIVITY METHOD

During resistivity survey, four steel electrodes are used to conduct the measurements. All the four electrodes are driven in line into the ground at specified distance from each other depending upon the configuration being used. A direct

current is introduced into the ground through the two outer electrodes known as current electrodes A and B. The two inner electrodes M and N are used as potential electrodes to measure the potential difference. By measuring the current (I) between the current electrodes A and B and the associated potential difference (V) developed between the potential electrodes M and N, resistivity of the corresponding subsurface medium enclosed between the current electrodes is obtained.



Electrode Configuration

Normally, the medium is inhomogeneous or anisotropic therefore, the resistivity is known as apparent resistivity and is computed by the following formula:

$$\rho a = K \times V / I \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where: ρa

ρa	=	apparent resistivity in ohm-meters
K	=	geometric factor for individual electrode arrangement
V	=	potential difference in milli volts
I	=	current passing through ground in milli amperes

Equation (1) is the general equation for calculating apparent resistivity in electrical resistivity prospecting.

The apparent soil resistivity obtained in this case represents an average value of the soils within the sphere of influence of the test set up.

3.0 FIELD PROCEDURE

Resistivity-measuring equipment PASI 16 GL-N (ITALY) was used for recording current and potential difference in the field. Schlumberger electrode configuration was used for the survey. In case of Schlumberger array, the distance of the current and potential electrodes from the center, which are referred as AB/2 and MN/2 respectively, characterizes the array. MN/2 is always kept sufficiently small relative to AB/2. The average potential gradient measured between M and N is a close approximation to the potential gradient at the center of the array.

Measurements were taken and noted before re-positioning the electrodes for next reading. The mid point of the electrodes was fixed as the sounding location, while the length of the configuration was gradually increased accordingly in order to measure the resistivity for deeper depths level. At each location, in one sounding, apparent resistivity values were obtained at different specific depths.

In case of Schlumberger electrode configuration, the apparent resistivity is computed as: -

$$\rho a = \pi \times \frac{(AB/_2)^2 - (MN/_2)^2}{MN} \times V / I$$

4.0 METHOD OF EVALUATION

The resistivity field curves are obtained by plotting the apparent resistivity values against depths on a bi-log graph paper. After smoothing the plotted curves all the field data is registered to computer. The interpretation of sounding is done with the help of computer and direct interpretation software. The resistivity sounding data collected from the area is interpreted by computer-aided techniques

using INTERPEX USA software, RESIXP. The layer models are calculated by an iterative procedure. During each iteration the model parameters are adjusted and the deviation of the corresponding curve from the measured curve is checked. The deviation is defined by the RMSE (root mean square error), which is displayed after each iteration. At the end of calculations, the model, which results in the smallest error, is plotted showing layer's true resistivity and corresponding thickness.

In practice, evaluation of resistivity sounding is invariably subjected to the principle of equivalence i.e. any resistivity sounding can be matched with several slightly deviating model curves, representing different sub-surface resistivity stratification depending upon groundwater behavior of the area. The evaluation of the data is therefore, confronted with hundreds of options for a single field curve to make its selection of the most consistent model of the sub-surface conditions.

5.0 INTERPRETATION OF V.E.S. DATA

The measured resistivity when subjected to evaluation process yield different sub-surface geo-electrical layers. These geo-electrical layers need a correlation with the sub-surface hydrogeological conditions for interpretation. Transformation of geo-electrical layers into hydrogeological zonings are essentially based on the information obtained from test holes, tube wells and other data of previous investigations conducted in similar areas. The evaluated resistivity values of the sub-surface layers and the assumed formation factor in the area has been used to estimate electrical conductivity of the groundwater contained in the subsurface lithological layers.

After correlating all the available information, the interpreted sub-surface hydrogeological conditions at each sounding location are presented in the form of columnar section in Figure-1A.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the Reconnaissance Survey, Inventory of existing tube wells, analysis of archived data and interpretation of resistivity results of the sounding points, the following conclusions & recommendations are made regarding the hydro-geological conditions prevailing in the investigated area.

6.1 CONCLUSIONS

- Depth to water lies between 1.61 – 3.75 meters.
- The subsurface lithology has fine to coarse sand, silt with layers of clay up to explored depth of 300 meters.
- Subsurface zone bearing resistivity values < 30 ohm-m is interpreted between the 3.75-100, 2.73-61.82, 2.68-120.0, 2.75-25.56 & 163.1-275, 2.76-86.32, 1.61-33.15, 1.85-18.42, 2.52-27.41, 2.88-12.47 and 2.71-17.74 meters depth at the sounding points S-01, S-02, S-03, S-04, S-05, S-06, S-07, S-08, S-09 and S-10 respectively. The aquifers pertaining to these zones are saturated with marginal quality of water with TDS > 1000 ppm approximately.
- Subsurface zone bearing resistivity values > 30 ohm-m is interpreted between the 61.82-300, 120.-300, 25.56-163.1, 86.32-275, 33.15-300, 18.42-250, 27.41-275, 12.47-250 and 17.74-250 meters depth at the sounding points S-02, S-03, S-04, S-05, S-06, S-07, S-08 S-09 and S-10 respectively. The aquifers pertaining to these zones are saturated with Good to fair quality of water with TDS < 1000 ppm approximately.
- The quality of groundwater may further deteriorate in future.

- Interpreted lithologic description, depth to water table & quality of groundwater on the basis of resistivity values of each sounding point is summarized in the table-1 given below.

Table-1

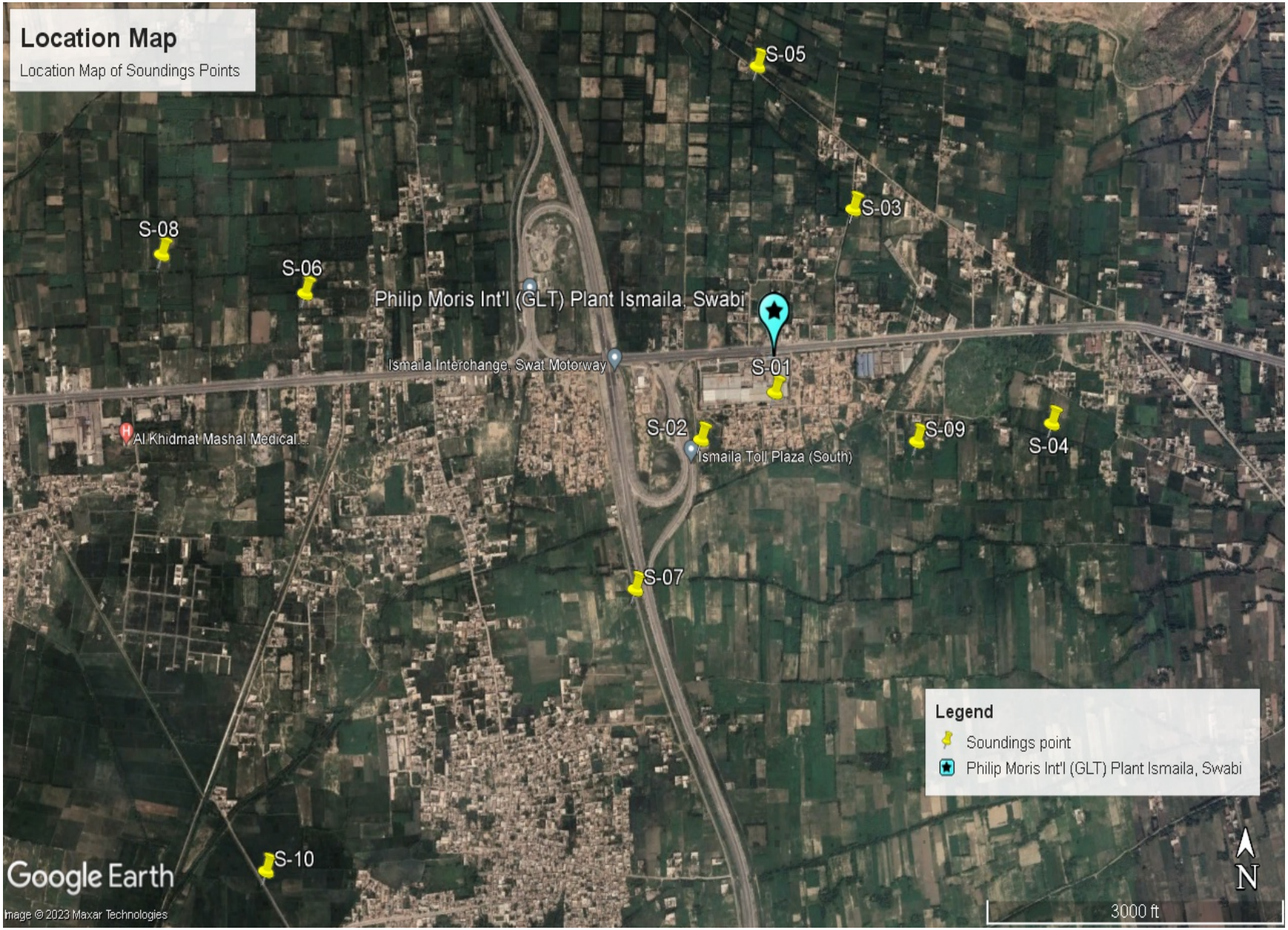
Sr No.	Sounding Points	Coordinates		< 30 ohm.m, TDS > 1000 ppm, Quality of water marginal	> 30 ohm.m, TDS < 1000 ppm, Quality of water Good to Fair	Water Table (Meters)
1	S-1	34.22866	72.21694	3.75 - 100 m	-	3.75
2	S-2	34.22749	72.21447	2.37 - 61.82 m	61.82 - 300 m	2.37
3	S-3	34.23320	72.21957	2.68 - 120 m	120 - 300 m	2.68
4	S-4	34.22790	72.22624	2.75 - 25.56 m 163.1 - 275 m	25.56 - 163.1 m	2.75
5	S-5	34.23674	72.21635	2.76 - 86.32 m	86.32 - 275 m	2.76
6	S-6	34.23110	72.20118	1.61 - 33.15 m	33.15 - 300 m	1.61
7	S-7	34.23378	72.21227	1.85 - 18.42 m	18.42 - 250 m	1.85
8	S-8	34.23206	72.19637	2.52 - 27.41 m	27.41 - 275 m	2.52
9	S-9	34.22745	72.22171	2.88 - 12.47 m	12.47 - 250 m	2.88
10	S-10	34.21679	72.19989	2.71 - 17.74 m	17.74 - 250 m	2.71

6.2 RECOMMENDATIONS

- The boreholes of about 152.39, 182.87, 121.91, 182.87, 121.91, 182.87, 182.87, 182.87 and 121.91 meters depth are recommended for the installation of tube wells at the sounding points S-02, S-03, S-04, S-05, S-06, S-07, S-08, S-09 and S-10 respectively.

- In order to avoid intrusion of poor-quality water from the upper aquifer, a confining seal (2 meters thick) of Bentonite must be placed at about 100 ft below ground level during tube well installation.
- The borehole must be electrically logged to get the water quality profile throughout the drilled depth and to define the exact depth and thickness of aquifer zones for the optimal design of the tube well.
- The borehole should be converted into tubewell under the strict supervision of a well-qualified hydro- geologist.

FIGURES


Location Map
Location Map of Soundings Points
S-05
S-03
S-08
S-06
Philip Moris Int'l (GLT) Plant Ismaila, Swabi
Ismaila Interchange, Swat Motorway
S-01
S-02
Ismaila Toll Plaza (South)
S-09
S-04
Al Khidmat Mashal Medical...
S-07
S-10
Legend
Soundings point
Philip Moris Int'l (GLT) Plant Ismaila, Swabi
N
3000 ft
Google Earth
Image © 2023 Maxar Technologies

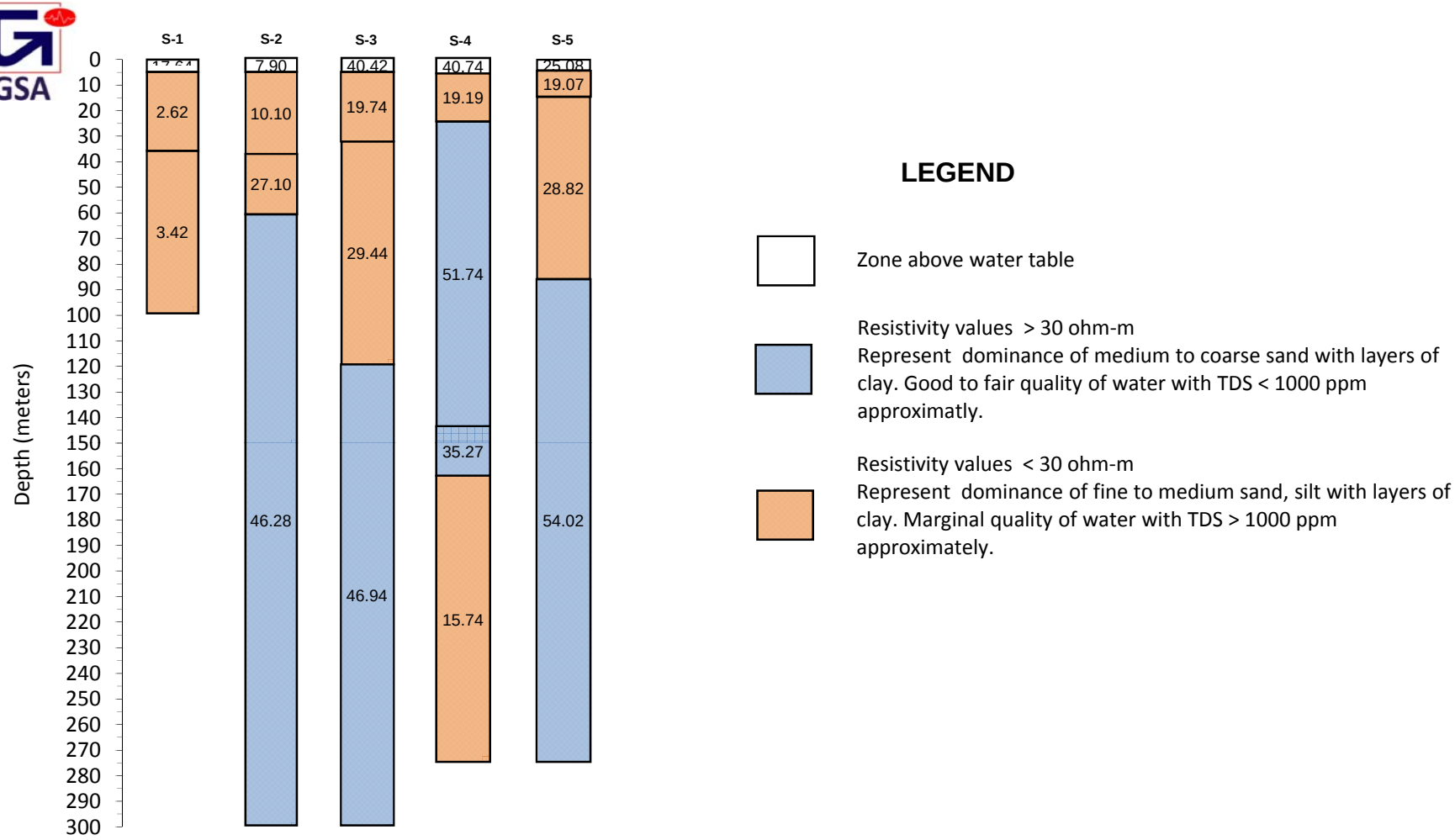


Figure-1A: Columnar view of the interpreted subsurface hydrogeological conditions at sounding points based on electrical resistivity survey for groundwater investigation around the plant of Philip Morris International, Mardan-Sawabi Road, KPK Pakistan.

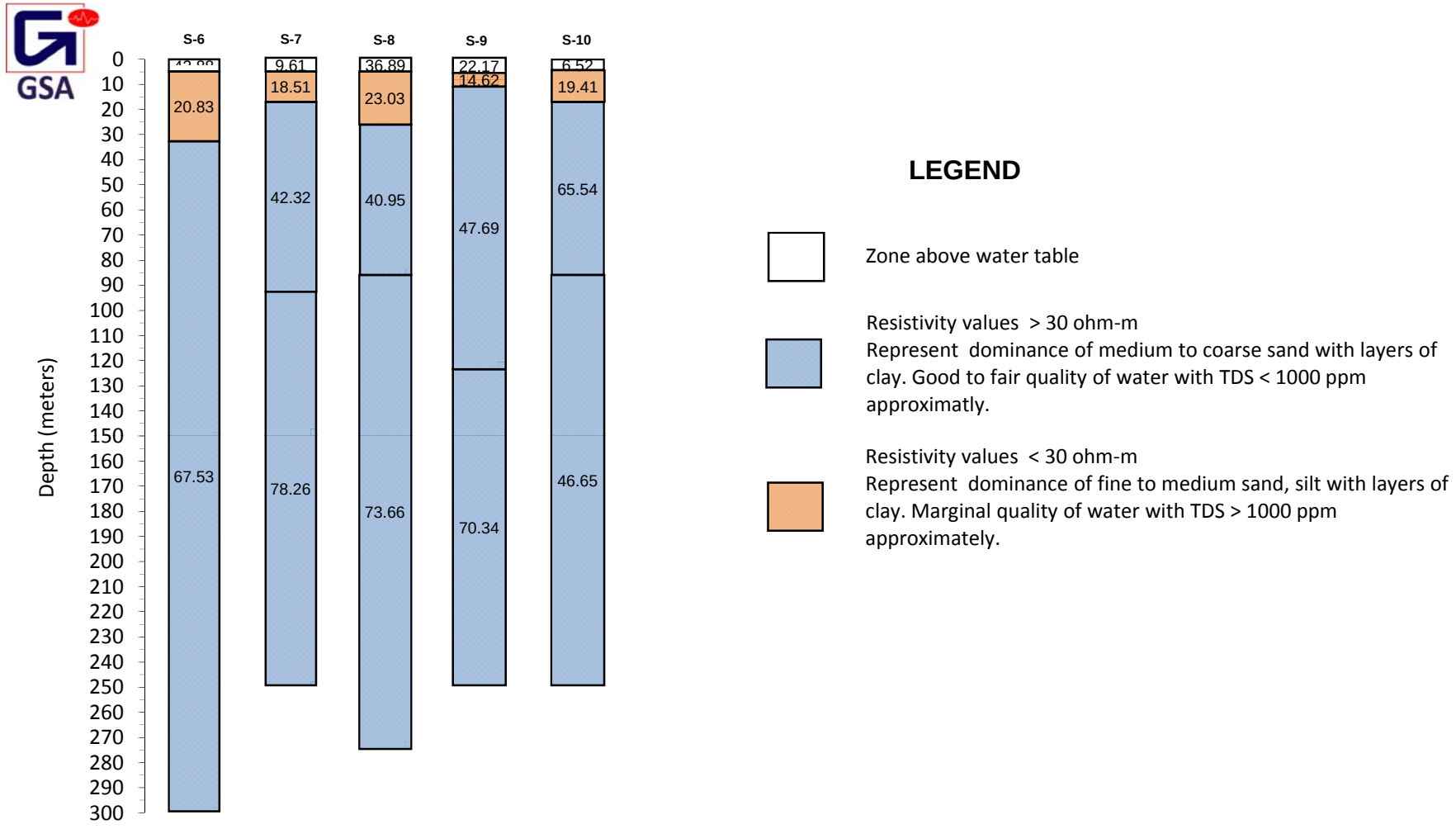


Figure-1A: Columnar view of the interpreted subsurface hydrogeological conditions at sounding points based on electrical resistivity survey for groundwater investigation around the plant of Philip Morris International, Mardan-Sawabi Road, KPK Pakistan.

ANNEXURE

Interpreted data sets of the Sounding Points

DATA SET: PHILIP 1

CLIENT: PHILIP MORRIS INTERNATIONAL DATE: 07.03.2023
LOCATION: SWABI-MARDAN ROAD, ISMAILA SOUNDING: S-01
COUNTY: BAGHICHA, KPK, PAKISTAN AZIMUTH:
PROJECT: GROUND WATER INVESTIGATION EQUIPMENT: PASI 16 GL-N
ELEVATION: 0.00
SOUNDING COORDINATES: X: 34.2287 Y: 72.2169

Schlumberger Configuration

FITTING ERROR: 0.220 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
			0.0		
1	27.15	1.46	-1.46	0.0538	39.71
2	17.64	2.29	-3.75	0.130	40.53
3	2.62	32.79	-36.55	12.48	86.13
4	3.42				

ALL PARAMETERS ARE FREE

No.	SPACING (m)	RHO-A (ohm-m) DATA	RHO-A (ohm-m) SYNTHETIC	DIFFERENCE (percent)
1	1.50	25.87	25.87	-0.0115
2	3.00	21.68	21.71	-0.125
3	5.00	15.80	15.75	0.308
4	7.00	10.99	11.02	-0.248
5	10.00	6.59	6.59	0.00663
6	15.00	3.77	3.76	0.175
7	20.00	3.04	3.05	-0.143
8	25.00	2.85	2.85	-0.0672
9	30.00	2.80	2.79	0.201
10	40.00	2.77	2.78	-0.244
11	50.00	2.82	2.81	0.468
12	60.00	2.85	2.86	-0.260
13	70.00	2.90	2.91	-0.163
14	80.00	2.96	2.96	-0.0771
15	90.00	3.01	3.00	0.329
16	100.0	3.04	3.04	-0.102

PARAMETER RESOLUTION MATRIX:

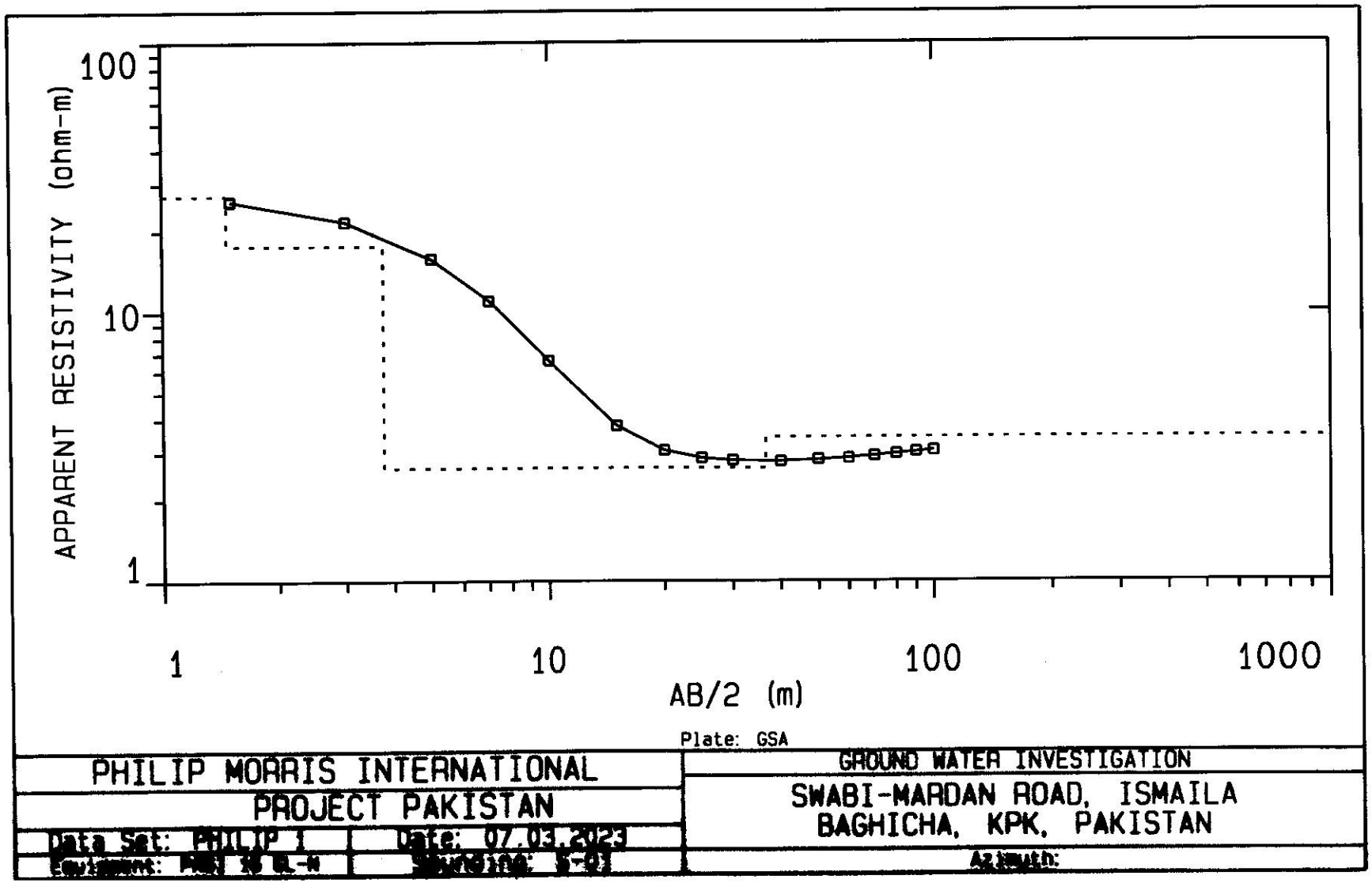


Plate: GSA

PHILIP MORRIS INTERNATIONAL	GROUND WATER INVESTIGATION
PROJECT PAKISTAN	SWABI-MARDAN ROAD, ISMAILA BAGHICHA, KPK, PAKISTAN
Data Set: PHILIP 1 / Date: 07.03.2023	
Equipment: [illegible] / [illegible]	Azimuth:

DATA SET: PHILIP 2

CLIENT: PHILIP MORRIS INTERNATIONAL DATE: 07.03.2023
LOCATION: BAGHICHA SOUNDING: S-02
COUNTY: KPK, PAKISTAN AZIMUTH:
PROJECT: GROUND WATER INVESTIGATION EQUIPMENT: PASI 16 GL-N
ELEVATION: 0.00
SOUNDING COORDINATES: X: 34.2275 Y: 72.2145

Schlumberger Configuration

FITTING ERROR: 0.283 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
			0.0		
1	3.62	0.595	-0.595	0.164	2.16
2	7.90	1.77	-2.37	0.225	14.05
3	10.10	34.81	-37.18	3.44	351.8
4	27.10	24.64	-61.82	0.909	667.8
5	46.28				

ALL PARAMETERS ARE FREE

No.	SPACING (m)	RHO-A (ohm-m) DATA	RHO-A (ohm-m) SYNTHETIC	DIFFERENCE (percent)
1	1.50	5.11	5.11	-0.0110
2	3.00	6.56	6.57	-0.00870
3	5.00	7.65	7.63	0.263
4	7.00	8.28	8.30	-0.189
5	10.00	8.88	8.91	-0.387
6	15.00	9.52	9.48	0.411
7	20.00	9.84	9.83	0.105
8	25.00	10.12	10.12	-0.0106
9	30.00	10.41	10.41	-0.0581
10	40.00	11.07	11.08	-0.0752
11	50.00	11.87	11.89	-0.163
12	60.00	12.83	12.82	0.0884
13	70.00	13.76	13.81	-0.391
14	80.00	14.96	14.83	0.833
15	90.00	15.82	15.86	-0.263
16	100.0	16.83	16.87	-0.209
17	125.0	19.23	19.26	-0.147
18	150.0	21.50	21.42	0.382

No.	SPACING (m)	RHO-A (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
19	175.0	23.38	23.35	0.114
20	200.0	25.07	25.08	-0.0446
21	225.0	26.51	26.63	-0.446
22	250.0	28.03	28.02	0.0523
23	275.0	29.23	29.27	-0.129
24	300.0	30.48	30.40	0.264

PARAMETER RESOLUTION MATRIX:
"F" INDICATES FIXED PARAMETER

P 1	0.82								
P 2	-0.05	0.93							
P 3	0.00	0.00	1.00						
P 4	0.00	0.00	0.00	0.19					
P 5	0.00	0.00	0.00	0.00	0.98				
T 1	-0.33	-0.15	0.00	0.01	0.00	0.31			
T 2	-0.03	-0.16	-0.02	-0.03	0.01	-0.19	0.51		
T 3	0.00	-0.01	-0.01	-0.22	0.02	0.00	-0.05	0.91	
T 4	-0.01	0.01	0.01	-0.28	-0.07	-0.01	0.05	0.00	0.60
	P 1	P 2	P 3	P 4	P 5	T 1	T 2	T 3	T 4

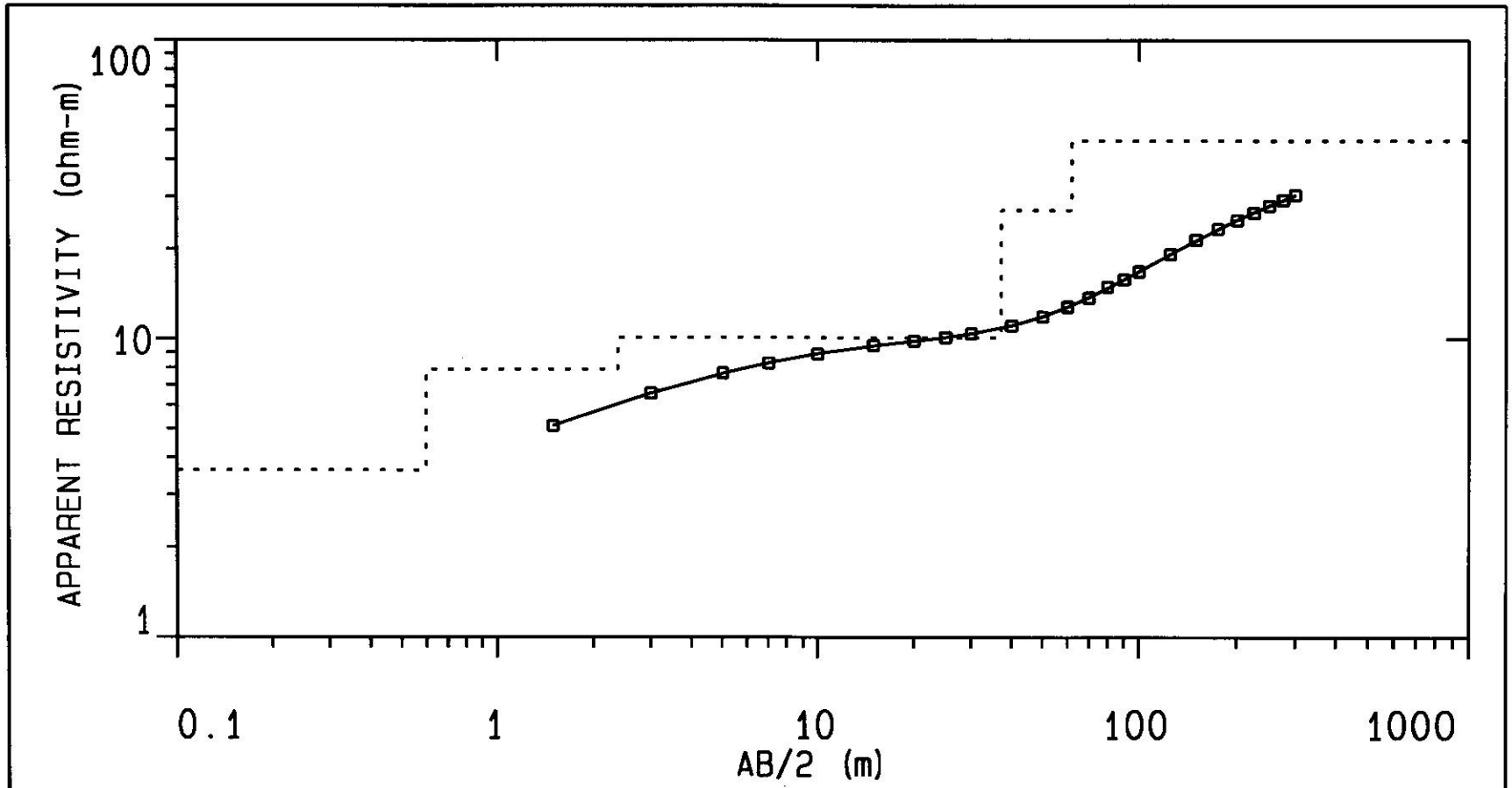


Plate: GSA

PHILIP MORRIS INTERNATIONAL	GROUND WATER INVESTIGATION
PROJECT PAKISTAN	BAGHICHA KPK, PAKISTAN
Data Set: PHILIP 2 — Date: 07.03.2023	
Equipment: PASI 16 GL-N — Azimuth:	

DATA SET: PHILIP 3

CLIENT: PHILIP MORRIS INTERNATIONAL DATE: 07.03.2023
LOCATION: GULABAD TORAPARAN SOUNDING: S-03
COUNTY: KPK, PAKISTAN AZIMUTH:
PROJECT: GROUND WATER INVESTIGATION EQUIPMENT: PASI 16 GL-N
ELEVATION: 0.00
SOUNDING COORDINATES: X: 34.2332 Y: 72.2196

Schlumberger Configuration

FITTING ERROR: 0.199 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
			0.0		
1	25.49	0.669	-0.669	0.0262	17.06
2	40.42	2.01	-2.68	0.0499	81.59
3	19.74	29.60	-32.29	1.49	584.5
4	29.44	87.75	-120.0	2.98	2583.9
5	46.94				

ALL PARAMETERS ARE FREE

No.	SPACING (m)	RHO-A (ohm-m) DATA	RHO-A (ohm-m) SYNTHETIC	DIFFERENCE (percent)
1	1.50	30.15	30.16	-0.0413
2	3.00	33.08	33.03	0.168
3	5.00	31.14	31.20	-0.174
4	7.00	28.11	28.11	0.0153
5	10.00	24.68	24.64	0.152
6	15.00	21.97	21.99	-0.0902
7	20.00	21.10	21.10	-0.00665
8	25.00	20.88	20.85	0.118
9	30.00	20.88	20.87	0.0205
10	40.00	21.27	21.29	-0.127
11	50.00	21.97	21.96	0.0667
12	60.00	22.70	22.71	-0.0312
13	70.00	23.34	23.47	-0.537
14	80.00	24.34	24.20	0.559
15	90.00	24.91	24.90	0.0428
16	100.0	25.62	25.56	0.225
17	125.0	26.96	27.05	-0.327
18	150.0	28.38	28.38	-0.00257

No.	SPACING (m)	RHO-A (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
19	175.0	29.59	29.59	-0.0137
20	200.0	30.77	30.72	0.134
21	225.0	31.73	31.78	-0.153
22	250.0	32.78	32.76	0.0578
23	275.0	33.71	33.67	0.0970
24	300.0	34.50	34.52	-0.0635

PARAMETER RESOLUTION MATRIX:
"F" INDICATES FIXED PARAMETER

P 1	0.93								
P 2	-0.03	0.95							
P 3	0.00	0.00	1.00						
P 4	0.00	-0.01	0.00	0.96					
P 5	0.00	0.00	0.00	-0.03	0.87				
T 1	-0.21	-0.16	-0.01	-0.01	0.00	0.19			
T 2	0.01	0.05	0.01	0.01	0.00	0.12	0.93		
T 3	0.00	-0.02	-0.01	-0.07	-0.04	-0.03	0.04	0.85	
T 4	0.00	-0.01	-0.01	-0.13	-0.26	-0.01	0.02	-0.18	0.37
	P 1	P 2	P 3	P 4	P 5	T 1	T 2	T 3	T 4

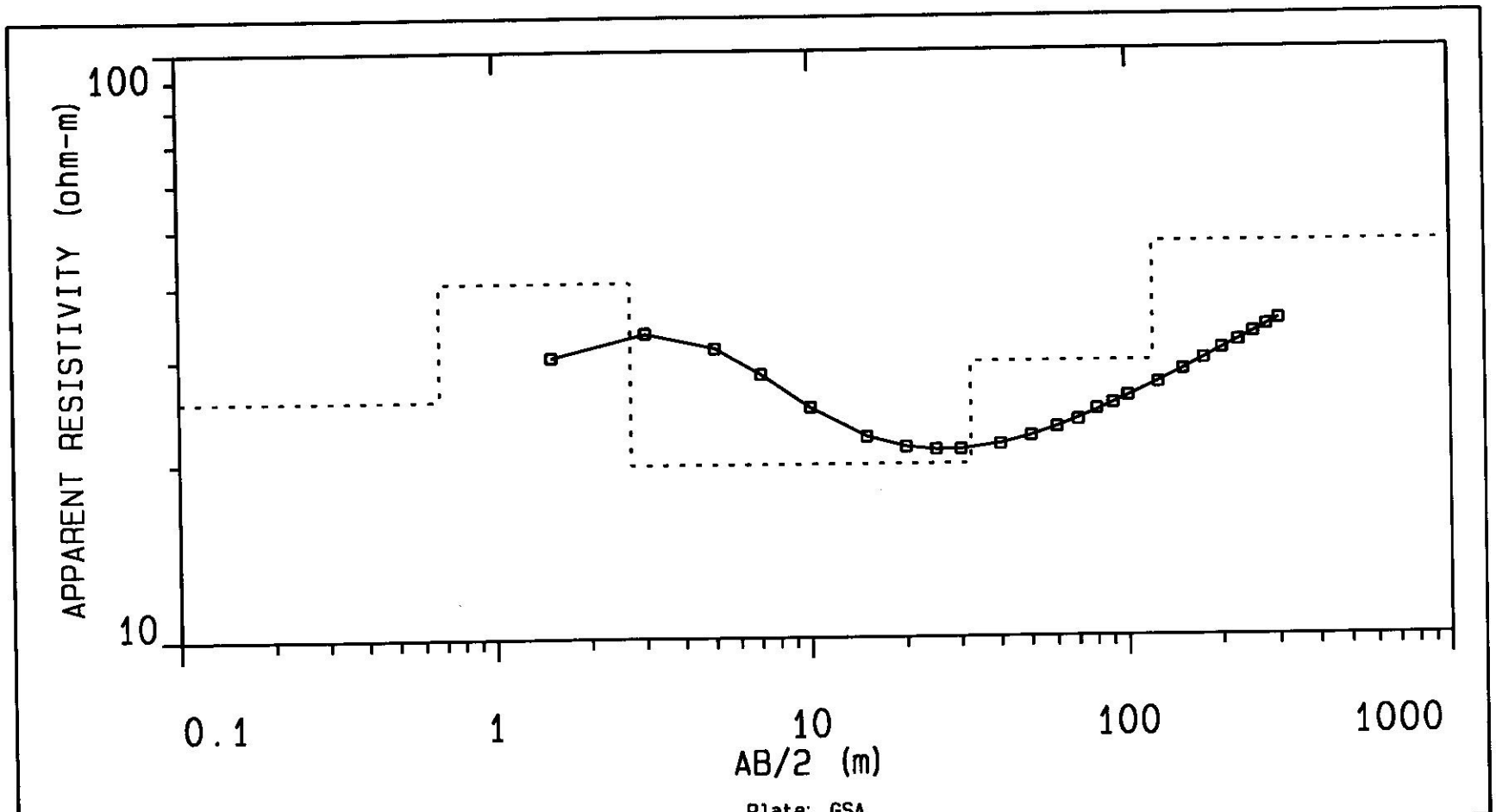


Plate: GSA

PHILIP MORRIS INTERNATIONAL	GROUND WATER INVESTIGATION
PROJECT PAKISTAN	GULABAD TORAPARAN KPK, PAKISTAN
Data Set: PHILIP 3 — Date: 07.03.2023	
Equipment: PASI 16 GL-N — Operator: S-05	Azimuth:

DATA SET: PHILIP 4

CLIENT: PHILIP MORRIS INTERNATIONAL DATE: 07.03.2023
LOCATION: GAUHARABAD ISMAILA SOUNDING: S-04
COUNTY: KPK, PAKISTAN AZIMUTH:
PROJECT: GROUND WATER INVESTIGATION EQUIPMENT: PASI 16 GL-N
ELEVATION: 0.00
SOUNDING COORDINATES: X: 34.2279 Y: 72.2262

Schlumberger Configuration

FITTING ERROR: 0.162 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
			0.0		
1	11.15	1.16	-1.16	0.104	13.00
2	40.74	1.58	-2.75	0.0389	64.58
3	19.19	22.81	-25.56	1.18	438.0
4	51.74	119.2	-144.7	2.30	6167.5
5	35.27	18.42	-163.1	0.522	650.0
6	15.74				

ALL PARAMETERS ARE FREE

No.	SPACING (m)	RHO-A (ohm-m) DATA	RHO-A (ohm-m) SYNTHETIC	DIFFERENCE (percent)
1	1.50	13.24	13.24	0.0380
2	3.00	17.75	17.77	-0.159
3	5.00	21.28	21.22	0.278
4	7.00	22.34	22.34	-0.0146
5	10.00	22.34	22.38	-0.188
6	15.00	21.73	21.71	0.0787
7	20.00	21.42	21.44	-0.0955
8	25.00	21.73	21.67	0.270
9	30.00	22.18	22.24	-0.226
10	40.00	23.95	23.97	-0.0467
11	50.00	26.05	26.01	0.149
12	60.00	28.01	28.04	-0.0809
13	70.00	29.95	29.90	0.156
14	80.00	31.45	31.55	-0.331
15	90.00	33.02	32.98	0.130
16	100.0	34.19	34.19	0.00511
17	125.0	36.41	36.41	-0.00314

No.	SPACING (m)	RHO-A (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
18	150.0	37.70	37.68	0.0577
19	175.0	38.23	38.22	0.0190
20	200.0	38.23	38.22	0.0334
21	225.0	37.70	37.80	-0.272
22	250.0	37.18	37.09	0.234
23	275.0	36.16	36.17	-0.0529

PARAMETER RESOLUTION MATRIX:
"F" INDICATES FIXED PARAMETER

P 1	0.99											
P 2	-0.03	0.47										
P 3	0.00	-0.02	0.99									
P 4	0.00	-0.01	-0.01	0.98								
P 5	0.00	0.00	0.00	0.01	0.02							
P 6	0.00	0.00	0.00	-0.03	0.06	0.31						
T 1	-0.03	-0.21	0.00	0.00	0.00	0.00	0.88					
T 2	0.01	0.39	0.03	0.02	-0.01	0.00	0.13	0.65				
T 3	0.00	-0.01	-0.01	-0.02	0.01	-0.01	0.01	0.03	0.97			
T 4	0.00	0.01	0.01	0.05	0.06	0.21	0.00	-0.02	0.04	0.20		
T 5	0.00	0.01	0.01	0.04	0.09	0.34	0.00	-0.02	0.03	0.30	0.44	
	P 1	P 2	P 3	P 4	P 5	P 6	T 1	T 2	T 3	T 4	T	

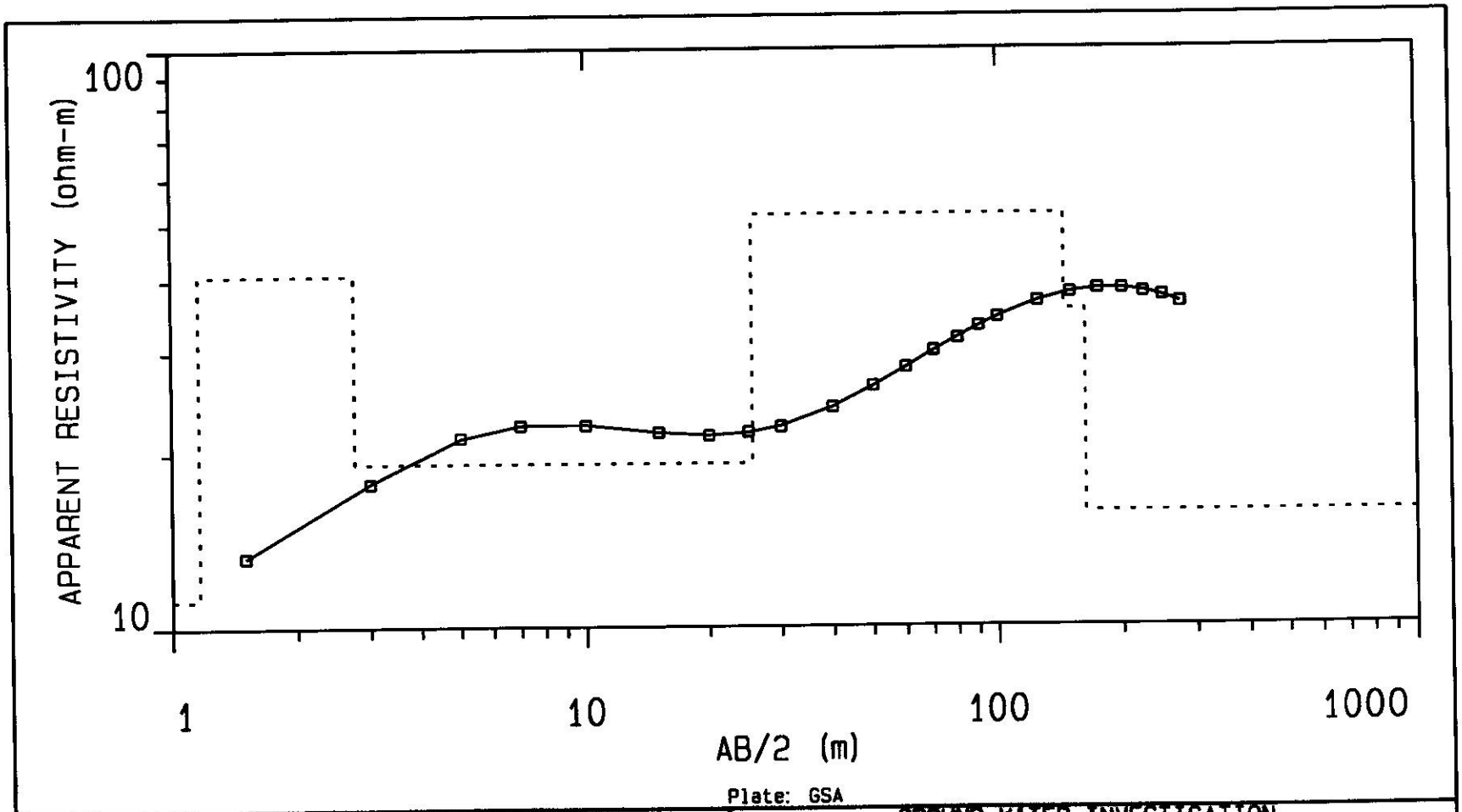


Plate: GSA

PHILIP MORRIS INTERNATIONAL	GROUND WATER INVESTIGATION
PROJECT PAKISTAN	GAUHARABAD ISMAILA KPK, PAKISTAN
Data Set: PHILIP 4 Date: 07.03.2023	
Electrode: AB/2 in m Location: S-08	Azimuth:

DATA SET: PHILIP 5

CLIENT: PHILIP MORRIS INTERNATIONAL
LOCATION: TORAPARAN ISMAILA
COUNTY: KPK, PAKISTAN
PROJECT: GROUND WATER INVESTIGATION
ELEVATION: 0.00
SOUNDING COORDINATES: X: 34.2367 Y: 72.2163

DATE: 08.03.2023
SOUNDING: S-05
AZIMUTH:
EQUIPMENT: PASI 16 GL-N

Schlumberger Configuration

FITTING ERROR: 0.162 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
			0.0		
1	18.91	0.823	-0.823	0.0435	15.57
2	25.08	1.93	-2.76	0.0773	48.64
3	19.07	12.04	-14.80	0.631	229.6
4	28.82	71.52	-86.32	2.48	2061.9
5	54.02				

ALL PARAMETERS ARE FREE

No.	SPACING (m)	RHO-A (ohm-m) DATA	RHO-A (ohm-m) SYNTHETIC	DIFFERENCE (percent)
1	1.50	20.45	20.46	-0.0101
2	3.00	22.09	22.08	0.0325
3	5.00	22.18	22.18	-0.0328
4	7.00	21.63	21.64	-0.0356
5	10.00	20.97	20.96	0.0733
6	15.00	20.68	20.68	0.0159
7	20.00	21.03	21.04	-0.0393
8	25.00	21.67	21.68	-0.0507
9	30.00	22.40	22.40	-0.0206
10	40.00	23.81	23.80	0.0434
11	50.00	25.04	24.99	0.213
12	60.00	25.93	25.99	-0.247
13	70.00	26.85	26.87	-0.0880
14	80.00	27.72	27.68	0.173
15	90.00	28.43	28.43	5.366E-04
16	100.0	29.20	29.16	0.119
17	125.0	30.87	30.93	-0.181
18	150.0	32.64	32.64	0.0146

No.	SPACING (m)	RHO-A (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
19	175.0	34.18	34.28	-0.284
20	200.0	35.99	35.81	0.502
21	225.0	37.16	37.23	-0.181
22	250.0	38.57	38.53	0.113
23	275.0	39.67	39.71	-0.108

PARAMETER RESOLUTION MATRIX:
"F" INDICATES FIXED PARAMETER

P 1	0.98								
P 2	-0.01	0.95							
P 3	0.00	-0.01	0.99						
P 4	0.00	0.00	-0.01	0.99					
P 5	0.00	0.00	-0.01	-0.02	0.94				
T 1	-0.10	-0.15	0.00	0.00	0.00	0.21			
T 2	0.00	0.12	0.05	0.02	0.02	0.23	0.53		
T 3	0.00	-0.01	-0.03	-0.03	-0.04	0.01	0.13	0.85	
T 4	0.00	0.00	-0.01	-0.04	-0.10	0.01	0.05	-0.10	0.82
	P 1	P 2	P 3	P 4	P 5	T 1	T 2	T 3	T 4

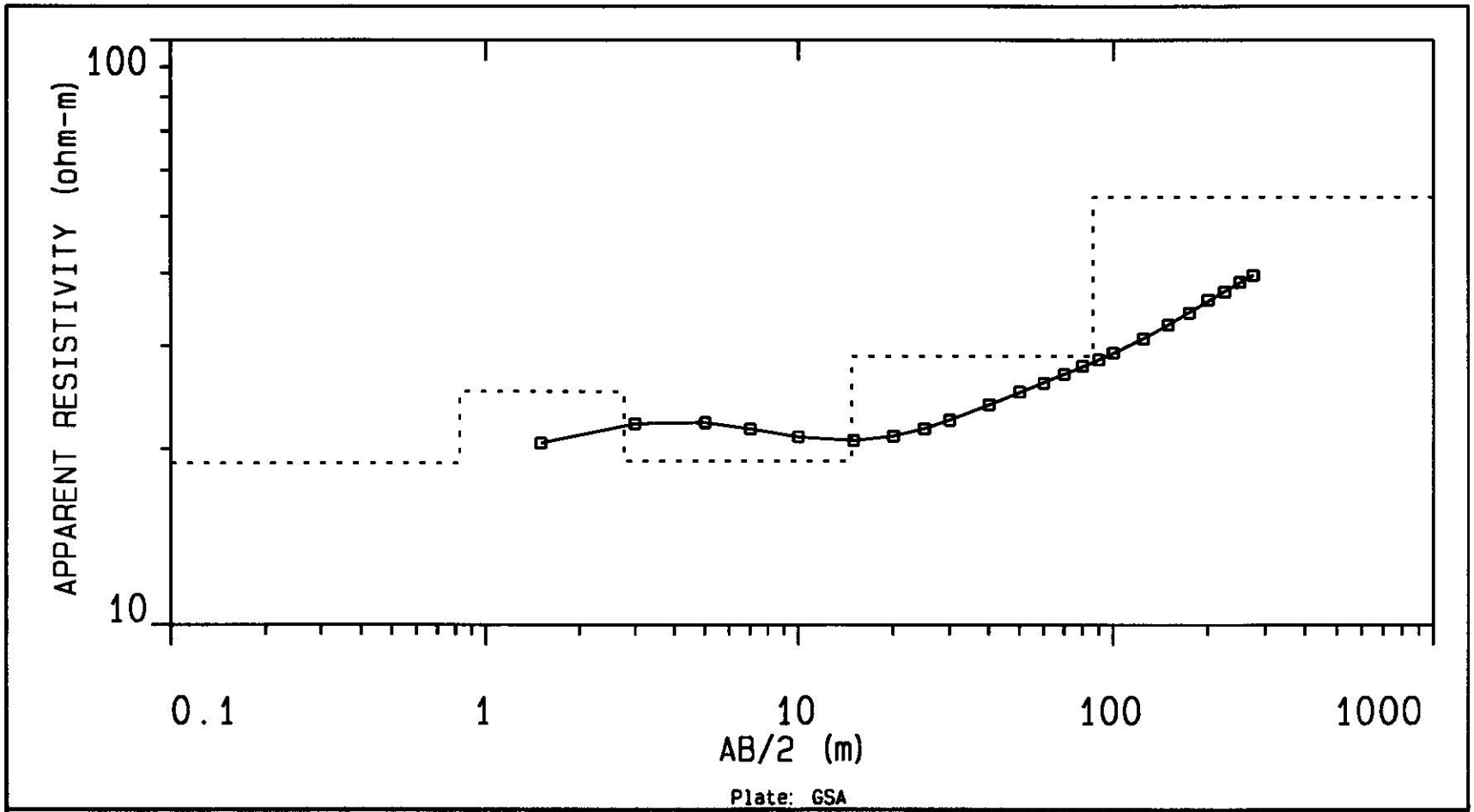


Plate: GSA

PHILIP MORRIS INTERNATIONAL	GROUND WATER INVESTIGATION
PROJECT PAKISTAN	TORAPARAN ISMAILA KPK, PAKISTAN
[illegible]	Azimuth:

DATA SET: PHILIP 6

CLIENT: PHILIP MORRIS INTERNATIONAL DATE: 08.03.2023
LOCATION: SHEHBAZ GARHI REHANABAD SOUNDING: S-06
COUNTY: BAGHICHA STOP KPK PAKISTAN AZIMUTH:
PROJECT: GROUND WATER INVESTIGATION EQUIPMENT: PASI 16 GL-N
ELEVATION: 0.00
SOUNDING COORDINATES: X: 34.2311 Y: 72.2012

Schlumberger Configuration

FITTING ERROR: 0.323 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
			0.0		
1	14.82	0.535	-0.535	0.0361	7.94
2	42.88	1.07	-1.61	0.0251	46.21
3	20.83	31.54	-33.15	1.51	657.2
4	67.53				

ALL PARAMETERS ARE FREE

No.	SPACING (m)	RHO-A (ohm-m) DATA	RHO-A (ohm-m) SYNTHETIC	DIFFERENCE (percent)
1	1.50	23.15	23.15	-0.0310
2	3.00	27.37	27.31	0.192
3	5.00	26.37	26.48	-0.417
4	7.00	24.79	24.76	0.117
5	10.00	23.15	23.09	0.251
6	15.00	22.09	22.06	0.157
7	20.00	21.89	21.94	-0.249
8	25.00	22.30	22.23	0.320
9	30.00	22.72	22.77	-0.207
10	40.00	24.25	24.36	-0.441
11	50.00	26.37	26.37	-0.0210
12	60.00	28.67	28.58	0.315
13	70.00	30.88	30.81	0.232
14	80.00	32.96	32.98	-0.0441
15	90.00	34.73	35.02	-0.838
16	100.0	37.20	36.93	0.727
17	125.0	41.21	41.10	0.267
18	150.0	44.39	44.52	-0.281
19	175.0	47.38	47.34	0.0845

No.	SPACING (m)	RHO-A (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
20	200.0	49.63	49.69	-0.111
21	225.0	51.52	51.66	-0.290
22	250.0	53.30	53.34	-0.0890
23	275.0	54.98	54.78	0.372
24	300.0	56.01	56.01	0.00232

PARAMETER RESOLUTION MATRIX:
"F" INDICATES FIXED PARAMETER

P 1	0.71						
P 2	-0.05	0.69					
P 3	0.00	-0.01	1.00				
P 4	0.00	0.00	0.00	1.00			
T 1	-0.40	-0.24	0.00	0.00	0.35		
T 2	-0.07	0.25	0.01	0.00	0.05	0.73	
T 3	0.00	0.00	0.00	0.00	0.00	0.01	0.99
	P 1	P 2	P 3	P 4	T 1	T 2	T 3

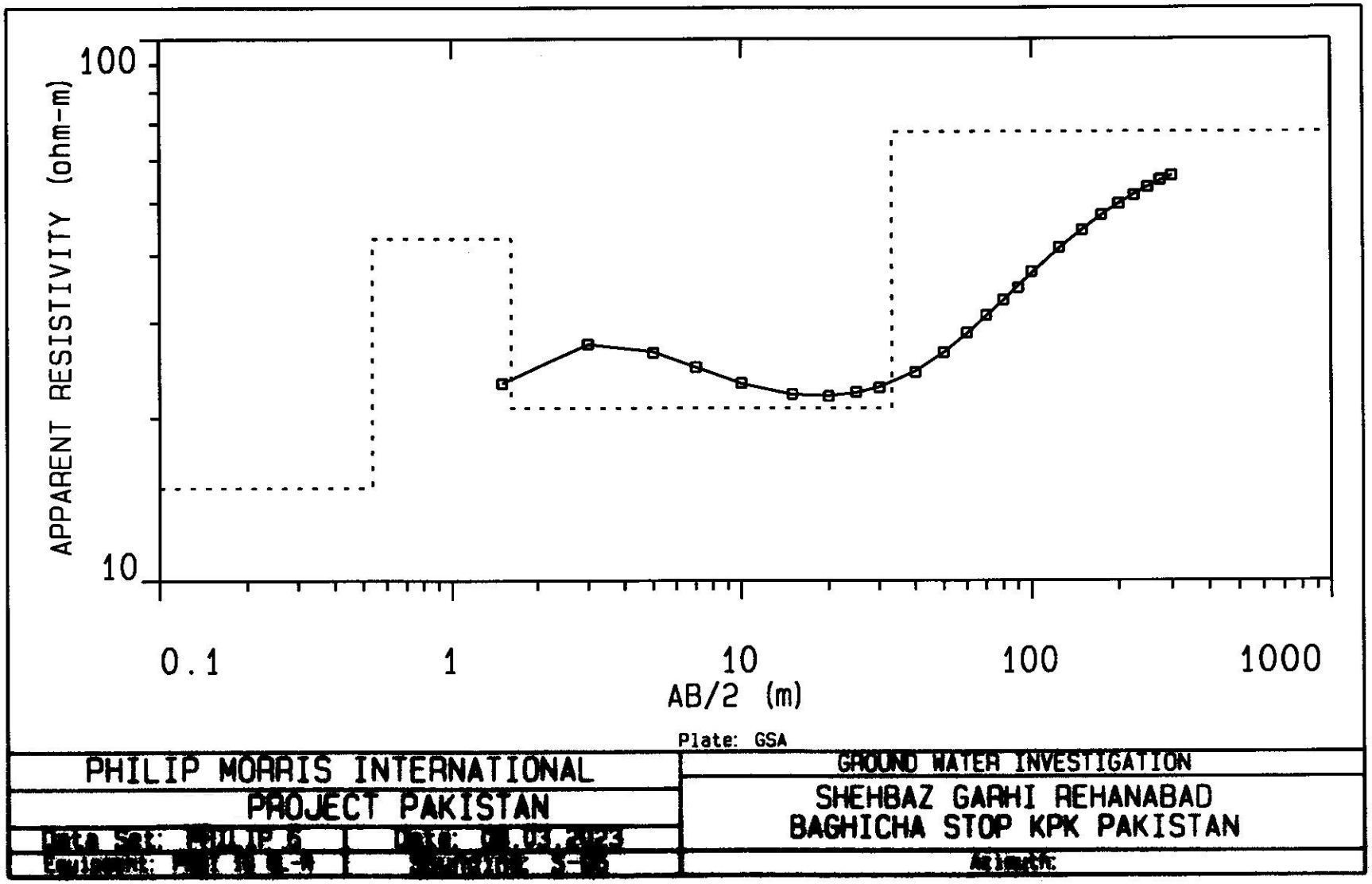


Plate: GSA

PHILIP MORRIS INTERNATIONAL	GROUND WATER INVESTIGATION
PROJECT PAKISTAN	SHEHBAZ GARHI REHANABAD BAGHICHA STOP KPK PAKISTAN
[illegible]	[illegible]
[illegible]	[illegible]

DATA SET: PHILIP 7

CLIENT: PHILIP MORRIS INTERNATIONAL
DATE: 08.03.2023
LOCATION: BAGHICHA DHERI
SOUNDING: S-07
COUNTY: KPK, PAKISTAN
AZIMUTH:
PROJECT: GROUND WATER INVESTIGATION
EQUIPMENT: PASI 16 GL-N
ELEVATION: 0.00
SOUNDING COORDINATES: X: 34.2238 Y: 72.2123

Schlumberger Configuration

FITTING ERROR: 0.265 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
			0.0		
1	28.18	0.578	-0.578	0.0205	16.29
2	9.61	1.28	-1.85	0.133	12.30
3	18.51	16.57	-18.42	0.894	306.8
4	42.32	73.90	-92.33	1.74	3128.1
5	78.26				

ALL PARAMETERS ARE FREE

No.	SPACING (m)	RHO-A (ohm-m) DATA	RHO-A (ohm-m) SYNTHETIC	DIFFERENCE (percent)
1	1.50	16.87	16.87	-0.0201
2	3.00	13.24	13.24	0.0602
3	5.00	14.40	14.42	-0.159
4	7.00	15.66	15.64	0.129
5	10.00	16.87	16.85	0.121
6	15.00	18.20	18.20	0.0278
7	20.00	19.40	19.38	0.106
8	25.00	20.51	20.60	-0.433
9	30.00	21.89	21.87	0.0707
10	40.00	24.47	24.44	0.149
11	50.00	26.86	26.83	0.116
12	60.00	28.92	28.97	-0.172
13	70.00	30.88	30.87	0.0592
14	80.00	32.57	32.57	0.0140
15	90.00	34.21	34.12	0.280
16	100.0	35.51	35.54	-0.0960
17	125.0	38.61	38.74	-0.340
18	150.0	41.59	41.58	0.0290

No.	SPACING (m)	RHO-A (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
19	175.0	43.98	44.16	-0.420
20	200.0	46.94	46.54	0.857
21	225.0	48.72	48.72	0.00501
22	250.0	50.57	50.72	-0.298

PARAMETER RESOLUTION MATRIX:
"F" INDICATES FIXED PARAMETER

P 1	0.69								
P 2	-0.19	0.80							
P 3	0.00	-0.01	1.00						
P 4	0.00	-0.01	-0.01	0.97					
P 5	0.00	0.00	0.00	-0.04	0.83				
T 1	0.34	0.26	0.01	0.00	0.00	0.60			
T 2	-0.13	-0.19	-0.02	-0.02	-0.01	0.20	0.80		
T 3	0.00	-0.02	-0.01	-0.03	-0.03	0.01	-0.04	0.95	
T 4	0.01	-0.02	-0.01	-0.09	-0.27	0.00	-0.04	-0.09	0.52
	P 1	P 2	P 3	P 4	P 5	T 1	T 2	T 3	T 4

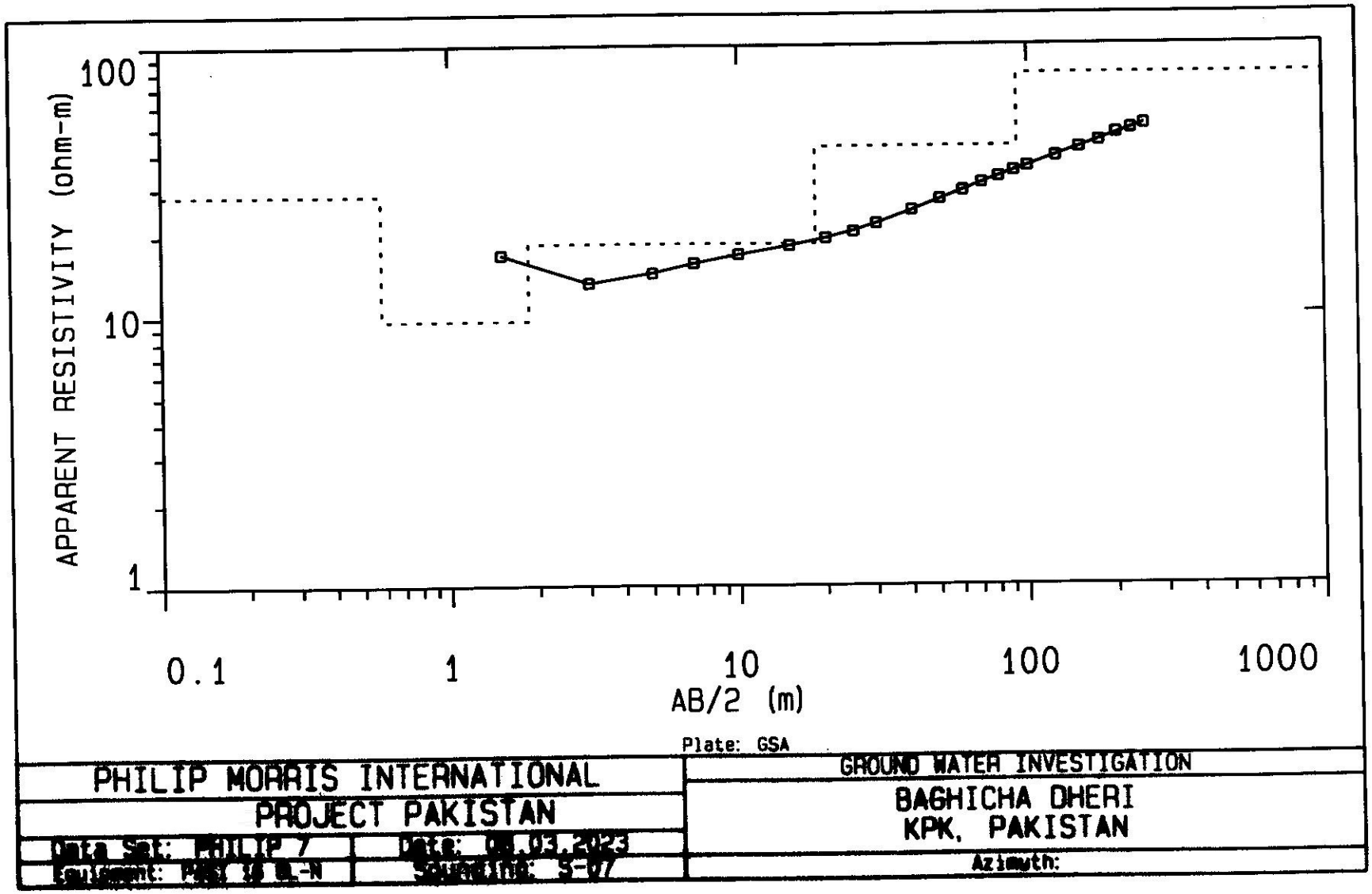


Plate: GSA

PHILIP MORRIS INTERNATIONAL	GROUND WATER INVESTIGATION
PROJECT PAKISTAN	BAGHICHA DHERI KPK, PAKISTAN
Data Set: PHILIP 7	Date: 08.03.2023
Equipment: PASI 16 GL-N	Sounding: S-07
	Azimuth:

DATA SET: PHILIP 8

CLIENT: PHILIP MORRIS INTERNATIONAL DATE: 09.03.2023
LOCATION: (BUTT SARI) SHEHBAZ GARHI SOUNDING: S-08
COUNTY: KPK, PAKISTAN AZIMUTH:
PROJECT: GROUND WATER INVESTIGATION EQUIPMENT: PASI 16 GL-N
ELEVATION: 0.00
SOUNDING COORDINATES: X: 34.2321 Y: 72.1964

Schlumberger Configuration

FITTING ERROR: 0.160 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
			0.0		
1	36.89	2.52	-2.52	0.0684	93.24
2	23.03	24.88	-27.41	1.08	573.3
3	40.95	59.09	-86.51	1.44	2420.5
4	73.66				

ALL PARAMETERS ARE FREE

No.	SPACING (m)	RHO-A (ohm-m) DATA	RHO-A (ohm-m) SYNTHETIC	DIFFERENCE (percent)
1	1.50	36.50	36.51	-0.0270
2	3.00	34.76	34.73	0.0835
3	5.00	31.31	31.34	-0.119
4	7.00	28.59	28.56	0.0958
5	10.00	26.11	26.14	-0.101
6	15.00	24.69	24.65	0.198
7	20.00	24.35	24.37	-0.0615
8	25.00	24.52	24.57	-0.181
9	30.00	25.04	25.02	0.0812
10	40.00	26.29	26.35	-0.196
11	50.00	28.00	27.93	0.261
12	60.00	29.61	29.56	0.165
13	70.00	31.09	31.15	-0.186
14	80.00	32.64	32.66	-0.0500
15	90.00	34.04	34.10	-0.164
16	100.0	35.50	35.46	0.104
17	125.0	38.60	38.60	-0.00206
18	150.0	41.38	41.42	-0.0961
19	175.0	44.07	43.99	0.170

No.	SPACING (m)	RHO-A (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
20	200.0	46.27	46.32	-0.108
21	225.0	48.59	48.43	0.321
22	250.0	50.19	50.34	-0.304
23	275.0	52.10	52.06	0.0727

PARAMETER RESOLUTION MATRIX:
"F" INDICATES FIXED PARAMETER

P 1	1.00						
P 2	0.00	1.00					
P 3	0.00	-0.01	0.90				
P 4	0.00	0.00	-0.05	0.92			
T 1	0.00	0.00	0.01	0.00	0.98		
T 2	0.00	-0.01	-0.11	-0.04	0.02	0.88	
T 3	0.00	-0.01	-0.19	-0.18	0.02	-0.17	0.51
	P 1	P 2	P 3	P 4	T 1	T 2	T 3

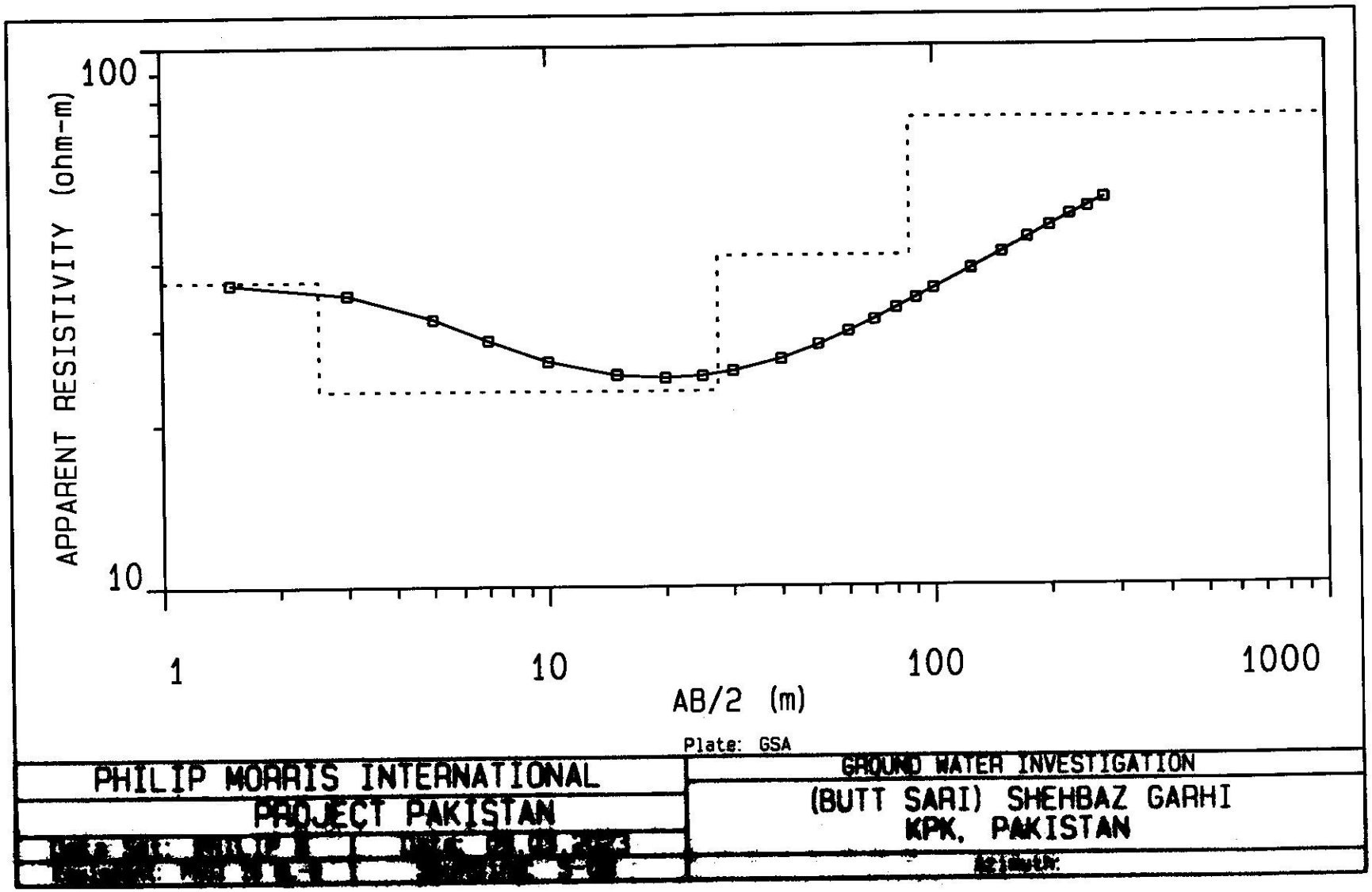


Plate: GSA

PHILIP MORRIS INTERNATIONAL
PROJECT PAKISTAN

GROUND WATER INVESTIGATION
(BUTT SARI) SHEHBAZ GARHI
KPK, PAKISTAN

DATA SET: PHILIP 9

CLIENT: PHILIP MORRIS INTERNATIONAL DATE: 09.03.2023
LOCATION: BAGHICHA CAMP SOUNDING: S-09
COUNTY: KPK, PAKISTAN AZIMUTH:
PROJECT: GROUND WATER INVESTIGATION EQUIPMENT: PASI 16 GL-N
ELEVATION: 0.00
SOUNDING COORDINATES: X: 34.2275 Y: 72.2217

Schlumberger Configuration

FITTING ERROR: 0.281 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. [illegible]. (Ohm-m^2)
			0.0		
1	24.59	1.15	-1.15	0.0468	28.34
2	22.17	1.73	-2.88	0.0781	38.40
3	14.62	9.59	-12.47	0.655	140.3
4	47.69	112.5	-124.9	2.35	5366.5
5	70.34				

ALL PARAMETERS ARE FREE

No.	SPACING (m)	RHO-A (ohm-m) DATA	RHO-A (ohm-m) SYNTHETIC	DIFFERENCE (percent)
1	1.50	24.02	24.03	-0.0423
2	3.00	22.51	22.48	0.135
3	5.00	20.32	20.36	-0.209
4	7.00	18.86	18.84	0.124
5	10.00	17.84	17.83	0.0230
6	15.00	18.34	18.35	-0.0593
7	20.00	20.13	20.09	0.200
8	25.00	22.09	22.18	-0.386
9	30.00	24.25	24.26	-0.0376
10	40.00	28.14	27.94	0.705
11	50.00	30.88	30.93	-0.158
12	60.00	33.22	33.36	-0.419
13	70.00	35.18	35.37	-0.526
14	80.00	37.24	37.05	0.510
15	90.00	38.61	38.49	0.305
16	100.0	39.70	39.75	-0.113
17	125.0	42.37	42.33	0.111
18	150.0	44.39	44.40	-0.0153

No.	SPACING (m)	RHO-A (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
19	175.0	46.05	46.17	-0.275
20	200.0	47.82	47.75	0.137
21	225.0	49.17	49.20	-0.0492
22	250.0	50.57	50.53	0.0690

PARAMETER RESOLUTION MATRIX:
"F" INDICATES FIXED PARAMETER

P 1	1.00								
P 2	0.01	0.95							
P 3	0.00	-0.02	0.98						
P 4	0.00	0.00	-0.01	1.00					
P 5	0.00	0.00	0.00	-0.01	0.80				
T 1	0.02	0.13	0.01	0.00	0.00	0.06			
T 2	-0.01	0.11	0.08	0.01	0.00	-0.13	0.67		
T 3	0.00	-0.01	-0.02	-0.01	0.00	0.00	0.06	0.97	
T 4	0.00	-0.01	-0.02	-0.03	-0.35	0.00	0.05	-0.04	0.30
	P 1	P 2	P 3	P 4	P 5	T 1	T 2	T 3	T 4

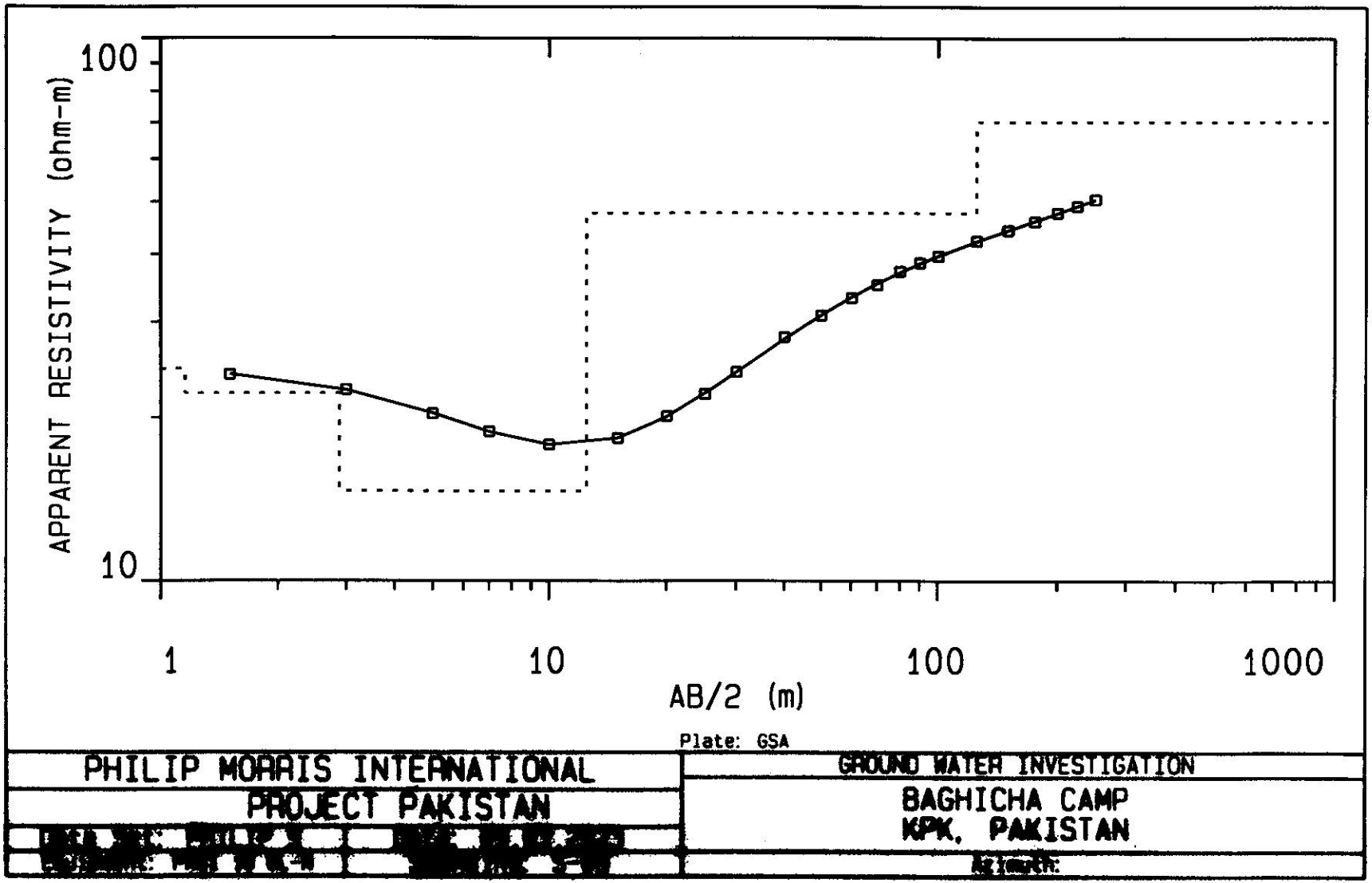


Plate: GSA

PHILIP MORRIS INTERNATIONAL	GROUND WATER INVESTIGATION
PROJECT PAKISTAN	BAGHICHA CAMP KPK, PAKISTAN
[redacted]	Azimuth:

DATA SET: PHILIP10

CLIENT: PHILIP MORRIS INTERNATIONAL DATE: 09.03.2023
LOCATION: BAGHICHA DHERI SOUNDING: S-10
COUNTY: KPK, PAKISTAN AZIMUTH:
PROJECT: GROUND WATER INVESTIGATION EQUIPMENT: PASI 16 GL-N
ELEVATION: 0.00
SOUNDING COORDINATES: X: 34.2168 Y: 72.1999

Schlumberger Configuration

FITTING ERROR: 0.275 PERCENT

L #	RESISTIVITY (ohm-m)	THICKNESS (meters)	ELEVATION (meters)	LONG. COND. (Siemens)	TRANS. RES. (Ohm-m^2)
			0.0		
1	16.73	1.13	-1.13	0.0675	18.91
2	6.52	1.58	-2.71	0.242	10.32
3	19.41	15.03	-17.74	0.774	291.8
4	65.54	68.74	-86.49	1.04	4506.2
5	46.65				

ALL PARAMETERS ARE FREE

No.	SPACING (m)	RHO-A (ohm-m) DATA	RHO-A (ohm-m) SYNTHETIC	DIFFERENCE (percent)
1	1.50	14.67	14.66	0.0217
2	3.00	11.47	11.48	-0.0610
3	5.00	11.16	11.15	0.100
4	7.00	12.39	12.38	0.0649
5	10.00	14.24	14.27	-0.192
6	15.00	16.73	16.74	-0.0601
7	20.00	18.83	18.83	-0.0152
8	25.00	20.91	20.83	0.386
9	30.00	22.74	22.80	-0.299
10	40.00	26.68	26.62	0.245
11	50.00	30.06	30.10	-0.141
12	60.00	33.14	33.16	-0.0619
13	70.00	35.69	35.81	-0.341
14	80.00	38.25	38.08	0.425
15	90.00	40.09	40.03	0.142
16	100.0	41.43	41.69	-0.635
17	125.0	45.08	44.85	0.512
18	150.0	46.97	46.93	0.0909

No.	SPACING (m)	RHO-A (ohm-m) DATA	SYNTHETIC	DIFFERENCE (percent)
19	175.0	48.30	48.27	0.0622
20	200.0	48.98	49.11	-0.252
21	225.0	49.42	49.59	-0.339
22	250.0	50.00	49.84	0.322

PARAMETER RESOLUTION MATRIX:
"F" INDICATES FIXED PARAMETER

P 1	0.99								
P 2	-0.03	0.50							
P 3	0.00	-0.04	0.98						
P 4	0.00	-0.02	-0.01	0.96					
P 5	0.00	0.00	0.00	-0.01	0.93				
T 1	0.03	0.28	0.02	0.01	0.00	0.82			
T 2	-0.02	-0.30	-0.04	-0.02	0.00	0.16	0.80		
T 3	0.00	-0.05	-0.02	-0.04	0.00	0.02	-0.05	0.95	
T 4	0.00	0.02	0.02	0.12	0.20	0.00	0.03	0.08	0.18
	P 1	P 2	P 3	P 4	P 5	T 1	T 2	T 3	T 4

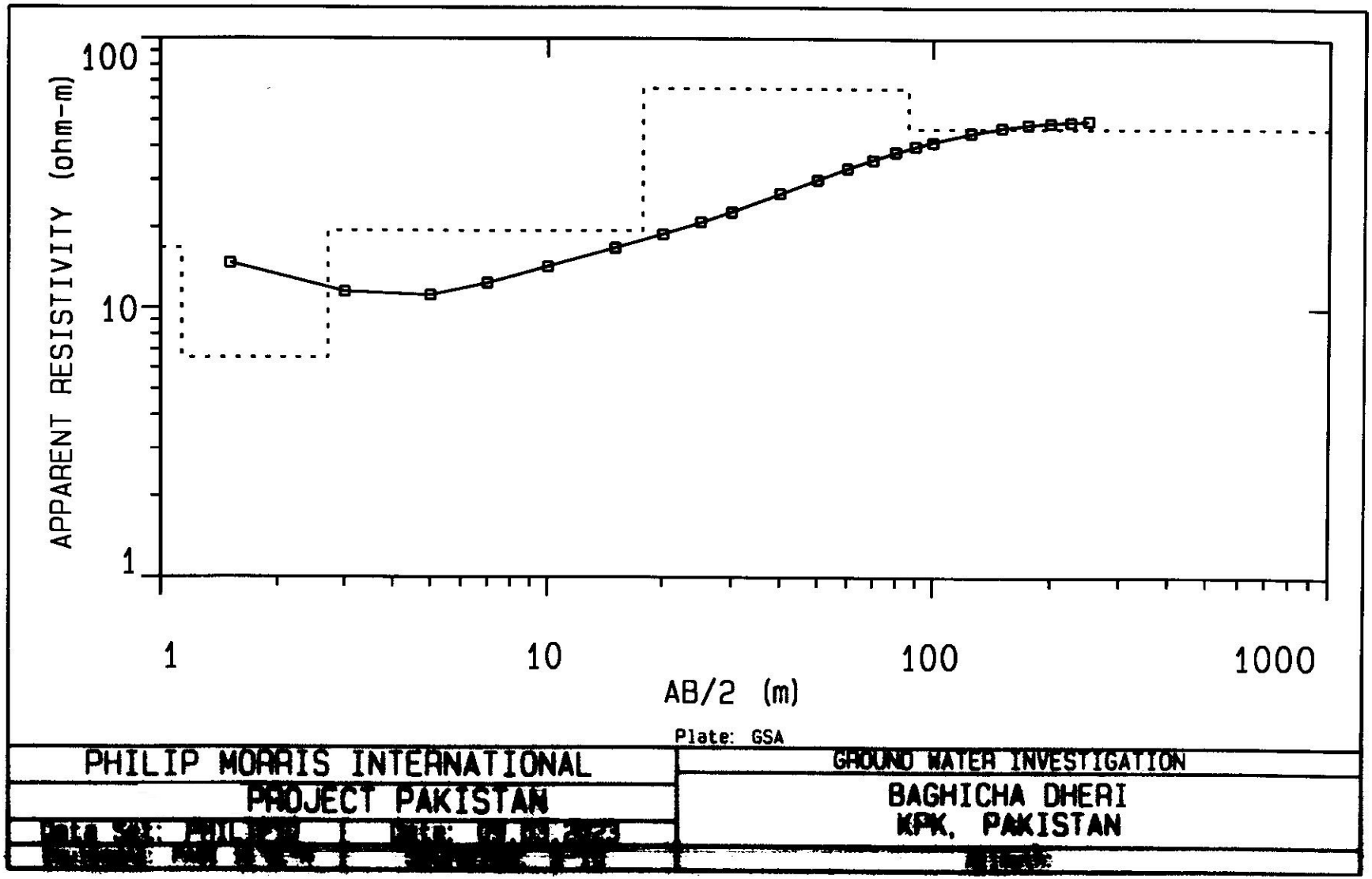


Plate: GSA

PHILIP MORRIS INTERNATIONAL PROJECT PAKISTAN	GROUND WATER INVESTIGATION BAGHICHA DHERI KPK, PAKISTAN

Appendix - 6 Lab Results of Surrounding Area

PHYSICAL / CHEMICAL ANALYSIS RESULTS

Sr. No.	Sample Code	Location	Coordinates		Source	Physical / Chemical Analysis Results															
			E	N		pH	Odure	Colour	Taste	Temperature	Turbidity NTU	T.D.S mg/l	T. Hardness mg/l	Calcium mg/l	Magnisium mg/l	Alkalinity mg/l	Chloride mg/l	EC	HCO3	CO3	Sulphate mg/l
W.H.O. Max: Permissible Levels						6.5 - 8.5	-	-	-	25 °C	5	1000	500	200	150	-	250	-	-	-	250
1	CArHCO3CO3)1 45/PVT/22-23	Baghicha Camp 2	72.216950	34.228510	T.W 1	7.8	Un-obj	Un-obj	Un-obj	25	1.1	860	280	72	25	448	122	1560	448	NIL	-
2	CArHCO3CO3)2 45/PVT/22-23	Baghicha Camp 2	72.217140	34.227890	T.W 2	7.8	Un-obj	Un-obj	Un-obj	25	5.0	375	160	28	23	126	50	680	126	NIL	-
3	CArHCO3CO3)3 45/PVT/22-23	Bala Ghari	72.147500	34.221970	T.W 3	6.7	Un-obj	Un-obj	Un-obj	25	1.68	495	290	52	40	42	99	900	219	NIL	-
4	CArHCO3CO3)4 45/PVT/22-23	PMI Tubewell # 01	72.216068	34.228827	T.W 4	6.8	Un-obj	Un-obj	Un-obj	25	1.0	410	300	60	38	301	70	744	301	NIL	-
5	CArHCO3CO3)5 45/PVT/22-23	PMI Tubewell # 02	72.217323	34.229321	T.W 5	6.7	Un-obj	Un-obj	Un-obj	25	4.7	420	200	36	28	112	99	765	112	NIL	-
6	CArHCO3CO3)6 45/PVT/22-23	Baghicha Dheri	72.204520	34.215500	T.W 8	7.0	Un-obj	Un-obj	Un-obj	25	1.9	2000	770	188	100	238	632	4000	238	NIL	-
7	CArHCO3CO3)7 45/PVT/22-23	But Sari	72.197210	34.238100	T.W 10	7.0	Un-obj	Un-obj	Un-obj	25	1.5	470	410	60	65	308	75	854	308	NIL	-
8	CArHCO3CO3)8 45/PVT/22-23	Bala Ghari	72.147500	34.221970	T.W 11	6.9	Un-obj	Un-obj	Un-obj	25	0.2	320	240	76	13	182	29	582	182	NIL	-

Appendix - 7 Generalized Information of Existing Wells/Water Source

GSA

GENERALIZED INFORMATION OF EXISTING WELLS/WATER SOURCE

Sr. #	Coordinates		Location					Remarks
	E	N	Location	Depth, ft	Water Level Ft	Type of pump	TDS (ppm)	
1	72.215400	34.228350	Baghicha	120	7	Hand Pump	400	
2	72..21585	34.228590	Baghicha	120	5	Hand Pump	280	
3	72.096390	34.217131	Baghicha	100	10	Hand Pump	490	
4	72.216830	34.230140	Baghicha	80	10	Hand Pump	540	
5	72.217400	34.230270	Baghicha	150	40	Hand Pump	890	
6	72.212170	34.220920	Baghicha	80	10	Hand Pump	590	
7	72.204540	34.214740	Baghicha Dheri	110	25	Hand Pump	1260	Saily Water
8	72.204550	34.214220	Baghicha Dheri	100	25	Hand Pump	2110	
9	72.204360	34.215980	Baghicha Dheri	100	20	Hand Pump	940	
10	72.204490	34.215080	Baghicha Dheri	80	20	Hand Pump	590	Stomach Problem after Drinking
11	72.204520	34.204520	Baghicha Dheri	100	10		1330	Throat Issue
12	72.204480	34.214393	Baghicha Dheri	130	20		270	
13	72.198410	34.218790	Baghicha Dheri	100	15	Submersible	180	
14	72.198750	34.218520	Baghicha Dheri	100	15		420	
15	72.198280	34.219120	Baghicha Dheri	100	20		190	
16	72.204450	34.215270	Baghicha Dheri	100	25	Submersible	2240	Stomach Problem after Drinking
17	72.216950	34.228510	Baghicha Camp 2	80	8	Hand Pump	690	Stomach Problem after Drinking
18	72.216950	34.228170	Baghicha Camp 3	80	7	Hand Pump	420	Fever cause after drinking
19	72.217140	34.227890	Baghicha Camp 4	100	10	Hand Pump	370	Stomach Problem after Drinking
20	72.215960	34.227810	Baghicha Camp 5	120	7	Hand Pump	170	Government Hand Pump Stomach Problem after Drinking
21	72.211280	34.220750	Mohalla Khel Baghicha	100	15	Hand Pump	560	Stomach Problem after Drinking
22	72.211660	34.219980	Mohalla Khel Baghicha	80	15	Hand Pump	460	

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GENERALIZED INFORMATION OF EXISTING WELLS/WATER SOURCE

Sr. #	Coordinates		Location					Remarks
	E	N	Location	Depth, ft	Water Level Ft	Type of pump	TDS (ppm)	
23	72.211620	34.220290	Mohalla Khel Baghicha	100	10	Hand Pump	690	
24	72.211650	34.220260	Mohalla Khel Baghicha	120	15	Motor	420	
25	72.247130	34.226940	Ismaila	100	20	Hand Pump	520	
26	72.241603	34.236438	Ismaila	100	20	Hand Pump	490	
27	72.244370	34.231241	Ismaila	100	20	Hand Pump	380	
28	72.246766	34.231425	Ismaila	100	20	Hand Pump	400	
29	72.245583	34.231122	Ismaila	100	20	Hand Pump	360	
30	72.249185	34.233810	Ismaila	100	20	Hand Pump	510	
31	72.230457	34.347628	Ismaila	90	20	Hand Pump	330	
32	72.255005	34.347628	Palo Dheri	90	20	Hand Pump	280	
33	72.145020	34.283690	Bakshali	160		Hand Pump	830	Water has color changed
34	72.208500	34.249150	Kando	80	40	Hand Pump	470	
35	72.202100	34.231030	Shahbaz Garhi	120	30	Submersible	390	
36	72.201450	34.230770	Shahbaz Garhi	120	40	Submersible	230	
37	72.202100	34.231030	Shahbaz Garhi	120	30	Submersible	390	
38	72.201450	34.230770	Shahbaz Garhi	120	40	Submersible	230	
39	72.424000	34.223670	Zandu Dheri	80	30	Submersible	340	
40	72.424000	34.223670	Zandu Dheri	80	30	Submersible	340	
41	72.141190	34.241510	Bala ghari	80	20	Hand Pump	370	
42	72.207050	34.249700	Bala ghari	80	40	Hand Pump	190	Distasteful
43	72.147500	34.221970	Bala ghari	120	20	Hand Pump	330	Iching Issue
44	72.148160	34.221920	Bala ghari	120	20	Hand Pump	490	

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GENERALIZED INFORMATION OF EXISTING WELLS/WATER SOURCE

Sr. #	Coordinates		Location					Remarks
	E	N	Location	Depth, ft	Water Level Ft	Type of pump	TDS (ppm)	
45	72.196310	34.237030	But sari	80	40	Hand Pump	401	
46	72.195410	34.236990	But sari	75	25	Hand Pump	370	
47	72.196600	34.238050	But sari	100	35		330	
48	72.197210	34.238100	But sari	100	25	Submersible	310	Stomach Problem after Drinking
49	72.166810	34.232140	Gohrabad	90	36	Open Well	490	Stomach Problem after Drinking
50	72.226390	34.229100	Goharabad	100	5	Submersible	260	
51	72.226390	34.229100	Goharabad	100	5	Submersible	260	
52	72.166810	34.232140	Gohrabad	90	36	Open Well	490	Stomach Problem after Drinking
53	72.212860	34.239250	Tora panra	130	40	Submersible	190	
54	72.216200	34.237100	Tora panra	100	10	Submersible	310	
55	72.227970	34.227570	Tora panra	120	10	Submersible	260	3008032358
56	72.212860	34.239250	Tora Panra	130	40	Submersible	190	
57	72.216200	34.237100	Tora Panra	100	10	Submersible	310	
58	72.227970	34.227570	Tora Panra	120	10	Submersible	260	
59	72.215080	34.237780	Tora panra	100	12	Hand Pump	320	Stomach Problem after Drinking
60	72.216220	34.237790	Tora panra	90	9	Hand Pump	370	Stomach Problem after Drinking
61	72.216510	34.237860	Tora panra	100	10	Hand Pump	391	
62	72.224620	34.227920	Tora panra	125	10	Hand Pump	360	
63	72.071890	34.211270	Mardan	100		Hand Pump	490	
64	72.064530	34.212160	Mardan	90		Hand Pump	370	
65	72.069360	34.214510	Mardan	100		Hand Pump	450	
66	72.068830	34.218170	Mardan	110		Hand Pump	400	

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GENERALIZED INFORMATION OF EXISTING WELLS/WATER SOURCE

Sr. #	Coordinates		Location					Remarks
	E	N	Location	Depth, ft	Water Level Ft	Type of pump	TDS (ppm)	
67	72.063200	34.221780	Mardan	90		Hand Pump	500	
68	72.091540	34.225570	Mardan	80		Hand Pump	370	
69	72.070320	34.229320	Mardan	200		Hand Pump	290	
70	72.072360	34.236850	Mardan	200		Hand Pump	590	Unfit for Drinking
71	72.748900	34.237550	Mardan	200		Hand Pump	390	
72	72.072180	34.237230	Mardan	200		Hand Pump	430	
73	72.073250	34.239390	Mardan	200		Hand Pump	170	
74	72.078140	34.250060	Mardan	100		Hand Pump	370	
75	72.111560	34.243640	Mardan	100		Hand Pump	290	
76	72.125250	34.255620	Mardan	100		Hand Pump	670	
77	72.143870	34.283150	Mardan	120		Hand Pump	670	
78	72.143860	34.282930	Mardan	100		Hand Pump	320	
79	72.141490	34.283040	Mardan	100		Hand Pump	290	
80	72.137090	34.282880	Mardan	100		Hand Pump	650	
81	72.154570	34.283100	Mardan	130		Hand Pump	390	
82	72.184630	34.298390	Mardan	190		Hand Pump	470	
83	72.185340	34.301310	Mardan	130		Hand Pump	301	
84	72.183760	34.300660	Mardan	100		Hand Pump	230	
85	72.182500	34.302440	Mardan	100		Hand Pump	330	
86	72.228322	34.163800	Dobyan	100		Hand Pump	330	
87	72.231380	34.158670	Dobyan	110		Hand Pump	460	
88	72.230338	34.159134	Dobyan	140		Hand Pump	350	

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GENERALIZED INFORMATION OF EXISTING WELLS/WATER SOURCE

Sr. #	Coordinates		Location					Remarks
	E	N	Location	Depth, ft	Water Level Ft	Type of pump	TDS (ppm)	
89	72.230106	34.157235	Dobyan	190		Hand Pump	470	
90	72.233892	34.161494	Dobyan	110		Hand Pump	570	
91	72.234262	34.162803	Dobyan	120		Hand Pump	670	
92	72.167375	34.181257	Dobyan	100		Hand Pump	370	
93	72.165302	34.190882	Dobyan	100		Hand Pump	400	
94	72.165042	34.193773	Dobyan	170		Hand Pump	290	
95	72.164842	34.194132	Dobyan	100		Hand Pump	300	
96	72.166325	34.200939	Dobyan	110		Hand Pump	270	
97	72.166797	34.194550	Dobyan	110		Hand Pump	600	
98	72.248988	34.174129	Dobyan	100		Hand Pump	160	
99	34.310290	72.216670	Surkh Dheri	130		Hand Pump	310	
100	34.309470	72.218280	Surkh Dheri	120		Hand Pump	450	
101	34.310940	72.221500	Surkh Dheri	160		Hand Pump	390	
102	34.317110	72.237140	Surkh Dheri	100		Hand Pump	430	
103	34.300510	72.223190	Surkh Dheri	100		Hand Pump	400	

GSA

GENERALIZED INFORMATION OF EXISTING WELLS/WATER SOURCE

Sr. #	Coordinates		Location					Remarks
	E	N	Location	Depth, ft	Water Level Ft	Type of pump	TDS (ppm)	
104	34.29770	72.229250	Surkh Dheri	120		Hand Pump	400	
105	34.29695	72.231660	Surkh Dheri	100		Hand Pump	360	
106	34.29762	72.229060	Surkh Dheri	110		Hand Pump	310	
107	34.2031891	72.270630	Surkh Dheri	140		Hand Pump	400	
108	34.1748650	72.273329	Surkh Dheri	140		Hand Pump	310	
109	34.1746451	72.273715	Surkh Dheri	140		Hand Pump	360	
110	34.1753205	72.268045	Surkh Dheri	110		Hand Pump	299	
111	341674808	72.274223	Surkh Dheri	110		Hand Pump	300	
112	34.1613421	72.271246	Surkh Dheri	100		Hand Pump	460	
113	34.1591837	72.267079	Surkh Dheri	100		Hand Pump	400	
114	34.1589426	72.262788	Surkh Dheri	130		Hand Pump	610	
115	34.1579491	72.256509	Surkh Dheri	150		Hand Pump	420	
116	34.1565261	72.258991	Surkh Dheri	150		Hand Pump	400	
117	34.1539947	72.250764	Surkh Dheri	150		Hand Pump	360	
118	34.1520109	72.239301	Surkh Dheri	150		Hand Pump	400	
119	34.1524298	72.230577	Surkh Dheri	150		Hand Pump	390	
120	34.1521909	72.229603	Surkh Dheri	190		Hand Pump	360	
121	34.1526224	72.228916	Surkh Dheri	150		Hand Pump	320	
122	34.1583267	72.228916	Surkh Dheri	150		Hand Pump	455	
123	34.158320	72.230924	Surkh Dheri	120		Hand Pump	490	
124	34.1646118	72.228269	Surkh Dheri	150		Hand Pump	500	

GSA

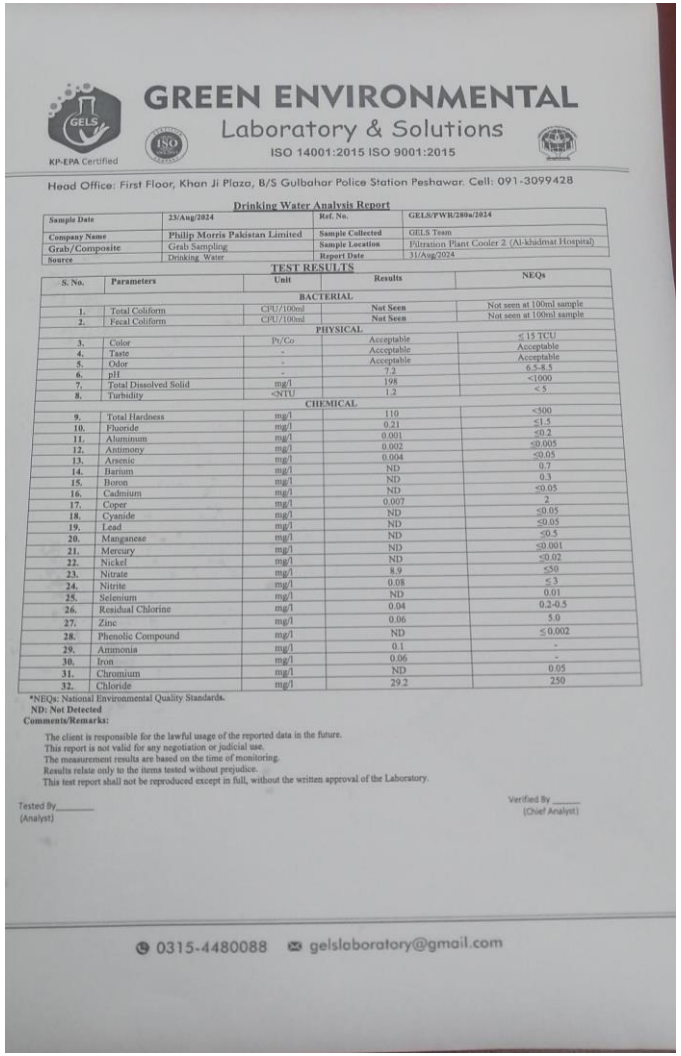
GENERALIZED INFORMATION OF EXISTING WELLS/WATER SOURCE

Sr. #	Coordinates		Location					Remarks
	E	N	Location	Depth, ft	Water Level Ft	Type of pump	TDS (ppm)	
125	34.237225	72.233911	Adina	130		Hand Pump	400	
126	34.24100	72.238840	Adina	130		Hand Pump	510	
127	34.24380	72.245140	Adina	100		Hand Pump	420	
128	34.24013	72.254580	Adina	100		Hand Pump	320	
129	34.23819	72.256600	Adina	120		Hand Pump	520	
130	34.23698	72.259200	Adina	120		Hand Pump	420	
131	34.23675	72.260750	Adina	120		Hand Pump	300	
132	34.23734	72.258640	Adina	120		Hand Pump	400	
133	34.23589	72.257960	Adina	110		Hand Pump	460	
134	34.23442	72.257670	Adina	100		Hand Pump	431	
135	34.23236	72.259120	Adina	100		Hand Pump	360	
136	34.26642	72.259150	Adina	100		Hand Pump	360	
137	34.22400	72.260700	Adina	150		Hand Pump	320	
138	34.22433	72.262120	Adina	180		Hand Pump	450	
139	34.22319	72.265720	Adina	100		Hand Pump	421	
140	34.22176	72.261140	Adina	120		Hand Pump	600	
141	34.21785	72.257140	Adina	120		Hand Pump	290	
142	34.21355	72.252020	Adina	100		Hand Pump	350	
143	34.23101	72.256030	Adina	100		Hand Pump	510	
144	34.21793	72.157840	Adina	100		Hand Pump	350	
145	34.20316	72.086680	Adina	130		Hand Pump	400	
146	34.24437	72.054800	Adina	120		Hand Pump	390	

Appendix - 8 Field Photographs

Water Quality Tests 2024 (Catchment)
Alkhidmat Hospital
Kalpani Nullah (02 sample points)- IWRA
Stepa Canal (02 sample points)- IWRA

Water Quality Tests 2024 (Catchment)
Alkhidmat Hospital



GREEN ENVIRONMENTAL
Laboratory & Solutions
ISO 14001:2015 ISO 9001:2015
KP-EPA Certified

Head Office: First Floor, Khan Ji Plaza, B/S Gulbahar Police Station Peshawar. Cell: 091-3099428

Drinking Water Analysis Report

Sample Date	23/Aug/2024	Ref. No.	GELS/PWR/280a/2024
Company Name	Philip Morris Pakistan Limited	Sample Collected	GELS Team
Grab/Composite	Grab Sampling	Sample Location	Filtration Plant Cooler 2 (Al-khidmat Hospital)
Source	Drinking Water	Report Date	31/Aug/2024

TEST RESULTS

S. No.	Parameters	Unit	Results	NEQs
	BACTERIAL			
1.	Total Coliform	CFU/100ml	Not Seen	Not seen at 100ml sample
2.	Fecal Coliform	CFU/100ml	Not Seen	Not seen at 100ml sample
	PHYSICAL			
3.	Color	Pt/Co	Acceptable	≤ 15 TCU
4.	Taste	-	Acceptable	Acceptable
5.	Odor	-	Acceptable	Acceptable
6.	pH	-	7.2	6.5-8.5
7.	Total Dissolved Solid	mg/l	198	<1000
8.	Turbidity	<NTU	1.2	< 5
	CHEMICAL			
9.	Total Hardness	mg/l	110	<500
10.	Fluoride	mg/l	0.21	≤1.5
11.	Aluminum	mg/l	0.001	≤0.2
12.	Antimony	mg/l	0.002	≤0.005
13.	Arsenic	mg/l	0.004	≤0.05
14.	Barium	mg/l	ND	0.7
15.	Boron	mg/l	ND	0.3
16.	Cadmium	mg/l	ND	≤0.05
17.	Coper	mg/l	0.007	2
18.	Cyanide	mg/l	ND	≤0.05
19.	Lead	mg/l	ND	≤0.05
20.	Manganese	mg/l	ND	≤0.5
21.	Mercury	mg/l	ND	≤0.001
22.	Nickel	mg/l	ND	≤0.02
23.	Nitrate	mg/l	8.9	≤50
24.	Nitrite	mg/l	0.08	≤ 3
25.	Selenium	mg/l	ND	0.01
26.	Residual Chlorine	mg/l	0.04	0.2-0.5
27.	Zinc	mg/l	0.06	5.0
28.	Phenolic Compound	mg/l	ND	≤ 0.002
29.	Ammonia	mg/l	0.1	-
30.	Iron	mg/l	0.06	-
31.	Chromium	mg/l	ND	0.05
32.	Chloride	mg/l	29.2	250

*NEQs: National Environmental Quality Standards.
ND: Not Detected
Comments/Remarks:

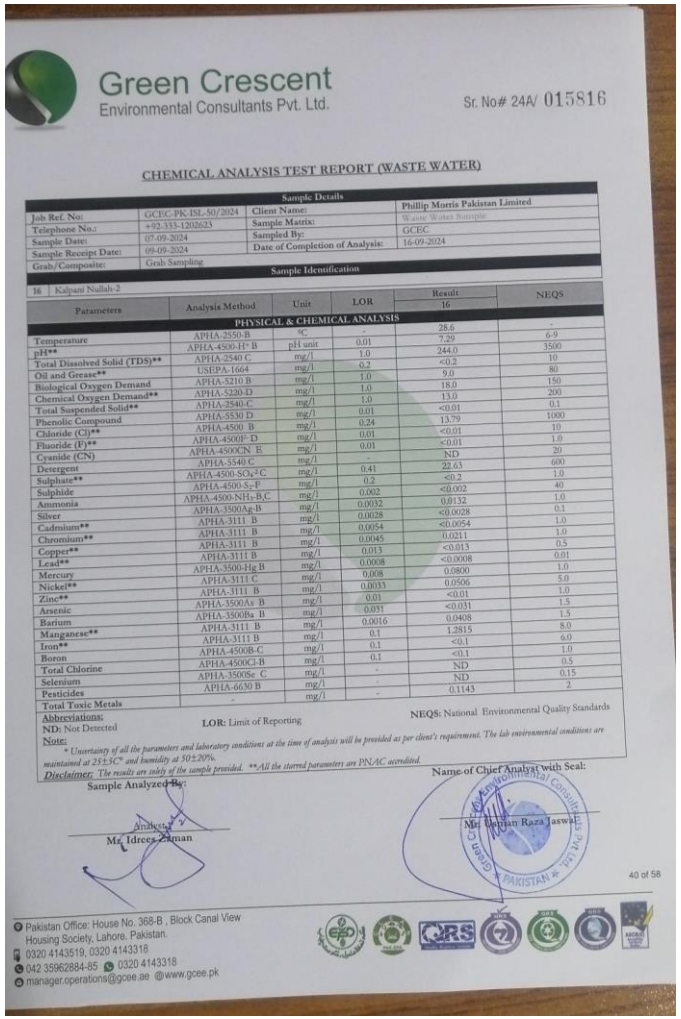
The client is responsible for the lawful usage of the reported data in the future.
This report is not valid for any negotiation or judicial use.
The measurement results are based on the time of monitoring.
Results relate only to the items tested without prejudice.
This test report shall not be reproduced except in full, without the written approval of the Laboratory.

Tested By_____
(Analyst)

Verified By_____
(Chief Analyst)

0315-4480088 gelslaboratory@gmail.com

Water Quality Tests 2024 (Catchment)
Kalpani Nullah (02 sample points)- IWRA



Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 24A/ 015816

CHEMICAL ANALYSIS TEST REPORT (WASTE WATER)

Sample Details			
Job Ref. No:	GCEC-PK-ISL-50/2024	Client Name:	Phillip Morris Pakistan Limited
Telephone No.:	+92-333-1202623	Sample Matrix:	Waste Water Sample
Sample Date:	07-09-2024	Sampled By:	GCEC
Sample Receipt Date:	09-09-2024	Date of Completion of Analysis:	16-09-2024
Grab/Composite:	Grab Sampling		

Sample Identification

16 | Kalpani Nullah-2

Parameters	Analysis Method	Unit	LOR	Result 16	NEQS
PHYSICAL & CHEMICAL ANALYSIS					
Temperature	APHA-2550-B	°C	-	28.6	-
pH**	APHA-4500-H+ B	pH unit	0.01	7.29	6-9
Total Dissolved Solid (TDS)**	APHA-2540 C	mg/l	1.0	244.0	3500
Oil and Grease**	USEPA-1664	mg/l	0.2	<0.2	10
Biological Oxygen Demand	APHA-5210 B	mg/l	1.0	9.0	80
Chemical Oxygen Demand**	APHA-5220-D	mg/l	1.0	13.0	150
Total Suspended Solid**	APHA-2540-C	mg/l	1.0	<0.01	200
Phenolic Compound	APHA-5530 D	mg/l	0.01	13.79	0.1
Chloride (Cl)**	APHA-4500 B	mg/l	0.24	<0.01	1000
Fluoride (F)**	APHA-4500F- D	mg/l	0.01	<0.01	10
Cyanide (CN)	APHA-4500CN E	mg/l	-	ND	1.0
Detergent	APHA-5540 C	mg/l	0.41	22.63	20
Sulphate**	APHA-4500-SO4-2 C	mg/l	0.2	<0.2	600
Sulphide	APHA-4500-S-2 F	mg/l	0.002	<0.002	1.0
Ammonia	APHA-4500-NH3 B,C	mg/l	0.0032	0.0132	40
Silver	APHA-3500Ag-B	mg/l	0.0028	<0.0028	1.0
Cadmium**	APHA-3111 B	mg/l	0.0054	<0.0054	0.1
Chromium**	APHA-3111 B	mg/l	0.0045	0.0211	1.0
Copper**	APHA-3111 B	mg/l	0.013	<0.013	1.0
Lead**	APHA-3111 B	mg/l	0.0008	<0.0008	0.5
Mercury	APHA-3500-Hg B	mg/l	0.0008	0.0800	0.01
Nickel**	APHA-3111 C	mg/l	0.008	0.0506	1.0
Zinc**	APHA-3111 B	mg/l	0.0033	<0.01	5.0
Arsenic	APHA-3500As B	mg/l	0.01	<0.031	1.0
Barium	APHA-3500Ba B	mg/l	0.031	0.0408	1.5
Manganese**	APHA-3111 B	mg/l	0.0016	1.2815	8.0
Iron**	APHA-3111 B	mg/l	0.1	<0.1	6.0
Boron	APHA-4500B-C	mg/l	0.1	<0.1	1.0
Total Chlorine	APHA-4500Cl-B	mg/l	0.1	ND	0.5
Selenium	APHA-3500Se C	mg/l	-	ND	0.15
Pesticides	APHA-6630 B	mg/l	-	ND	2
Total Toxic Metals	-	mg/l	-	0.1143	

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 client's requirement. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%.
Disclaimer: The results are solely of the sample provided. **All the starred parameters are PNAC accredited.

Sample Analyzed By:
Analyst
Mr. Idrees Zaman

Name of Chief Analyst with Seal:
Mr. Usman Raza Jaswal

40 of 58

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
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Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 24A/ 015815

CHEMICAL ANALYSIS TEST REPORT (WASTE WATER)

Sample Details			
Job Ref. No:	GCEC-PK-ISL-50/2024	Client Name:	Phillip Morris Pakistan Limited
Telephone No.:	+92-333-1202623	Sample Matrix:	Waste Water Sample
Sample Date:	07-09-2024	Sampled By:	GCEC
Sample Receipt Date:	09-09-2024	Date of Completion of Analysis:	16-09-2024
Grab/Composite:	Grab Sampling		

Sample Identification

15 | Kalpani Nullah-1

Parameters	Analysis Method	Unit	LOR	Result 15	NEQS
PHYSICAL & CHEMICAL ANALYSIS					
Temperature	APHA-2550-B	°C	-	28.5	-
pH**	APHA-4500-H+ B	pH unit	0.01	7.33	6-9
Total Dissolved Solid (TDS)**	APHA-2540 C	mg/l	1.0	240.0	3500
Oil and Grease**	USEPA-1664	mg/l	0.2	<0.2	10
Biological Oxygen Demand	APHA-5210 B	mg/l	1.0	9.0	80
Chemical Oxygen Demand**	APHA-5220-D	mg/l	1.0	18.0	150
Total Suspended Solid**	APHA-2540-C	mg/l	1.0	16.0	200
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	0.1
Chloride (Cl)**	APHA-4500 B	mg/l	0.24	15.76	1000
Fluoride (F)**	APHA-4500F- D	mg/l	0.01	<0.01	10
Cyanide (CN)	APHA-4500CN E	mg/l	0.01	<0.01	1.0
Detergent	APHA-5540 C	mg/l	-	ND	20
Sulphate**	APHA-4500-SO4-2 C	mg/l	0.41	21.81	600
Sulphide	APHA-4500-S-2 F	mg/l	0.2	<0.2	1.0
Ammonia	APHA-4500-NH3 B,C	mg/l	0.002	<0.002	40
Silver	APHA-3500Ag-B	mg/l	0.0032	<0.0032	1.0
Cadmium**	APHA-3111 B	mg/l	0.0028	<0.0028	0.1
Chromium**	APHA-3111 B	mg/l	0.0054	<0.0054	1.0
Copper**	APHA-3111 B	mg/l	0.0045	0.0160	1.0
Lead**	APHA-3111 B	mg/l	0.013	<0.013	0.5
Mercury	APHA-3500-Hg B	mg/l	0.0008	<0.0008	0.01
Nickel**	APHA-3111 C	mg/l	0.008	0.0707	1.0
Zinc**	APHA-3111 B	mg/l	0.0033	0.0077	5.0
Arsenic	APHA-3500As B	mg/l	0.01	<0.01	1.0
Barium	APHA-3500Ba B	mg/l	0.031	<0.031	1.5
Manganese**	APHA-3111 B	mg/l	0.0016	0.0149	1.5
Iron**	APHA-3111 B	mg/l	0.1	0.1200	8.0
Boron	APHA-4500B-C	mg/l	0.1	<0.1	6.0
Total Chlorine	APHA-4500Cl-B	mg/l	0.1	<0.1	1.0
Selenium	APHA-3500Se C	mg/l	-	ND	0.5
Pesticides	APHA-6630 B	mg/l	-	ND	0.15
Total Toxic Metals	-	mg/l	-	0.0867	2

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 client's requirement. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%.
Disclaimer: The results are solely of the sample provided. **All the starred parameters are PNAC accredited.

Sample Analyzed By:
Analyst
Mr. Idrees Zaman

Name of Chief Analyst with Seal:
Mr. Usman Raza Jaswal

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Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
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Water Quality Tests 2024 (Catchment)
Stepa Canal (02 sample points)- IWRA

Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 24A/ 015814

CHEMICAL ANALYSIS TEST REPORT (WASTE WATER)

Sample Details			
Job Ref. No:	GCEC-PK-ISL-50/2024	Client Name:	Phillip Morris Pakistan Limited
Telephone No.:	+92-333-1202623	Sample Matrix:	Waste Water Sample
Sample Date:	07-09-2024	Sampled By:	GCEC
Sample Receipt Date:	09-09-2024	Date of Completion of Analysis:	16-09-2024
Grab/Composite:	Grab Sampling		

Sample Identification

14 | Stepa Canal-2

Parameters	Analysis Method	Unit	LOR	Result 14	NEQS
PHYSICAL & CHEMICAL ANALYSIS					
Temperature	APHA-2550-B	°C	-	28.6	-
pH**	APHA-4500-H+ B	pH unit	0.01	7.83	6-9
Total Dissolved Solid (TDS)**	APHA-2540 C	mg/l	1.0	6.0	3500
Oil and Grease**	USEPA-1664	mg/l	0.2	<0.2	10
Biological Oxygen Demand	APHA-5210 B	mg/l	1.0	4.0	80
Chemical Oxygen Demand**	APHA-5220-D	mg/l	1.0	8.0	150
Total Suspended Solid**	APHA-2540-C	mg/l	1.0	12.0	200
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	0.1
Chloride (Cl)**	APHA-4500 B	mg/l	0.24	5.91	1000
Fluoride (F)**	APHA-4500F- D	mg/l	0.01	<0.01	10
Cyanide (CN)	APHA-4500CN E	mg/l	0.01	<0.01	1.0
Detergent	APHA-5540 C	mg/l	-	ND	20
Sulphate**	APHA-4500-SO_4^{2-}C	mg/l	0.41	7.82	600
Sulphide	APHA-4500-S_2-F	mg/l	0.2	<0.2	1.0
Ammonia	APHA-4500-NH_3-B,C	mg/l	0.002	<0.002	40
Silver	APHA-3500Ag-B	mg/l	0.0032	<0.0032	1.0
Cadmium**	APHA-3111 B	mg/l	0.0028	<0.0028	0.1
Chromium**	APHA-3111 B	mg/l	0.0054	<0.0054	1.0
Copper**	APHA-3111 B	mg/l	0.0045	0.0161	1.0
Lead**	APHA-3111 B	mg/l	0.013	<0.013	0.5
Mercury	APHA-3500-Hg B	mg/l	0.0008	<0.0008	0.01
Nickel**	APHA-3111 C	mg/l	0.008	0.0477	1.0
Zinc**	APHA-3111 B	mg/l	0.0033	<0.0033	5.0
Arsenic	APHA-3500As B	mg/l	0.01	<0.01	1.0
Barium	APHA-3500Ba B	mg/l	0.031	<0.031	1.5
Manganese**	APHA-3111 B	mg/l	0.0016	0.0076	1.5
Iron**	APHA-3111 B	mg/l	0.1	0.1408	8.0
Boron	APHA-4500B-C	mg/l	0.1	<0.1	6.0
Total Chlorine	APHA-4500Cl-B	mg/l	0.1	<0.1	1.0
Selenium	APHA-3500Se C	mg/l	-	ND	0.5
Pesticides	APHA-6630 B	mg/l	-	ND	0.15
Total Toxic Metals	-	mg/l	-	0.0638	2

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 client's requirement. The lab environmental conditions are maintained at 25±3C° and humidity at 50±20%.*
Disclaimer: *The results are solely of the sample provided. **All the starred parameters are PNAC accredited.*

Sample Analyzed By:
Analyst
Mr. Idrees Zaman

Name of Chief Analyst with Seal:
Mr. Usman Raza Jaswal

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Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
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Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 24A/ 015813

CHEMICAL ANALYSIS TEST REPORT (WASTE WATER)

Sample Details			
Job Ref. No:	GCEC-PK-ISL-50/2024	Client Name:	Phillip Morris Pakistan Limited
Telephone No.:	+92-333-1202623	Sample Matrix:	Waste Water Sample
Sample Date:	07-09-2024	Sampled By:	GCEC
Sample Receipt Date:	09-09-2024	Date of Completion of Analysis:	16-09-2024
Grab/Composite:	Grab Sampling		

Sample Identification

13 | Stepa Canal-1

Parameters	Analysis Method	Unit	LOR	Result 13	NEQS
PHYSICAL & CHEMICAL ANALYSIS					
Temperature	APHA-2550-B	°C	-	28.3	-
pH**	APHA-4500-H+ B	pH unit	0.01	7.98	6-9
Total Dissolved Solid (TDS)**	APHA-2540 C	mg/l	1.0	132.0	3500
Oil and Grease**	USEPA-1664	mg/l	0.2	<0.2	10
Biological Oxygen Demand	APHA-5210 B	mg/l	1.0	7.0	80
Chemical Oxygen Demand**	APHA-5220-D	mg/l	1.0	9.0	150
Total Suspended Solid**	APHA-2540-C	mg/l	1.0	8.0	200
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	0.1
Chloride (Cl)**	APHA-4500 B	mg/l	0.24	5.91	1000
Fluoride (F)**	APHA-4500F- D	mg/l	0.01	<0.01	10
Cyanide (CN)	APHA-4500CN E	mg/l	0.01	<0.01	1.0
Detergent	APHA-5540 C	mg/l	-	ND	20
Sulphate**	APHA-4500-SO_4^{2-}C	mg/l	0.41	12.75	600
Sulphide	APHA-4500-S_2-F	mg/l	0.2	<0.2	1.0
Ammonia	APHA-4500-NH_3-B,C	mg/l	0.002	<0.002	40
Silver	APHA-3500Ag-B	mg/l	0.0032	0.0294	1.0
Cadmium**	APHA-3111 B	mg/l	0.0028	<0.0028	0.1
Chromium**	APHA-3111 B	mg/l	0.0054	<0.0054	1.0
Copper**	APHA-3111 B	mg/l	0.0045	0.0129	1.0
Lead**	APHA-3111 B	mg/l	0.013	0.0324	0.5
Mercury	APHA-3500-Hg B	mg/l	0.0008	<0.0008	0.01
Nickel**	APHA-3111 C	mg/l	0.008	0.0412	1.0
Zinc**	APHA-3111 B	mg/l	0.0033	0.0083	5.0
Arsenic	APHA-3500As B	mg/l	0.01	<0.01	1.0
Barium	APHA-3500Ba B	mg/l	0.031	<0.031	1.5
Manganese**	APHA-3111 B	mg/l	0.0016	0.0251	1.5
Iron**	APHA-3111 B	mg/l	0.1	0.1607	8.0
Boron	APHA-4500B-C	mg/l	0.1	<0.1	6.0
Total Chlorine	APHA-4500Cl-B	mg/l	0.1	<0.1	1.0
Selenium	APHA-3500Se C	mg/l	-	ND	0.5
Pesticides	APHA-6630 B	mg/l	-	ND	0.15
Total Toxic Metals	-	mg/l	-	0.1159	2

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 client's requirement. The lab environmental conditions are maintained at 25±3C° and humidity at 50±20%.*
Disclaimer: *The results are solely of the sample provided. **All the starred parameters are PNAC accredited.*

Sample Analyzed By:
Analyst
Mr. Idrees Zaman

Name of Chief Analyst with Seal:
Mr. Usman Raza Jaswal

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