

FINAL REPORT

**TECHNICAL ASSESSMENT OF WATER INTERVENTIONS
IN PAIKGACHA AND KALAROA PROVIDED BY
WATERAID**

**PAIKGACHA, KHULNA &
KALAROA, SATKHIRA**

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EXECUTIVE SUMMARY

WaterAid Bangladesh (WAB) has been working since 1986 to improve WASH rights for poor and marginalised communities in Bangladesh. Despite the challenges of Arsenic contamination and high salinity groundwater in the south-western coastal belt and significantly lowering the ground water table in most parts of the country, WAB and their partners NABOLOK and Dhaka Ahsania Mission (DAM) have implemented the water interventions at Paikgacha, Khulna named SEHI project and Kalaroa, Satkhira named Amader Kalaroa Project (AKP) under the Small Town Programme.

The SEHI project at Paikgacha has four major categories of water options throughout nine (9) wards: Arsenic and Iron Removal Plant (AIRP), pipe water supply – water point and tap point, Rain Water Harvesting System (RWHS) and tube well platform. This water interventions provide about 50% coverage in the area. There are 5 AIRP at community & 25 AIRP at HH level serving 378 people; 1 RWHS at community, 2 at school & 119 at HH servicing 914 people & 761 students; and 5 TW platform serving 110 people. In addition, a recently installed 3,00,000 L capacity pipe water supply system serving 3,485 people and 2,934 students, respectively.

AKP project at Kalaroa has mostly AIRP (34 units) water options with 2 Sidko and 1 Drink well. All these units are installed to serve either community or institute level throughout 9 wards of the Paurashava. The AKP project gives the safe water coverage to approximately 11, 300 people (including 4,700 students) out of 28,700. This number represents approximately 40% water coverage in the area.

Because of high contamination of arsenic and iron in groundwater, some of these system are operating under challenging conditions. Therefore, a technical assessment adopting both qualitative and quantitative techniques was conducted to identify the issues and concerns for the sustainability of these water supply projects. As part of technical assessment of the water interventions program in both Paikgacha and Kalaroa, the assessment team conducted water sampling program consisting of collection of raw, treated and QA/QC water samples from selected water options as well as conducted a socio-economical questionnaire survey at both project locations.

At SEHI project of Paikgacha, Khulna, treated water samples from most of AIRP units met Bangladesh Standard except sample A-1-6-C (0.075 mg/L) and A-3-1-C (0.075 mg/L) for As and A-4-20-H (1.64 mg/L) for Fe. However, treated water have trace of FC and/or TC whereas raw water are free of FC/TC, which indicates perhaps poor maintenance of the treatment system, cross contamination during washing the filtering media, foreign contamination sources perhaps

faecal droppings from birds and animals. In case of pipe water supply system, raw water of the water treatment plant have high Fe (4.27-5.5 mg/L) with trace of As (0.01-0.02 mg/L); however, treated water samples from all water/tap points met the Bangladesh Standards for both parameters. However, treated water from few water points (P-4-1, P-6-11 and P-7-12) had the presence of TC and/or FC, which indicates source of contamination or cross contamination during water transport through the pipe network. In addition, all water from RWHS met Bangladesh standards except one sample (R-9-3) had trace of FC (4/100 mL). This represent a good performance of RWHS water options despite having potential risk for chemical, physical and microbial contamination (WHO, 2004).

Under SEHI project, the water interventions were established mostly for low income people in the area. The majority (97%) of the water users are married and lowly educated, having average 4 family members in the household and lower monthly income (average Tk. 8500). The users (about 99%) don't need more than 20 L water and collect 1-2 times in a day. However, approximately 54% of users feel that they need more water; whereas, most of them (about 75%) don't stand longer in the queue while collecting water. All users (100%) are satisfied with exiting water interventions and would like to continue such service in future. This reveals that the existing water interventions are capable of supplying the water demand; however, a significant portion of the respondents (54%) would seek higher demand in coming year. A significant portion of water coverage (75%) is by pipe water supply which don't require users' participation for maintenance activity. However, most users (approx. 89%) do not receive any training for maintaining the water interventions. All users (99%) claim that once in a month maintenance with majority (87%) have no difficulties for maintenance works and all (99%) claim that there is almost no water quality test i.e. zero (0) testing frequency. This findings indicate that there a major necessity of improvement of direct users' participation through training and motivation towards user driven water options for sustainable water supply system in the area. The survey result shows these water users have minimum level of education and low income with severe burden situation due to dependent number of family members. However, they are satisfied with the existing water interventions. Currently, they are contributing an average of Tk.35; however, most of the users (90%) would like to pay more for safe drinking water options in future.

At AKP Project of Kalaroa, Satkhira, the raw water of AIRP units have high presence of As (0.075 - 0.09 mg/L) and Fe (3.56-5.45 mg/L); however, all treated water satisfies Bangladesh Standard for Fe despite exceeded for As in few units (T-2-2 (0.08 mg/L), T-2-31 (0.075 mg/L) and T-7-8 (0.075 mg/L)). Both raw and treated water shows microbial contamination (TC and/or FC) which represent perhaps poor maintenance of the system, cross contamination and/or faecal contamination from birds and animals.

The treated water from both the Sidko plants satisfy the requirement of Fe; however, treated water samples (T-8-35/T-8-35A (0.06/0.075 mg/L)) from Sidko in ward 8 exceed the value of As with respect to Bangladesh Standard. In addition, both the treated samples had trace of TC and/or FC. The Drink well's raw water sample exceed the values of As, Fe and TC of Bangladesh Standard. The treated water from the Drink well satisfy both the value of As and Fe; however, it had trace of TC and FC.

Almost similar socio-economic situation, water demand, consumptions and user satisfaction were observed in Kalaroa from the assessment obtained from the questionnaire survey. In this technical assessment, almost similar findings were observed in both projects. Therefore, the following recommendations are applicable for both the projects:

1. The frequency of maintenance for AIRP units need to be increased and the regular monitoring to judge the performance of the system is necessary which will eventually increase water quality testing frequency. This testing can be done using field kits/set up by well-trained water users in the area.
2. Regardless of the water treatment options (e.g. AIRP, Sidko, Drink well, RWHS, pipe water supply etc.), there must be a system/option/unit for disinfection to avoid microbial contamination. A significant amount of disinfection level can be also achieved in some case by using low cost Solar Disinfection Unit.
3. There should be an appropriate program for improving the direct user active participation through training and motivation towards user driven water interventions for sustainable safe drinking water supply. Moreover, the direct monetary contribution of the users can be increased considering the socio-economic aspects.

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ABBREVIATIONS

AIRP	Arsenic Iron Removal Plant
DAM	Dhaka Ahsania Mission
HH	Household
MDG	Millennium Development Goal
NGO	Non-Government Organisation
O&M	Operation and Maintenance
RWHS	Rain Water Harvesting System
SPSS	Statistical Package for Social Science
WAB	WaterAid Bangladesh (WAB)
WASH	Water, sanitation and hygiene
WHO	World Health Organization

1. INTRODUCTION

1.1 Background

WaterAid Bangladesh (WAB), a leading international non-governmental organization (NGO), has been working since 1986 to improve WASH rights for poor and marginalised communities in Bangladesh. WAB collaborates with NGOs, civil society groups, government institutions, academic and research institutes, and different stakeholders to achieve safe drinking water Millennium Development Goal (MDG) for Bangladesh to be reached 89% coverage by 2015. Despite the challenges of Arsenic contaminated and high salinity groundwater in the south-western coastal belt and significantly lowering the ground water table in most parts of the country, WAB and their partners NABOLOK and Dhaka Ahsania Mission (DAM) have implemented the water interventions at Paikgacha, Khulna and Kalaroa, Satkhira under the Small Town Programme.

WAB and NABALOK have started their activities since December 2009 to ensure safe water for the poorest citizens of Paikgacha Paurashava under the Sustainable Environmental Health Initiative (SEHI) Project through installation of several Arsenic and Iron Removal Plant (AIRP), Rain Water Harvesting System (RWHS), Tube Well Platform (TW), and later pipe water supply system. One of the objectives of SEHI project is to establish WASH rights to people who are severely affected with salinity, iron and arsenic contamination drinking water.

In addition, WAB and DAM, under Amader Kalaroa Project (AKP), also have installed 35 AIRP, 2 Sidko plant and 1 Drink Well since June 2012 with the aim of providing sustainable drinking water supply for the people of Kalaroa, Satkhira, one of the highest Arsenic contaminated in areas in Bangladesh (“Amader Kalaroa | Dhaka Ahsania Mission,” 2016).

Currently, these systems, especially the arsenic and iron removal units, are operating under challenging conditions because of high contamination of arsenic and iron. Therefore, a technical assessment including data collection, analyses, review and necessary recommendations is required to identify the issues and concerns for the sustainability of these water supply projects. The purpose of this assessment is to evaluate the performance of these water supply systems located at Paikgacha and Kalaroa municipality and to provide necessary recommendations to ensure the sustainability of these two systems.

1.2 Project Location

- **Paikgacha Municipality of Khulna District:** WAB partnering with NABOLOK has implemented different types of Rain Water Harvesting System (RWHS), Arsenic and Iron removal plants (AIRP) and water supply piping network for last four years. The location of the municipality of Paikgacha is shown in Figure 1.

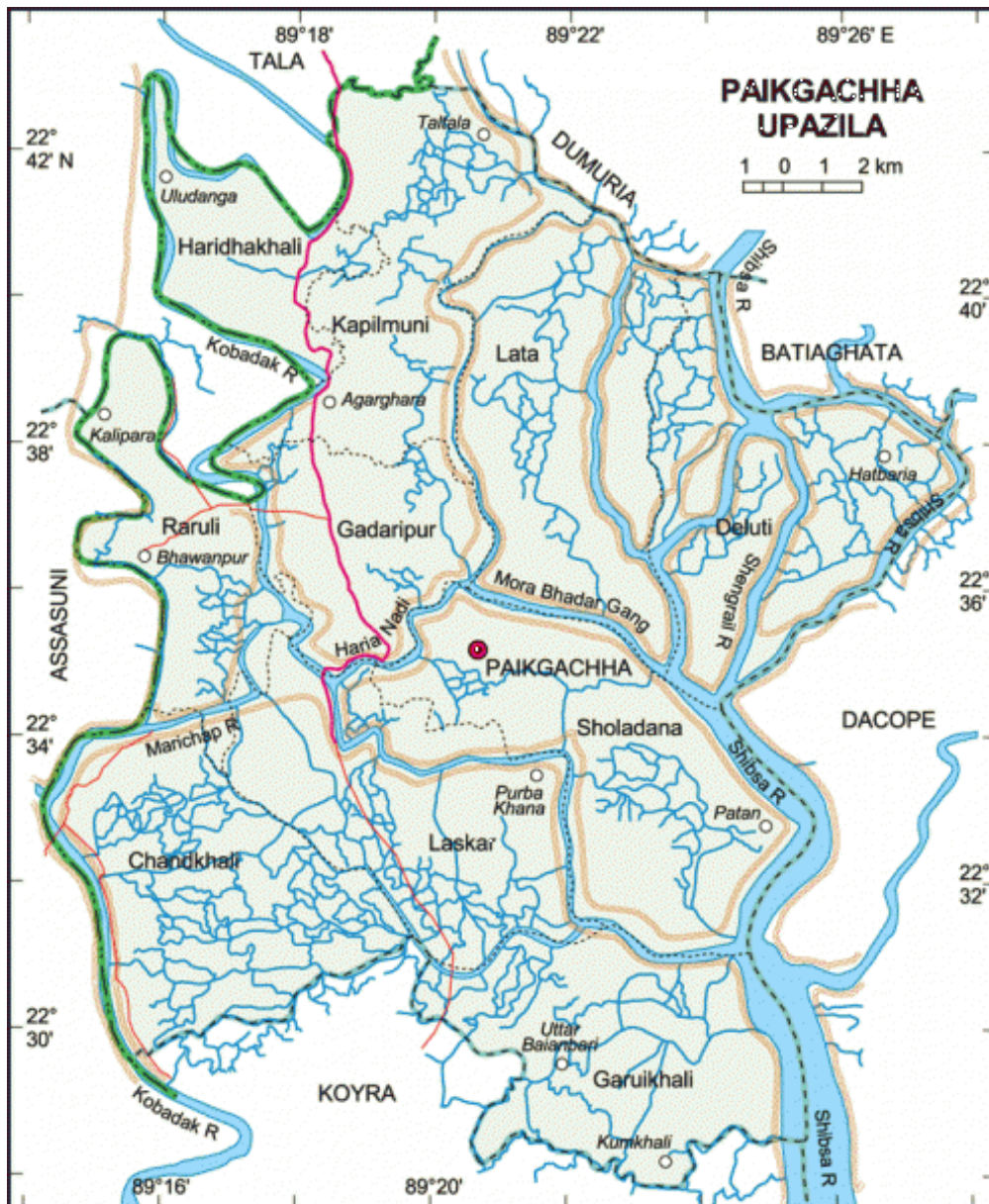


Figure 1: Location Map of Paikgacha, Khulna

Source: ("Paikgacha Upazila HQ - Wikimapia," 2016)

- **Kalaroa Municipality of Satkhira District:** WAB partnering with Dhaka Ahasania Mission (DAM) has also implemented different types of Arsenic and Iron removal

technologies including SIDKO plants for last three years. The location of the municipality of Kalaroa is shown in Figure 2.



Figure 2. Location Map of Kalaroa, Satkhira

(Source: <http://kalaroa.satkhira.gov.bd/>)

1.3 Objectives of the Assessment

The objectives of the technical assessment includes the followings:

- To identify the technical challenges and difficulties of these water supply projects located at Paikgacha and Kalaroa;
- To evaluate the performance of the water treatments technologies used in both locations;
- To evaluate the capacity of these technologies and current consumption rate and safe service life of the interventions;
- To review the consumer demand, source capacity and current supply including the operation and maintenance (O&M) plan and current practices; and
- To collect raw and treated water samples for and conduct necessary laboratory analyses and finally to provide recommendation based on the findings.

1.4 Scope of Work Program

Scope of work including, but not limited to

- Discussions with WaterAid team to understand the assignment, the background and expectations from the study.
- Visit all the safe water technologies provided by WaterAid at Paikgacha and Kalaroa.
- Perform the water quality test of different parameters of raw water and treated water.
- Discussion with management committees and users on consumer demand, consumption, capacity of the technology and regular and periodic operational difficulties, regular and periodic operation and maintenance plan and practices.
- Discussion with local implementing partner on implementing challenges and opportunities about the technologies.
- Regular liaison with contact person of WAB to provide updates on progress.
- Final document incorporating feedback on draft version from WAB.

2. OVERVIEW OF THE WATER INTERVENTIONS PROJECTS

Under Small Town programme, WAB has been supporting Paikgacha municipality of Khulna district and Kalaroa municipality of Satkhira district to ensure safe drinking water for their inhabitants. The details of water interventions in both municipalities are discussed in following sections.

2.1 SEHI Project at Paikgacha, Khulna

Paikgacha is a small municipality of Khulna district located approximately 65 km south-west from the Khulna divisional town. It is approximately 50 km north of Sunderbans, the largest mangrove forests in the world (Centre, 2016). Paikgacha has a total of nine (9) wards with approximately 17,477 residents in the Paurashava. The scarcity of safe and adequate drinking water is one of the big problems of Paikgacha Paurashava area as ground water of most of the areas contains arsenic, saline & excessive iron. WAB with its implementation partner NABOLOK (An Non-government Organization for People's Empowerment) has started the Sustainable Environmental Health Initiative (SEHI) Project activities from December 2009 with the aim to ensure good governance and to fulfill the safe water and sanitation needs of the poorest inhabitants under Paikgacha Paurashava area ("NABOLOK Annual Report," 2012).

WAB and NABOLOK have installed several Arsenic and Iron Removal Plant (AIRP), Rain Water Harvesting System (RWHS), Tube Well Platform (TW), and later pipe water supply through water point (WP) and tap point (TP) throughout nine (9) wards of the paurashava. The summary of the water intervention is presented in Table 1:

Table 1: Summary of Water Interventions at Paikgacha, Khulna

	Household			Community			Institution (School)		
	Units	HH	User	Units	HH	User	Units	HH	User
Pipe Water Supply - Water Point (WP)	-	-	-	33	1099	2486	3	-	2646
Pipe Water Supply - Tap Point (TP)	-	-	-	48	265	999	1	-	288
Arsenic Iron Removal Plant (AIRP)	25	25	108	5	69	270	-	-	-
Rain Water Harvesting System (RWHS)	119	119	546	1	14	368	2	-	761
Tube Well Platform (TW)	-	-	-	5	24	110	-	-	-
Mobile Van Water	-	-	-	2			-	-	-
Total Water Interventions Options	144	144	654	94	1471	4233	6	0	3695

N.B.: HH- House Hold

The details water interventions at Paikgacha under SEHI Project is shown in Appendix A.

2.1.1 Arsenic Iron Removal Plant

Under SEHI project 5 arsenic iron removal plant (AIRP) at community level & 25 AIRP at HH level have installed by covering 378 community people. The details of AIRP units in different ward are presented in Appendix A.

2.1.2 Rain Water Harvesting System (RWHS)

WAB and NABOLOK also installed one (1) RWHS at community level, 2 at school level & 119 at household (HH) level by covering 914 community people & 761 students. The details of RWHS units in different ward are presented in Appendix A.

2.1.3 Pipe Water Supply System

WAB, NABOLOK, Rural Development Academy (RDA) and Paikgacha Paurashava have jointly installed the pipe water supply system in recent year. The water treatment plant has two (2) reservoirs each 1,00,000 L (i.e. 100m³) capacity. The treatment plant supplies approximately 3,00,000 L of water per day through its pipe network. Under this piping network system, there are approximately 33 water points (WP) and 48 tap points (TPs) in community level; and 3 WPs and 1 TP in institutional level servicing a total of 3,485 community people and 2,934 students, respectively. The details of WPs and TPs under pipe water supply system in different ward are presented in Appendix A.

2.2 Amader Kalaroa Project (AKP) at Kalaroa, Satkhira

Kalaroa is a small coastal town designated as a B category Pourashava which a home of 28,645 people, among whom most of them endure intense poverty along with the water and sanitation problems. This is one of the highest Arsenic contaminated urban areas in the country (“Amader Kalaroa | Dhaka Ahsania Mission,” 2016).

WAB with its implementation partner Dhaka Ahsania Mission (DAM) has installed 24 Arsenic Iron Removal Plants (AIRP), 2 Sidko Plant and 1 Drink Well System in community level; and 10 AIRP in institution level for water supply under a project named Amader Kalaroa (WASH in small towns). This water interventions represent approximately 40% safe water supply coverage throughout nine (9) ward of the Pourashava area. The main objective of the project is to establish a sustainable service delivery model to increase access to WASH facilities of the people of Kalaroa. The summary of the water intervention by WAB and DAM is presented in Table 2:

Table 2: Summary of Water Interventions at Kalaroa, Satkhira

	Household			Community			Institution (School)		
	Units	HH	User	Units	HH	User	Units	HH	Student
Arsenic Iron Removal Plant (AIRP)	-	-	-	24	1814	7406	10	-	4695
Sidko Plant	-	-	-	2	438	2680	-	-	-
Drink Well System	-	-	-	1	230	1178	-	-	-
Total Water Interventions Options	-	-	-	27	2482	11264	10	-	4695

N.B.: HH- House Hold

The details water interventions at Kalaroa under Amader Kalaroa Project is shown in Appendix B.

2.2.1 Arsenic Iron Removal Plant (AIRP)

A total of 24 AIRP units have been installed between June 2013 and October 2015 to serve 1,814 household (i.e. 7,406 users). Ten (10) AIRP units also are serving approximately 4,695 student of 10 schools located in ward 1, 2, 3, 5, 6 and 8. The details of AIRP units in different ward are presented in Appendix B.

2.2.2 Sidko Plant

Recently, one (1) Sidko plant in ward 3 (March 2015) and one (1) Sidko plant in 8 (March 2014) have been installed to serve 438 household (i.e. 2,680 users). The details of Sidko plant in ward 3 and 8 are presented in Appendix B.

2.2.3 Drink Wells

A Drink Well has been mounted in word 9 on December 2015 to serve approximately 1,178 users of 230 household. The details of Drink Wells in ward 9 is presented in Appendix B.

3. METHODOLOGY OF THE ASSESSMENT

3.1 Study Approach

This technical assessment is conducted adopting both qualitative and quantitative techniques. Interviewing with project key personnel, community survey focus on direct individual user and management personnel, and reviewing available project documents, annual, periodical monitoring and evaluation reports were conducted to generate qualitative information. In addition, physical observations of projects activities including water sampling for water quality parameter analysis (during field visits) were conducted to obtain quantitative information of project. Information received from WAB and its partners (i.e. DAM for Kalaroa project and NABOLOK for Paikgacha project) were triangulated during the field visit and review of documents.

3.2 Study Design

The following activities were conducted in order to generate relevant information for meeting the objectives of this assessment:

Initial Meetings and Phone Interview: In order to achieve the objectives of the assessment, an initial meeting and interviews over telephone were conducted with WAB's key project personnel, WAB technical advisor, project personnel of DAM for Kalaroa and key personnel of NABOLOK for Paikgacha for in-depth understanding about project goals, project area, its objective and activities. During the process, the schedule for the field visit was prepared.

Review of Relevant documents: Project documents, annual, monitoring and evaluation reports, water quality analysis data for both projects were collected and reviewed. In addition to this, relevant websites were visited for information collection in regards to this evaluation assignment.

Planning for Field visit: Based on the available time and water interventions in both projects, the team decided to visit each project located on separate dates on March 10, 2016 for Kalaroa, Satkhira and March 12, 2016 for Paikgacha, Khulna. The field schedule was prepared in close coordination with WAB, DAM and NABOLOK personnel.

Checklist/Questionnaire Preparation: The evaluation team had developed questionnaires to be asked to direct beneficiaries (i.e. users) of the schemes/projects and management personnel to gather the information for assessment of these water interventions. A questionnaire is presented in Appendix C.

Field Visit: The field visit was conducted on March 10, 2016 at Kalaroa, Satkhira and March 12, 2016 at Paikgacha, Khulna for physical observation, water samples collection from

selected water options and survey work program. The team was divided into groups at each project sites depending on the work program. The details of the work program is discussed in the following sections.

Meeting with WAB's Partners: Prior to starting the field work, meetings were carried out with WAB partners DAM and NABOLOK at their project office on March 10th and 12th, 2016 respectively. In these meetings, information regarding details water interventions options, project goal, current status, planning and strategy of organization, operation and maintenance information were gathered. At the same time findings of initial literature review was shared with partner organization.

The activities involved in the technical assessment are presented in the following chart sequentially as shown in Figure 3.

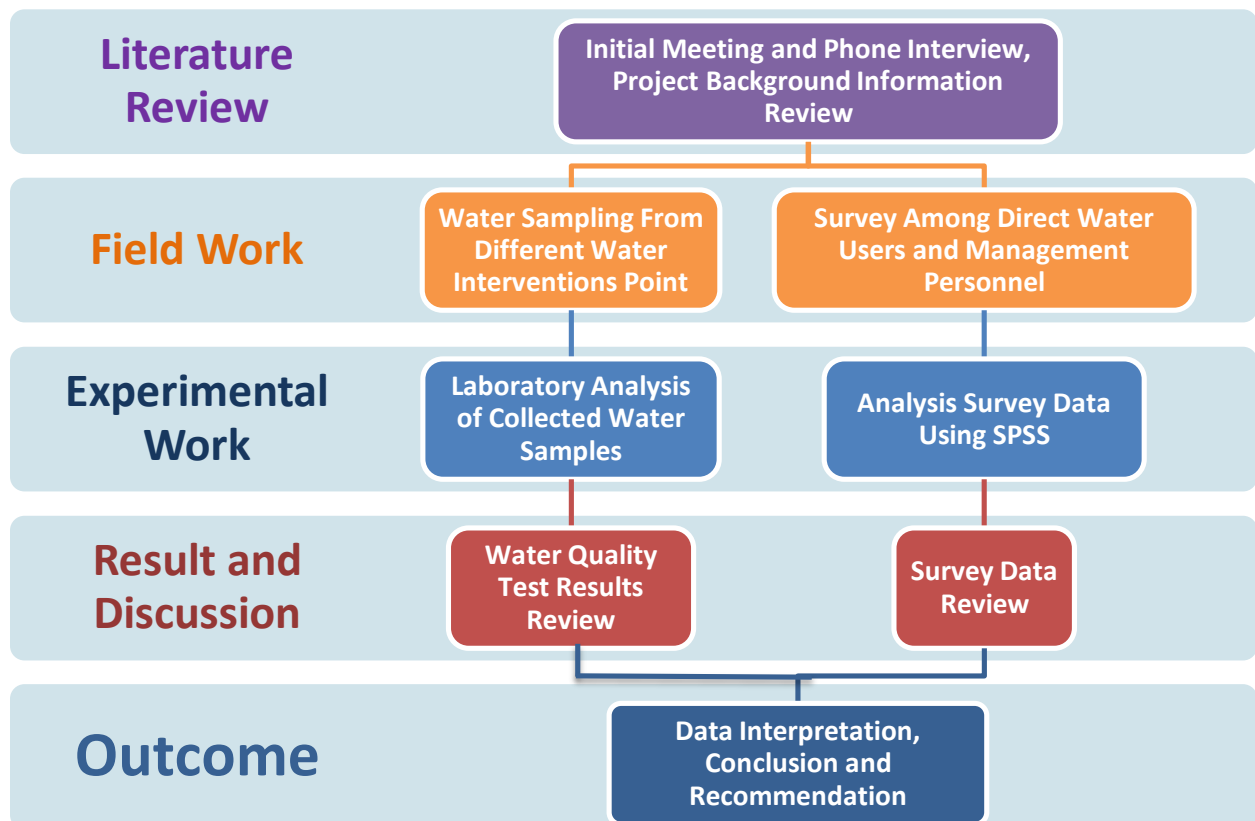


Figure 3: Flowchart Showing the Sequential Steps of the Technical Assessment

3.3 Water Quality Assessment

Water sampling program consisting of selected raw and treated water samples from different water interventions options from both Paikgacha and Kalaroa projects was conducted to meet the objectives of this technical assessment. The details of sampling program is discussed in the following sections.

3.3.1 Water Sampling Programme

3.3.1.1 Paikgacha Project

Based on review of number of different water options at Paikgacha, a water sampling program was developed consisting of raw, treated and QA/QC samples as shown in Table 3. Selected water samples were collected from different water interventions options (e.g. AIRP, pipe water supply – water point and tap point, RWHS, tube well platform etc.) on March 12, 2016 during the field visit. Collected water samples were submitted for laboratory analysis of pH, arsenic (As), iron (Fe), faecal coliform (FC) and/or total coliform (TC); and in some cases for turbidity (Tur) and electrical conductivity (EC). As QA/QC measures, two (2) field duplicate samples were also submitted for laboratory analysis. Water samples submitted for laboratory analysis were collected in the field following designed protocols discussed in QA/QC sections.

Table 3: Water Sampling Program at Paikgacha, Khulna

Ward No.	Type of Water Option	Level	No of Water Samples			Water Quality Parameter Analysis	Total Water Samples	Remarks
			Treated Water	Raw Water	QA/QC			
1, 2, 3, 4 & 6	Arsenic Iron Removal Plant (AIRP)	Community & Household	20	2	1	pH, As, Fe, TC, FC	23	1 Field Dup.
3, 4, 5, 6, 7, 8 & 9	Pipe Water Supply - Water Point & Tap Point	Community & Institute	20	2	1	pH, As, Fe, TC, FC	23	1 Field Dup.
2, 3, 4, 5, 6, 7 & 9	Rain Water Harvesting System (RWHS)	Community, Institute &	14	-	-	pH, As, Fe, TC, FC, Tur, EC	14	-
3 & 4	Tube Well Platform	Community	2	-	-	pH, As, Fe, TC, FC	2	-
Total			56	4	2		62	

- Not Sampled

3.3.1.2 Kalaroa Project

Based on review of different water options at Kalaroa, a water sampling program was developed consisting of raw, treated and QA/QC samples as showing in Table 4. Selected water samples were collected from different water interventions options (e.g. AIRP, Sidko, Drink well) on March 10, 2016. Collected water samples were then submitted for laboratory analysis of pH, arsenic (As), iron (Fe), faecal coliform (FC) and/or total coliform (TC). As QA/QC measures, two (2) field duplicate samples were also submitted for laboratory analysis.

Water samples submitted for laboratory analysis were collected in the field following designed protocols discussed in QA/QC sections.

Table 4: Water Sampling Program at Kalaroa, Satkhira

Ward No.	Type of Water Option	Total Water Options	No of Water Samples			Water Quality Parameter Analysis	Total Water Samples	Remarks
			Treated Water	Raw Water	QA/QC			
1	AIRP	4	2	1	1	pH, As, Fe, TC, FC	4	1 Lab Dup.
2	AIRP	5	3	1	-	pH, As, Fe, TC, FC	4	-
3	AIRP (4) & Sidko (1)	5	4	1	-	pH, As, Fe, TC, FC	5	-
4	AIRP	3	2	-	-	pH, As, Fe, TC, FC	2	-
5	AIRP	7	5	1	-	pH, As, Fe, TC, FC	6	-
6	AIRP	5	3	1	1	pH, As, Fe, TC, FC	5	1 Field Dup.
7	AIRP	2	1	-	-	pH, As, Fe, TC, FC	1	-
8	AIRP (2) & Sidko (1)	3	1	1	1	pH, As, Fe, TC, FC	3	1 Field Dup.
9	AIRP (2) & Drink Well (1)	3	3	1	-	pH, As, Fe, TC, FC	4	-
Total		37	24	7	3		34	

- Not Sampled

3.3.2 GPS Locations

During the water sampling program, water point GPS coordinates were collected for most locations at Kalaroa; however, GPS coordinates of only RWHS points were collected at Paikgacha. NABOLOK and DAM also provided the available GPS coordinates of remaining water points from their project database.

3.3.3 Analytical Testing

Collected water samples were analysed for the evaluation of pH, As, Fe, FC and/or TC parameters; and in some cases for turbidity and EC in the environmental engineering laboratory of the department of Civil Engineering, KUET campus. The laboratory experiments were conducted following Standard Methods for the Examination of Water and Wastewater. One (1) laboratory duplicate sample was also analysed for selected water quality parameters for Quality Assurance/Quality Control (QA/QC) measures.

3.3.4 Quality Assurance/Quality Control Measures

As Quality Assurance/Quality Control (QA/QC) measures, field duplicate sample from selected water samples was submitted for laboratory analysis of water quality parameters. Samples submitted for laboratory analysis were collected in the field following protocols designed to minimize the loss and/or change of concern constituents. Samples were placed in coolers containing ice and delivered to environmental engineering laboratory of the department of Civil Engineering, KUET by technical assessment team.

3.4 Social Evaluation of Water Interventions

3.4.1 Questionnaire Survey

This technical assessment used a combination of both quantitative and qualitative methods. A descriptive community-based cross sectional study design complemented by direct water users' survey and field observation of both Paikgacha and Kalaroa was conducted.

A pre-tested, structured questionnaire was prepared according to the objectives of the technical assessment. The questionnaire was prepared to gather the information of the socioeconomic status of the respondents (i.e. user), demand responsiveness and sustainability factors of the water interventions in the area, type of participation of beneficiaries, issues of cost sharing and recovery, community training and awareness creation, level of consumer satisfaction, physical condition of the water supply points, willingness of the beneficiaries for more contribution towards sustaining the system, and repair and maintenance issues for the water interventions. A structured questionnaire form is presented in Appendix C.

3.4.1.1 Sample Population at Paikgacha, Khulna

According to SEHI project water coverage information, approximately 8,600 users including 4,350 school/institutional users have water supply coverage through AIRP, pipe water supply, RWHS, tube well platform etc. in Paikgacha Paurashava. Since the beneficiaries are the main primary data sources in this survey; therefore, a sample population of 260 users was considered representing this water coverage users with 95% confidence level with a $\pm 6\%$ confidence interval. This estimated sample population were proportionally distributed based on percentage coverage among nine (9) wards in survey area. A total of 270 water users including management personnel were surveyed using the structured questionnaire on March 12, 2016 using different water interventions (e.g. AIRP, pipe water supply, RWHS, tube well platform etc.).

3.4.1.2 Samples Population at Kalaroa, Satkhira

As beneficiaries are the main primary data sources in this assessment; therefore, the survey samples population was determined based on initial information provided by DAM for Kalaroa project. According to project information, approximately 16,000 water users including 4,700 students of 10 schools in the area are taken under water interventions coverage by Amader Kalaroa Project. Therefore, a sample population of 262 users was considered representing this water users with 95% confidence level with a $\pm 6\%$ confidence interval. This estimated sample population were proportionally distributed based on percentage coverage among nine (9) wards in Kalaroa paurashava. A total of 273 water users including management personnel

were surveyed using the structured questionnaire on March 10, 2016 using different water interventions (e.g. AIRP, sidko plant, Drink Well etc.).

3.4.2 Method Used for Survey Data Analysis

Descriptive statistics based on percentages and ratios were used to analyze the findings. Qualitative data collected from water users/beneficiaries and management personnel using structured questionnaire interviews and discussions was entered and analyzed in Statistical Package for Social Science (SPSS) to determine descriptive statistics for the study.

4. RESULTS AND DISCUSSIONS

As part of technical assessment of the water interventions program in both Paikgacha and Kalaroa, the assessment team conducted water sampling program consisting of collection of raw, treated and QA/QC water samples from selected water options as well as conducted a socio-economical questionnaire survey at both project locations. The results and findings of this assessment are discussed in the following sections.

4.1 SEHI Project at Paikgacha, Khulna

4.1.1 Water Quality Assessment

As mentioned above, the SEHI project at Paikgacha has four major categories of water options: AIRP, pipe water supply – water point and tap point, RWHS and tube well platform. A total of 56 treated, 4 raw and 2 QA/QC water samples collected and analysed from these four water supply categories are discussed below. Appendix D present the results of water samples submitted for laboratory analysis. The results of the water samples were also compared with WHO drinking-water quality guidelines (“Department of Public Health Engineering (DPHE),” 2016; WHO, 2004) and Bangladesh Standard for Drinking Water (“Department of Public Health Engineering (DPHE),” 2016). The WHO guidelines and Bangladesh standards are also provided for comparison.

4.1.1.1 Arsenic Iron Removal Plant (AIRP)

Twenty (20) treated, 2 raw and 1 QA/QC samples were analysed for selected water quality parameters and compared with WHO guideline and Bangladesh Standards (BD Std.). The results of the water samples are presented in Appendix D. Treated water samples from most of water options met Bangladesh Standard except sample A-1-6-C (0.075 mg/L) and A-3-1-C (0.075 mg/L) for As and A-4-20-H (1.64 mg/L) for Fe. However, most of the treated water samples exceeded faecal coliform (FC) and total coliform (TC) standards.

Whereas, both raw water samples (A-1-9-C-Raw and A-1-2-H-Raw) satisfy the value of TC and FC of Bangladesh standards despite exceeding As or Fe parameters.

This indicates that poor maintenance of the treatment system, cross contamination during washing the filtering media, foreign contamination sources perhaps faecal droppings from birds and animals.

4.1.1.2 Pipe Water Supply – Water Point and Tape Point

A total twenty (20) treated and 1 QA/QC samples were collected from different water/tap points and analysed for water quality parameters. In addition, two (2) raw water samples were also

analysed from raw water collected at the water treatment plant. The results of the water samples are presented in Appendix D.

Raw water samples (P-3-1-R and P-3-1-A-R) from the water treatment plant exceeded Fe parameters of Bangladesh Standard with trace amount of As (sample P-3-1-R was 0.01 mg/L and P-3-1-A-R was 0.02 mg/L, respectively).

Treated water samples from all water/tap points met the Bangladesh Standards for As and Fe; however, three samples (P-4-1, P-6-11 and P-7-12) had presence of TC and/or FC, which indicates source of contamination or cross contamination during water transport through the pipe network.

These results indicate an overall good performance of pipe water supply system.

4.1.1.3 Rain Water Harvesting System

Fourteen (14) water samples from different RWHS units were collected and analysed for selected water parameters. The results of the water samples are presented in Appendix D. All water samples met selected water quality parameters for Bangladesh standards except one sample (R-9-3) had trace of FC (4/100 mL). This represent a good performance of RWHS water options despite having potential risk for chemical, physical and microbial contamination (WHO, 2004).

4.1.1.4 QA/QC Results

The results of QA/QC water samples and RPD calculations for the field duplicate water sample are provided in Appendix D. Analytical results for the field duplicate water samples showed good correlation with their corresponding analytical pairs. Results of QA/QC analyses of water samples suggest that field sampling/handling and laboratory analytical protocols were acceptable.

4.1.2 Evaluation of Questionnaire Survey

4.1.2.1 Water Interventions Coverage

WAB and NABOLOK have provided water coverage to approximately 8,700 residents (including 2,900 students at schools) out of 17,500, which represent approximately 50% safe water coverage in the Paurashava. However, this number drops to 30% if student are excluded. The questionnaire survey was conducted focusing on the proportion of water options coverage as shown in the Figure 4. The Summary of Questionnaire Survey Data at

Paikgacha is presented in Appendix E. The survey covered 97% water users and 3% management personnel. The respondents were mostly male 77% versus 23% female.

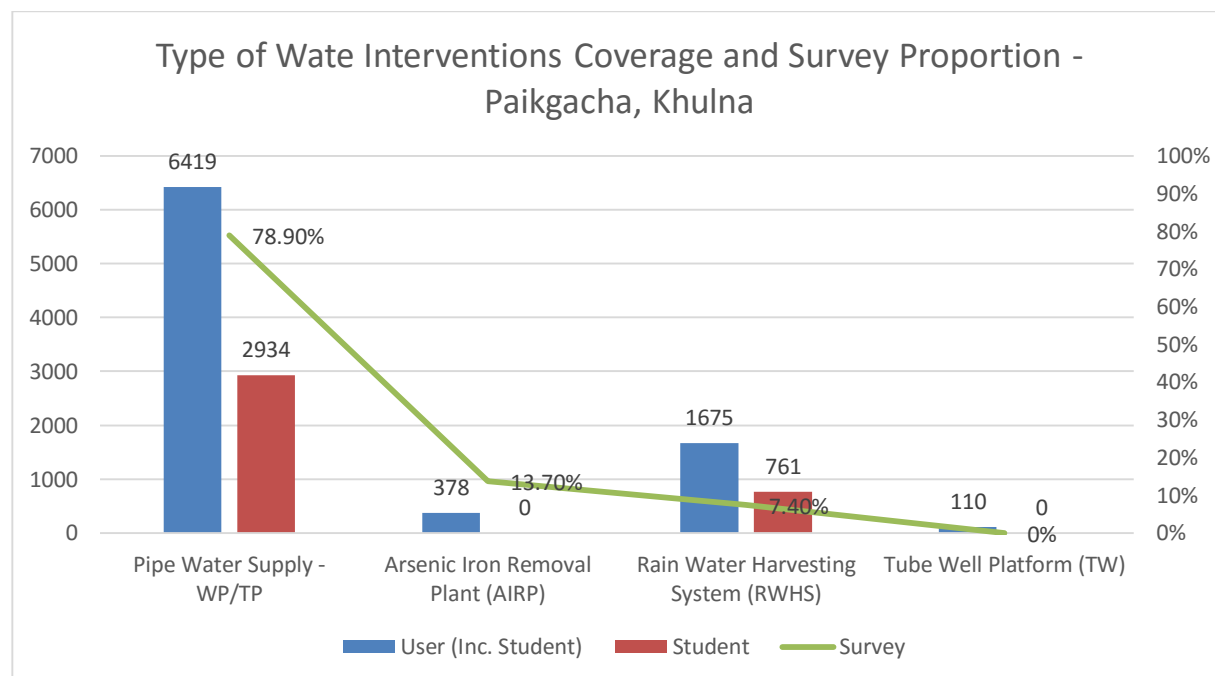


Figure 4: Type of Water Interventions Coverage and Survey Proportion - Paikgacha

4.1.2.2 Socio-Economic Status of Beneficiaries

Paikgacha has total 9 wards. The survey was conducted among ward 1, 4, 5 to 9 based on the proportion of water coverage. The majority (97%) of the respondents were married with average 4 family members in the household. The respondents are within minimum education level (i.e. illiterate: 51%, primary: 9%, junior secondary: 14%) having an average monthly income of about Tk. 8500 (std. dev. Tk. 5850). Approximately 26% of them are involved in business and most (48%) are involved in diversified profession for living. The average age was 35 years.

4.1.2.3 Water Consumption, Demand and Satisfaction

About 99% of water users need less than 20 litre water and collect 1-2 times in a day from water interventions. Approximately 54% of respondents feel that they need more water; however, they (about 75%) don't have to stay in the queue for long time while collecting water from water options. All water users (100%) are satisfied with exiting water interventions and would like to continue in future.

The above information indicates that the existing water options are mostly capable of supplying the user demand; however, a significant portion (54%) of the respondents would seek higher demand in coming year.

4.1.2.4 *Operation and Maintenance*

A higher percentage (89%) of water user did not receive any training for maintaining the water interventions they are using. The significant portion (75%) of water coverage is by pipe water supply which don't require user's participation for maintenance activity. This survey data coincident with this information. All respondents (99%) also claim once in a month maintenance frequency with majority (87%) have not difficulties during maintenance and all (99%) claim zero (0) frequency for water quality testing.

The survey results indicate a major necessity of improvement of direct user participation though training and motivation towards user driven water options for sustainable water supply system in the area.

4.1.2.5 *Financial Evaluation*

The water interventions were established mostly for low income residents in the area. The survey result shows these water users are having minimum education and low income with significant burden (4 members in the family) situation. However, they are satisfied with the existing water interventions. Currently, they are contributing average Tk. 35 (std. dev. Tk. 100); however, most (90%) of the user would like to pay more for safe drinking water options in future.

4.2 Amader Kalaroa Project (AKP) at Kalaroa, Satkhira

AKP project at Kalaroa has mostly AIRP (34 units) water options with 2 Sidko and 1 Drink well. All these units are installed to serve either community or institute level. A total of 24 treated, 7 raw and 3 QA/QC water samples collected from selected water options and analysed for drinking water quality assessment. Appendix E present the results of water samples submitted for laboratory analysis. The analytical results were compared with WHO drinking-water quality guidelines (“Department of Public Health Engineering (DPHE),” 2016; WHO, 2004) and Bangladesh Standard for Drinking Water (“Department of Public Health Engineering (DPHE),” 2016). The WHO guidelines and Bangladesh standards are also provided for comparison.

4.2.1 Water Quality Assessment

4.2.1.1 Arsenic Iron Removal Plant (AIRP)

Twenty one (21) treated, four (4) raw and one (1) QA/QC samples were collected from selected AIRP units located in ward 1 to 8 and 9. These samples were then analysed for selected water quality parameters and compared with WHO guideline and Bangladesh Standards for Drinking Water. The results of the water samples are presented in Appendix F.

Three (3) out of four (4) raw water samples (R-1-1, R-2-17, R-6-32) exceeded As (0.075, 0.09 and 0.075 mg/L, respectively) and Fe (3.56, 5.18 and 5.45 mg/L, respectively) of Bangladesh Standards. These exceeded raw water samples were collected from ward 1, 2 and 6. This finding represents high concentration of As and Fe in groundwater source in Kalaroa area. There were trace of TC and FC in raw water samples which represent perhaps poor maintenance of the system, cross contamination and/or faecal contamination from birds and animals.

All treated water samples met Bangladesh Standard for Fe; however, As contamination was observed in only three samples T-2-2 (0.08 mg/L), T-2-31 (0.075 mg/L) and T-7-8 (0.075 mg/L). In addition, most of treated samples had trace of TC and FC.

4.2.1.2 Sidko Plant

Two (2) treated, two (2) raw and one (1) QA/QC samples were collected and analysed for two Sidko plant located in ward 3 and 8. The water sample results are presented in Appendix F.

The treated water from both Sidko plant met the Fe; however, treated water samples (T-8-35/T-8-35A (0.06/0.075 mg/L)) from Sidko located in ward 8 exceed As of Bangladesh Standard. In addition, both treated samples had trace of TC and/or FC.

4.2.1.3 *Drink Well System*

One (1) treated and one (1) raw water sample were collected and analysed from Drink Well system located in ward 9. The water sample results are presented in Appendix F.

The raw water sample exceed As, Fe and TC of Bangladesh Standard. The treated water from the Drink Well met both As and Fe; however, it had trace of TC and FC.

4.2.1.4 *QA/QC Results*

The results of QA/QC water samples and RPD calculations for the field duplicate water sample are provided in Appendix F. Analytical results for the laboratory and field duplicate water samples showed good correlation with their corresponding analytical pairs except the RPD of T-6-30A (i.e. field duplicate of T-6-30) was 86% which exceeded alert limit. This is perhaps due to the sample heterogeneity with respect to total coliform (TC) count in water samples. Results of QA/QC analyses of water samples suggest that field sampling/handling and laboratory analytical protocols were acceptable.

4.2.2 Evaluation of Questionnaire Survey

4.2.2.1 *Water Interventions Coverage*

WAB and DAM have installed 34 AIRP, 2 Sidko and 1 Drink well to provide safe water coverage to approximately 11,300 residents (including 4,700 students for schools) out of 28,700, which represent approximately 40% safe water coverage in the area. This number drops to 22% if student are excluded. The questionnaire survey was conducted focusing on the proportion of water options coverage as shown in the Figure 5. The summary of survey data at Kalaroa is presented in Appendix G. The survey covered 98% users and 2% management personnel. The respondents were 57% male and 43% female.

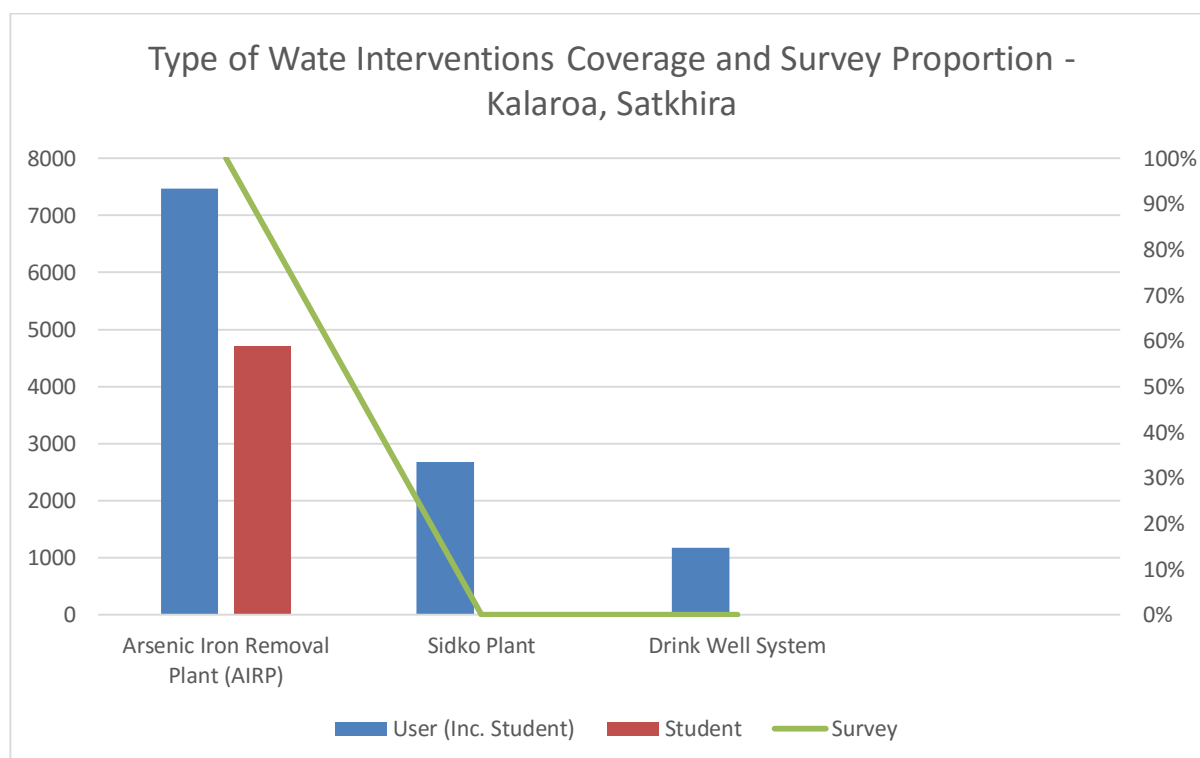


Figure 5: Type of Water Interventions Coverage and Survey Proportion – Kalaroa

4.2.2.2 Socio-Economic Status of Beneficiaries

There are 9 wards in Kalaroa. The survey was conducted among all wards based on the proportion of water coverage. The majority (96%) of the respondents were married with average 4 family members in the household. The residents of Kalaroa are within minimum education level (i.e. illiterate: 32%, primary: 15%, junior secondary: 21%) having an average monthly income of about Tk. 10,200 (std. dev. Tk. 6,650). Approximately 21% of them are involved in business; 22% are farmer; and a significant portion (38%) are involved in varied profession for living. The average age was 39 years.

4.2.2.3 Water Consumption, Demand and Satisfaction

All (100%) users need less than 20 litre water and collect 1-2 times in a day from water interventions. Approximately 52% of respondents feel that they need more water; however, 49% don't line stand for long time in the queue while collecting water from water options. All water users (100%) are satisfied with exiting water interventions and would like to continue in future.

This survey results indicates that the existing water interventions are capable of meeting the consumer demand; however, about half (52%) of water user would urge more water in coming year.

4.2.2.4 Operation and Maintenance

A higher percentage (78%) of water user did not receive any training for maintaining the water interventions. All users claim once in a month maintenance frequency with majority (93%) have not difficulties during maintenance. However, all claim zero (0) frequency per month for water quality testing.

This finding represents a higher urgency of improving user participation though training and motivation towards user driven water interventions for sustainable water options in the area.

4.2.2.5 Financial Evaluation

The water interventions at Kalaroa under AKP were started focusing the low income people in the area. The survey result shows these water users are lowly educated with low monthly income situation. In addition, there are average 4 family members in each household.

All (100%) users are satisfied with the existing water interventions. They are paying Tk. 20 per month; however, 43% of the user would like to pay more for safe drinking water in future.

5. CONCLUSIONS AND RECOMMENDATIONS

The technical assessment adopting both qualitative and quantitative techniques was conducted to identify the issues and concerns for the sustainability of these water supply projects. The findings of the assessment are summarized in the following sections:

5.1 Conclusion

SEHI Project at Paikgacha

Under SEHI project, WAB and NABOLOK have installed several AIRP, RWHS, TW and pipe water supply throughout nine (9) wards of the paurashava. This water interventions cover approximately 8,700 residents (including 2,900 students) out of 17,500, which represent approximately 50% safe water coverage in the area. This number decreases to 30% if student are excluded. There are 5 AIRP at community & 25 AIRP at HH level serving 378 people; 1 RWHS at community, 2 at school & 119 at HH servicing 914 people & 761 students; and 5 TW platform servicing 110 people. In addition, a recently installed 3,00,000 L capacity pipe water supply system servicing 3,485 people and 2,934 students, respectively.

Water Quality Assessment

- Treated water samples from most of AIRP units met Bangladesh Standard except sample A-1-6-C (0.075 mg/L) and A-3-1-C (0.075 mg/L) for As and A-4-20-H (1.64 mg/L) for Fe. However, treated water have trace of FC and/or TC whereas raw water are free of FC/TC, which indicates perhaps poor maintenance of the treatment system, cross contamination during washing the filtering media, foreign contamination sources perhaps faecal droppings from birds and animals.
- Raw water of the water treatment plant have high Fe (4.27-5.5 mg/L) with trace of As (0.01-0.02 mg/L); however, treated water samples from all water/tap points met the Bangladesh Standards for both parameters. However, treated water from few water points (P-4-1, P-6-11 and P-7-12) had presence of TC and/or FC, which indicates source of contamination or cross contamination during water transport through the pipe network.
- All water from RWHS met Bangladesh standards except one sample (R-9-3) had trace of FC (4/100 mL). This represent a good performance of RWHS water options despite having potential risk for chemical, physical and microbial contamination (WHO, 2004).
- An approximate sample location plan with water analytical results at Paikgacha Municipality, Khulna District is presented in Appendix H.

Evaluation of Questionnaire Survey

- The majority (97%) of the water users are married and lowly educated, having average 4 family members in the household and lower monthly income (average Tk. 8500).
- The users (about 99%) don't need more than 20 L water and collect 1-2 times in a day. However, approximately 54% of users feel that they need more water; whereas, most of them (about 75%) don't stand longer in the queue while collecting water.
- All users (100%) are satisfied with existing water interventions and would like to continue in future. This represents that the existing water interventions are capable of supplying the water demand; however, a significant portion (54%) of the respondents would seek higher demand in coming year.
- A significant portion (75%) of water coverage is by pipe water supply which don't require user's participation for maintenance activity. However, most users (approx. 89%) do not receive any training for maintaining the water interventions. All users (99%) claim once in a month maintenance with majority (87%) have not difficulties for maintenance and all (99%) claim zero (0) frequency for water quality testing. This results indicate a major necessity of improvement of direct user participation through training and motivation towards user driven water options for sustainable water supply system in the area.
- The water interventions were established mostly for low income residents in the area. The survey result shows these water users are having minimum education and low income with significant burden (4 members in the family) situation. However, they are satisfied with the existing water interventions. Currently, they are contributing average Tk. 35 (std. dev. Tk. 100); however, most (90%) of the user would like to pay more for safe drinking water options in future.

AKP Project at Kalaroa

Under AKP project, WAB and DAM have installed 24 AIRP, 2 Sidko and 1 Drink Well at community; and 10 AIRP in institution level throughout 9 wards of the Paurashava. The AKP project gives the safe water coverage to approximately 11, 300 people (including 4,700 students) out of 28,700. This number represents approximately 40% water coverage in the area; however, this number decreases to 22% without counting student.

Water Quality Assessment

- The raw water of AIRP units have high As (0.075 - 0.09 mg/L) and Fe (3.56-5.45 mg/L); however, all treated water met Bangladesh Standard for Fe despite exceeded for As in few units (T-2-2 (0.08 mg/L), T-2-31 (0.075 mg/L) and T-7-8 (0.075 mg/L)). Both raw and treated water shows microbial contamination (TC and/or FC) which represent perhaps poor maintenance of the system, cross contamination and/or faecal contamination from birds and animals.
- The treated water from both Sidko plants met Fe; however, treated water samples (T-8-35/T-8-35A (0.06/0.075 mg/L)) from Sidko in ward 8 exceed As of Bangladesh Standard. In addition, both treated samples had trace of TC and/or FC.
- The Drink well raw water sample exceed As, Fe and TC of Bangladesh Standard. The treated water from the Drink Well met both As and Fe; however, it had trace of TC and FC.
- An approximate sample location plan with water analytical results at Kalaroa Municipality, Satkhira District is presented in Appendix I.

Evaluation of Questionnaire Survey

Almost similar socio-economic situation, water demand, consumptions and user satisfaction were observed in Kalaroa questionnaire survey as summarized below:

- The majority (97%) of the water users are married, having average 4 family members in the household, lower educated and lower monthly income (average Tk. 8500) under the SEHI project.
- The users (about 99%) don't need more water (less than 20 litre) and collect 1-2 times in a day. However, approximately 52% of users feel that they need more water; whereas, half of them (about 49%) don't stand longer in the queue while collecting water.
- All users (100%) are satisfied with existing water interventions and would like to continue in future. This represents that the existing water interventions are capable of meeting consumer demand; however, about half (54%) of the respondents would seek higher demand in coming year.
- A significant portion (78%) of water users do not receive any training for maintaining the water interventions. All users claim once in a month maintenance with majority (93%) have not difficulties for maintenance and all claim zero (0) frequency for water quality testing. This finding represents a higher urgency of improving user participation through training and motivation towards user driven water interventions for sustainable water options in the area.
- At Kalaroa, the people are low educated and having lower monthly income with 4 family members in each household. They are satisfied with the existing water interventions. They are paying Tk. 20 per month; however, 43% of the user would like to pay more for safe drinking water in future.

The site photographs taken during the site visit at Paikgacha and Kalaroa are presented in Appendix J.

5.2 Recommendations

Almost similar findings were observed in both SEHI project at Paikgacha and AKP project at Kalaroa. Therefore, the same recommendations are applicable for both projects as follows:

1. The frequency of maintenance for AIRP units need to be increased and the regular monitoring to judge the performance of the system is necessary which will eventually increase water quality testing frequency. This testing can be done using field kits/set up by well-trained water users in the area.
2. Regardless of the water treatment options (e.g. AIRP, Sidko, Drink well, RWHS, pipe water supply etc.), there must be a system/option/unit for disinfection to avoid microbial contamination. A significant amount of disinfection level can be also achieved in some cases by using low cost Solar Disinfection Unit.
3. There should be an appropriate program for improving the direct user active participation through training and motivation towards user driven water interventions for sustainable safe drinking water supply. Moreover, the direct monetary contribution of the users can be increased considering the socio-economic aspects.

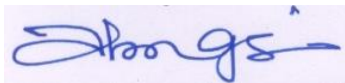
6. DISCLAIMER

The statements made in this technical assessment report are based solely on the information obtained to date as part of the above referenced work. The author has used his professional judgement in assessing this information and formulating its opinion and recommendations. New information may result in a change in this opinion. The mandate of this technical assessment is to perform the tasks prescribed by the Client with the due diligence of the profession. No other warranty or representation, expressed or implied, as to the accuracy of the information or recommendations is included or intended in this report. The results of this study should in no way be construed as a warranty that the treated water at any water options is free from any and all contamination.

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The ideas and opinions presented in this report are those of the author and do not necessarily reflect the view of Khulna University of Engineering and Technology (KUET), Khulna, Bangladesh.

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APPENDIX A

DETAILS WATER INTERVENTIONS INFORMATION AT PAIKGACHA, KHULNA

Details Water Interventions Information at Paikgacha, Khulna

Project Sl. No.	Name of facilities/ ID. Number	Level	Installation Date	Total HH	Total User	Ward No
1	PP/NP/WAB/SEHI/Com. AIRP # 10/Oct. '12	Community	25/10/12	12	57	4
2	PP/NP/WAB/SEHI/Com. AIRP # 11/Jan. '12	Community	22/1/13	12	48	1
3	PP/NP/WAB/SEHI/Com. AIRP # 12/Feb. '12	Community	18/2/13	18	64	1
4	PP/NP/WAB/SEHI/Com. RWHS # 7/Nov. '12	Community	28/11/12	74	368	7
5	PP/NP/WAB/SEHI/HH AIRP # 55/Jan. '13	Individual HH	14/1/13	1	3	1
6	PP/NP/WAB/SEHI/HH AIRP # 56/Jan. '13	Individual HH	14/1/13	1	2	1
7	PP/NP/WAB/SEHI/HH AIRP # 57/Jan. '13	Individual HH	14/1/13	1	4	1
8	PP/NP/WAB/SEHI/HH AIRP # 58/Jan. '13	Individual HH	14/1/13	1	4	1
9	PP/NP/WAB/SEHI/HH AIRP # 59/Jan. '13	Individual HH	14/1/13	1	5	1
10	PP/NP/WAB/SEHI/HH AIRP # 60/Jan. '13	Individual HH	14/1/13	1	3	2
11	PP/NP/WAB/SEHI/HH AIRP # 61/Jan. '13	Individual HH	14/1/13	1	4	2
12	PP/NP/WAB/SEHI/HH AIRP # 62/Jan. '13	Individual HH	14/1/13	1	3	2
13	PP/NP/WAB/SEHI/HH AIRP # 63/Jan. '13	Individual HH	14/1/13	1	2	6
14	PP/NP/WAB/SEHI/HH AIRP # 64/Jan. '13	Individual HH	14/1/13	1	6	6
15	PP/NP/WAB/SEHI/HH AIRP # 65/Jan. '13	Individual HH	14/1/13	1	2	6
16	PP/NP/WAB/SEHI/HH AIRP # 66/Jan. '13	Individual HH	14/1/13	1	5	6
17	PP/NP/WAB/SEHI/HH AIRP # 67/Jan. '13	Individual HH	14/1/13	1	7	7
18	PP/NP/WAB/SEHI/HH AIRP # 68/Jan. '13	Individual HH	2013-04-02	1	4	2
19	PP/NP/WAB/SEHI/HH AIRP # 69/Jan. '13	Individual HH	2013-04-02	1	4	4
20	PP/NP/WAB/SEHI/HH AIRP # 70/Jan. '13	Individual HH	2013-04-02	1	5	4
21	PP/NP/WAB/SEHI/HH AIRP # 71/Jan. '13	Individual HH	2013-04-02	1	5	4
22	PP/NP/WAB/SEHI/HH AIRP # 72/Jan. '13	Individual HH	2013-04-02	1	4	4
23	PP/NP/WAB/SEHI/HH AIRP # 73/Jan. '13	Individual HH	2013-04-02	1	3	4
24	PP/NP/WAB/SEHI/HH AIRP # 74/Jan. '13	Individual HH	2013-04-02	1	6	4
25	PP/NP/WAB/SEHI/HH AIRP # 75/Jan. '13	Individual HH	2013-04-02	1	6	4
26	PP/NP/WAB/SEHI/HH AIRP # 76/Jan. '13	Individual HH	2013-04-02	1	4	4
27	PP/NP/WAB/SEHI/HH AIRP # 77/Jan. '13	Individual HH	2013-04-02	1	6	4
28	PP/NP/WAB/SEHI/HH AIRP # 78/Jan. '13	Individual HH	2013-04-02	1	4	4
29	PP/NP/WAB/SEHI/HH AIRP # 79/Jan. '13	Individual HH	2013-04-02	1	7	4
30	PP/NP/WAB/SEHI/HH RWHS # 11/Oct. '12	Individual HH	2012-10-10	1	4	9
31	PP/NP/WAB/SEHI/HH RWHS # 12/Oct. '12	Individual HH	2012-10-10	1	4	9
32	PP/NP/WAB/SEHI/HH RWHS # 13/Oct. '12	Individual HH	2012-10-10	1	4	9
33	PP/NP/WAB/SEHI/HH RWHS # 14/Oct. '12	Individual HH	13/10/12	1	3	9
34	PP/NP/WAB/SEHI/HH RWHS # 15/Oct. '12	Individual HH	15/10/12	1	5	9
35	PP/NP/WAB/SEHI/HH RWHS # 16/Oct. '12	Individual HH	15/10/12	1	5	9
36	PP/NP/WAB/SEHI/HH RWHS # 17/Oct. '12	Individual HH	15/10/12	1	3	9
37	PP/NP/WAB/SEHI/HH RWHS # 18/Oct. '12	Individual HH	21/10/12	1	6	6
38	PP/NP/WAB/SEHI/HH RWHS # 19/Oct. '12	Individual HH	21/10/12	1	4	6
39	PP/NP/WAB/SEHI/HH RWHS # 20/Oct. '12	Individual HH	21/10/12	1	5	6
40	PP/NP/WAB/SEHI/HH RWHS # 21/Nov. '12	Individual HH	17/11/12	1	5	5
41	PP/NP/WAB/SEHI/HH RWHS # 22/Nov. '12	Individual HH	17/11/12	1	5	5
42	PP/NP/WAB/SEHI/HH RWHS # 23/Nov. '12	Individual HH	17/11/12	1	4	5
43	PP/NP/WAB/SEHI/HH RWHS # 24/Nov. '12	Individual HH	17/11/12	1	4	5
44	PP/NP/WAB/SEHI/HH RWHS # 25/Nov. '12	Individual HH	23/11/12	1	4	5
45	PP/NP/WAB/SEHI/HH RWHS # 26/Jan. '13	Individual HH	2013-06-02	1	6	6
46	PP/NP/WAB/SEHI/HH RWHS # 27/Jan. '13	Individual HH	2013-06-02	1	4	6
47	PP/NP/WAB/SEHI/HH RWHS # 28/Jan. '13	Individual HH	2013-06-02	1	4	6
48	PP/NP/WAB/SEHI/HH RWHS # 29/Jan. '13	Individual HH	25/2/13	1	4	5
49	PP/NP/WAB/SEHI/HH RWHS # 30/Jan. '13	Individual HH	25/2/13	1	5	5
50	PP/NP/WAB/SEHI/HH RWHS # 31/Jan. '13	Individual HH	25/2/13	1	6	5
51	PP/NP/WAB/SEHI/HH RWHS # 32/Jan. '13	Individual HH	25/2/13	1	7	5
52	PP/NP/WAB/SEHI/HH RWHS # 33/Jan. '13	Individual HH	25/2/13	1	4	5
53	PP/NP/WAB/SEHI/HH RWHS # 34/Mar. '12	Individual HH	2013-12-03	1	5	9
54	PP/NP/WAB/SEHI/HH RWHS # 35/Mar. '12	Individual HH	2013-12-03	1	5	9
55	PP/NP/WAB/SEHI/HH RWHS # 36/Mar. '12	Individual HH	2013-12-03	1	4	9
56	PP/NP/WAB/SEHI/HH RWHS # 37/Mar. '12	Individual HH	2013-12-03	1	4	9
57	PP/NP/WAB/SEHI/HH RWHS # 38/Mar. '12	Individual HH	2013-12-03	1	3	9
58	PP/NP/WAB/SEHI/HH RWHS # 39/Mar. '12	Individual HH	2013-12-03	1	5	9
59	PP/NP/WAB/SEHI/HH RWHS # 40/Mar. '12	Individual HH	2013-12-03	1	4	9
60	PP/NP/WAB/SEHI/HH RWHS # 41/Mar. '12	Individual HH	2013-12-03	1	5	9
61	PP/NP/WAB/SEHI/HH RWHS # 42/Mar. '12	Individual HH	2013-12-03	1	3	9
62	PP/NP/WAB/SEHI/HH RWHS # 43/Mar. '12	Individual HH	2013-12-03	1	4	9
63	PP/NP/WAB/SEHI/HH RWHS # 44/Mar. '12	Individual HH	2013-12-03	1	4	9
64	PP/NP/WAB/SEHI/HH RWHS # 45/Mar. '12	Individual HH	2013-12-03	1	5	9

Details Water Interventions Information at Paikgacha, Khulna

Project Sl. No.	Name of facilities/ ID. Number	Level	Installation Date	Total HH	Total User	Ward No
65	PP/NP/WAB/SEHI/Ins. RWHS # 3/October '12	School	29/10/12	544	544	6
66	PP/NP/WAB/SEHI/Ins. RWHS # 4/November '12	School	24/11/12	217	217	6
67	PP/NP/WAB/SEHI/TW Platform # 21/Jan. '13	Community	18/1/13	6	29	4
68	PP/NP/WAB/SEHI/TW Platform # 22/Jan. '13	Community	18/1/13	6	27	4
69	PP/NP/WAB/SEHI/TW Platform # 23/Jan. '13	Community	18/1/13	6	29	4
70	PP/NP/WAB/SEHI/TW Platform # 24/Jan. '13	Community	13/1/13	3	11	3
71	PP/NP/WAB/SEHI/TW Platform # 25/Jan. '13	Community	15/1/13	3	14	3
72	PP/NP/WAB/SEHI/HH RWHS # 65/Sep '13	Individual HH	September	1	5	8
73	PP/NP/WAB/SEHI/HH RWHS # 57/Sep '13	Individual HH	September	1	4	9
74	PP/NP/WAB/SEHI/HH RWHS # 58/Sep '13	Individual HH	September	1	5	9
75	PP/NP/WAB/SEHI/HH RWHS # 59/Sep '13	Individual HH	September	1	5	9
76	PP/NP/WAB/SEHI/HH RWHS # 60/Sep '13	Individual HH	September	1	4	9
77	PP/NP/WAB/SEHI/HH RWHS # 61/Sep '13	Individual HH	September	1	5	9
78	PP/NP/WAB/SEHI/HH RWHS # 56/Sep '13	Individual HH	September	1	4	6
79	PP/NP/WAB/SEHI/HH RWHS # 51/Sep '13	Individual HH	September	1	5	5
80	PP/NP/WAB/SEHI/HH RWHS # 52/Sep '13	Individual HH	September	1	7	5
81	PP/NP/WAB/SEHI/HH RWHS # 53/Sep '13	Individual HH	September	1	6	5
82	PP/NP/WAB/SEHI/HH RWHS # 54/Sep '13	Individual HH	September	1	5	5
83	PP/NP/WAB/SEHI/HH RWHS # 55/Sep '13	Individual HH	September	1	3	5
84	PP/NP/WAB/SEHI/HH RWHS # 62/Sep '13	Individual HH	September	1	2	9
85	PP/NP/WAB/SEHI/HH RWHS # 63/Sep '13	Individual HH	September	1	5	9
86	PP/NP/WAB/SEHI/HH RWHS # 64/Sep '13	Individual HH	September	1	5	9
87	PP/NP/WAB/SEHI/HH RWHS # 46/Sep '13	Individual HH	September	1	4	4
88	PP/NP/WAB/SEHI/HH RWHS # 47/Sep '13	Individual HH	September	1	5	4
89	PP/NP/WAB/SEHI/HH RWHS # 48/Sep '13	Individual HH	September	1	5	4
90	PP/NP/WAB/SEHI/HH RWHS # 49/Sep '13	Individual HH	September	1	5	4
91	PP/NP/WAB/SEHI/HH RWHS # 50/Sep '13	Individual HH	September	1	3	4
92	PP/NP/WAB/SEHI/Com. AIRP#13	Community	September	15	61	5
93	PP/NP/WAB/SEHI/Com AIRP#23/Dec-14	Community	Dec-14	12	40	3
94	PP/NP/WAB/SEHI/CTP#15/Feb-15	Community	Feb-15	4	16	9
95	PP/NP/WAB/SEHI/CTP#16/Feb-15	Community	Feb-15	4	19	9
96	PP/NP/WAB/SEHI/CTP#17/Feb-15	Community	Feb-15	5	21	9
97	PP/NP/WAB/SEHI/CTP#18/Feb-15	Community	Feb-15	10	37	9
98	PP/NP/WAB/SEHI/CTP#19/Feb-15	Community	Feb-15	4	16	9
99	PP/NP/WAB/SEHI/CTP#26/Mar-15	Community	Mar-15	8	31	9
100	PP/NP/WAB/SEHI/CTP#27/Mar-15	Community	Mar-15	6	18	9
101	PP/NP/WAB/SEHI/CTP#28/Mar-15	Community	Mar-15	4	17	9
102	PP/NP/WAB/SEHI/CTP#03/Jan-15	Community	Jan-15	7	21	8
103	PP/NP/WAB/SEHI/CWP/#8/SEP-14	Community	Aug-14	18	61	8
104	PP/NP/WAB/SEHI/CTP#8/Feb-15	Community	Feb-15	6	22	7
105	PP/NP/WAB/SEHI/HH RWHS#96/14		Jul-14	1	4	2
106	PP/NP/WAB/SEHI/HH RWHS#106/Aug-14		Aug-14	1	4	9
107	PP/NP/WAB/SEHI/HH RWHS#107/Aug-14		Aug-14	1	6	9
108	PP/NP/WAB/SEHI/HH RWHS#112/SEP-14		Sep-14	1	5	9
109	PP/NP/WAB/SEHI/CWP#05/14	Community	Aug-14	10	49	6
110	PP/NP/WAB/SEHI/CWP#12/Oct-14	Community	Oct-14	18	74	6
111	PP/NP/WAB/SEHI/CTP#01/Jan-15	Community	Jan-15	4	19	8
112	PP/NP/WAB/SEHI/CWP#04/14	Community	Aug-14	11	39	7
113	PP/NP/WAB/SEHI/CWP#06/14	Community	Aug-14	11	44	6
114	PP/NP/WAB/SEHI/CWP#16/Nov-14	Community	Nov-14	13	48	6
115	PP/NP/WAB/SEHI/CWP#20/Dec-14	Community	Dec-14	12	56	6
116	PP/NP/WAB/SEHI/CTP#14/Feb-15	Community	Feb-15	4	16	5
117	PP/NP/WAB/SEHI/CWP#24/Feb-15	Community	Feb-15	19	77	5
118	PP/NP/WAB/SEHI/CTP#7/Feb-15	Community	Feb-15	8	49	7
119	PP/NP/WAB/SEHI/CTP#9/Feb-15	Community	Feb-15	5	14	7
120	PP/NP/WAB/SEHI/CWP#15/Nov-14	Community	Nov-14	11	51	7
121	PP/NP/WAB/SEHI/CTP#10/Feb-15	Community	Feb-15	8	29	7
122	PP/NP/WAB/SEHI/CTP#20/Mar-15	Community	Mar-15	7	23	7
123	PP/NP/WAB/SEHI/CTP#21/Mar-15	Community	Mar-15	6	24	7
124	PP/NP/WAB/SEHI/CTP#22/Mar-15	Community	Mar-15	6	25	7
125	PP/NP/WAB/SEHI/CTP#23/Mar-15	Community	Mar-15	8	39	7
126	PP/NP/WAB/SEHI/CTP#24/Mar-15	Community	Mar-15	3	13	7
127	PP/NP/WAB/SEHI/CTP#25/Mar-15	Community	Mar-15	6	20	7
128	PP/NP/WAB/SEHI/CWP#23/Dec-14	Community	Dec-14	20	72	5

Details Water Interventions Information at Paikgacha, Khulna

Project Sl. No.	Name of facilities/ ID. Number	Level	Installation Date	Total HH	Total User	Ward No
129	PP/NP/WAB/SEHI/HH RWHS#113/SEP-14		Sep-14	1	3	5
130	PP/NP/WAB/SEHI/HH RWHS#114/SEP-14		Sep-14	1	5	5
131	PP/NP/WAB/SEHI/HH RWHS#115/SEP-14		Sep-14	1	6	5
132	PP/NP/WAB/SEHI/HH RWHS#116/SEP-14		Sep-14	1	4	5
133	PP/NP/WAB/SEHI/HH RWHS#117/SEP-14		Sep-14	1	5	5
134	PP/NP/WAB/SEHI/HH RWHS#118/SEP-14		Sep-14	1	4	5
135	PP/NP/WAB/SEHI/HH RWHS#119/SEP-14		Sep-14	1	4	5
136	PP/NP/WAB/SEHI/HH RWHS#120/SEP-14		Sep-14	1	3	5
137	PP/NP/WAB/SEHI/CTP#04/Jan-15	Community	Jan-15	4	14	6
138	PP/NP/WAB/SEHI/CTP#05/Jan-15	Community	Jan-15	4	14	6
139	PP/NP/WAB/SEHI/CTP#6/Feb-15	Community	Feb-15	5	19	6
140	PP/NP/WAB/SEHI/CWP#07/14	Community	Sep-14	11	45	6
141	PP/NP/WAB/SEHI/CWP#13/Oct-14	Community	Oct-14	15	66	6
142	PP/NP/WAB/SEHI/CWP#14/Oct-14	Community	Oct-14	15	72	6
143	PP/NP/WAB/SEHI/CWP#21/Dec-14	Community	Dec-14	18	75	6
144	PP/NP/WAB/SEHI/Ins.TP#1/Feb-15	School	Feb-15	288	288	9
145	PP/NP/WAB/SEHI/CWP#17/Dec-14	Community	Dec-14	13	51	9
146	PP/NP/WAB/SEHI/CWP/#10/SEP-14	Community	Sep-14	20	82	9
147	PP/NP/WAB/SEHI/CWP/#11/SEP-14	Community	Sep-14	35	136	9
148	PP/NP/WAB/SEHI/HH RWHS#101/Aug-14		Aug-14	1	4	9
149	PP/NP/WAB/SEHI/HH RWHS#102/Aug-14		Aug-14	1	4	9
150	PP/NP/WAB/SEHI/HH RWHS#103/Aug-14		Aug-14	1	5	9
151	PP/NP/WAB/SEHI/HH RWHS#104/Aug-14		Aug-14	1	4	9
152	PP/NP/WAB/SEHI/HH RWHS#105/Aug-14		Aug-14	1	4	9
153	PP/NP/WAB/SEHI/HH RWHS#108/SEP-14		Sep-14	1	5	9
154	PP/NP/WAB/SEHI/HH RWHS#109/SEP-14		Sep-14	1	4	9
155	PP/NP/WAB/SEHI/HH RWHS#110/SEP-14		Sep-14	1	5	9
156	PP/NP/WAB/SEHI/HH RWHS#111/SEP-14		Sep-14	1	5	9
157	PP/NP/WAB/SEHI/CTP#02/Jan-15	Community	Jan-15	7	13	4
158	PP/NP/WAB/SEHI/CWP#19/Dec-14	Community	Dec-14	10	34	4
159	PP/NP/WAB/SEHI/HH RWHS#100/14		Jul-14	1	5	5
160	PP/NP/WAB/SEHI/HH RWHS#98/14		Jul-14	1	4	5
161	PP/NP/WAB/SEHI/HH RWHS#99/14		Jul-14	1	4	5
162	PP/NP/WAB/SEHI/CTP#11/Feb-15	Community	Feb-15	4	14	5
163	PP/NP/WAB/SEHI/CTP#12/Feb-15	Community	Feb-15	10	29	5
164	PP/NP/WAB/SEHI/CWP#22/Mar-15	Community	Mar-15	25	100	4
165	PP/NP/WAB/SEHI/IWP/#1/SEP-14	Community	Sep-14	126	126	4
166	PP/NP/WAB/SEHI/CTP#13/Feb-15	Community	Feb-15	8	30	5
167	PP/NP/WAB/SEHI/CWP#18/Dec-14	Community	Dec-14	10	32	4
168	PP/NP/WAB/SEHI/HH RWHS#121/SEP-14		Sep-14	1	6	5
169	PP/NP/WAB/SEHI/HH RWHS#88/14		Jul-14	1	5	4
170	PP/NP/WAB/SEHI/HH RWHS#89/14		Jul-14	1	4	4
171	PP/NP/WAB/SEHI/HH RWHS#90/14		Jul-14	1	2	4
172	PP/NP/WAB/SEHI/HH RWHS#91/14		Jul-14	1	4	4
173	PP/NP/WAB/SEHI/HH RWHS#92/14		Jul-14	1	4	4
174	PP/NP/WAB/SEHI/HH RWHS#93/14		Jul-14	1	3	4
175	PP/NP/WAB/SEHI/HH RWHS#94/14		Jul-14	1	4	4
176	PP/NP/WAB/SEHI/HH RWHS#95/14		Jul-14	1	4	4
177	PP/NP/WAB/SEHI/HH RWHS#97/14		Jul-14	1	2	4
178	PP/NP/WAB/SEHI/CWP/#9/SEP-14	Community	Sep-14	1	46	4
179	PP/NP/WAB/SEHI/IWP#03/Mar-15	Community	Mar-15	376	376	4
180	PP/NP/WAB/SEHI/IWP#02/Mar-15	Community	Mar-15	139	139	5
181	WAB/PP/NP/SEHI/IWP#7/Feb-16	School	Feb-16		118	1
182	PP/NP/WAB/SEHI/CTP# 30/May-15	Community	May-15	4	21	8
183	PP/NP/WAB/SEHI/CTP# 31/May-15	Community	May-15	5	19	8
184	PP/NP/WAB/SEHI/CTP# 32/June-15	Community	Jun-15	6	19	9
185	WAB/PP/NP/SEHI/CTP# 37/Oct-15	Community	Oct-15	5	23	7
186	PP/NP/WAB/SEHI/HH RWHS#134/July-15		Jul-15	1	6	2
187	PP/NP/WAB/SEHI/HH RWHS#150/July-16		Jul-15	1	3	9
188	PP/NP/WAB/SEHI/HH RWHS#151/July-16		Jul-15	1	5	9
189	WAB/PP/NP/SEHI/CTP# 43/Jan-16	Community	Jan-16	5	18	6
190	WAB/PP/NP/SEHI/IWP#6/Dec-15	School	Dec-15		450	8
191	PP/NP/WAB/SEHI/CTP# 34/June-15	Community	Jun-15	7	28	7
192	PP/NP/WAB/SEHI/CWP# 28/ July-15	Community	Jul-15	15	59	7

Details Water Interventions Information at Paikgacha, Khulna

Project Sl. No.	Name of facilities/ ID. Number	Level	Installation Date	Total HH	Total User	Ward No
193	PP/NP/WAB/SEHI/CTP# 29/May-15	Community	May-15	4	14	7
194	PP/NP/WAB/SEHI/CWP# 26/ June-15	Community	Jun-15	12	42	7
195	WAB/PP/NP/SEHI/CWP#30/Oct-15	Community	Oct-15	16	46	7
196	PP/NP/WAB/SEHI/HH RWHS#133/July-15		Jul-15	1	5	5
197	PP/NP/WAB/SEHI/CTP# 33/June-15	Community	Jun-15	5	20	6
198	WAB/PP/NP/SEHI/CTP# 44/Jan-16	Community	Jan-16	4	17	6
199	WAB/PP/NP/SEHI/CTP# 45/Feb-16	Community	Feb-16	5	15	6
200	PP/NP/WAB/SEHI/IWP# 05/August-15	School	Aug-15		2078	4
201	PP/NP/WAB/SEHI/HH RWHS#126/July-15		Jul-15	1	4	4
202	PP/NP/WAB/SEHI/HH RWHS#135/July-15		Jul-15	1	5	4
203	PP/NP/WAB/SEHI/HH RWHS#136/July-15		Jul-15	1	5	4
204	WAB/PP/NP/SEHI/CTP# 39/Dec-15	Community	Dec-15	5	18	4
205	WAB/PP/NP/SEHI/CTP# 42/Jan-16	Community	Jan-16	5	24	4
206	PP/NP/WAB/SEHI/CTP# 35/June-15	Community	Jun-15	6	28	5
207	PP/NP/WAB/SEHI/CTP# 36/August-15	Community	Aug-15	7	18	5
208	PP/NP/WAB/SEHI/HH RWHS#127/July-15		Jul-15	1	6	5
209	WAB/PP/NP/SEHI/CTP# 38/Dec-15	Community	Dec-15	7	26	5
210	WAB/PP/NP/SEHI/CTP# 46/Feb-16	Community	Feb-16	5	17	5
211	WAB/PP/NP/SEHI/CWP# 32/Feb-16	Community	Feb-16	25	98	5
212	PP/NP/WAB/SEHI/CWP# 25/ May-15	Community	May-15	18	63	4
213	PP/NP/WAB/SEHI/CWP# 27/ June-15	Community	Jun-15	14	61	4
214	PP/NP/WAB/SEHI/HH RWHS#125/July-15		Jul-15	1	5	4
215	WAB/PP/NP/SEHI/CTP# 40/Dec-15	Community	Dec-15	5	18	4
216	WAB/PP/NP/SEHI/CTP# 41/Dec-15	Community	Dec-15	4	15	4
217	WAB/PP/NP/SEHI/CTP# 47/Feb-16	Community	Feb-16	5	17	4
218	PP/NP/WAB/SEHI/CWP# 29/ August-15	Community	Aug-15	18	79	4
219	PP/NP/WAB/SEHI/HH RWHS#122/July-15		Jul-15	1	9	4
220	PP/NP/WAB/SEHI/HH RWHS#123/July-15		Jul-15	1	5	4
221	PP/NP/WAB/SEHI/HH RWHS#124/July-15		Jul-15	1	4	4
222	PP/NP/WAB/SEHI/HH RWHS#128/July-15		Jul-15	1	4	5
223	PP/NP/WAB/SEHI/HH RWHS#129/July-15		Jul-15	1	3	5
224	PP/NP/WAB/SEHI/HH RWHS#130/July-15		Jul-15	1	7	5
225	PP/NP/WAB/SEHI/HH RWHS#131/July-15		Jul-15	1	5	5
226	PP/NP/WAB/SEHI/HH RWHS#132/July-15		Jul-15	1	9	5
227	PP/NP/WAB/SEHI/HH RWHS#137/July-15		Jul-15	1	3	9
228	PP/NP/WAB/SEHI/HH RWHS#138/July-15		Jul-15	1	5	9
229	PP/NP/WAB/SEHI/HH RWHS#139/July-15		Jul-15	1	5	9
230	PP/NP/WAB/SEHI/HH RWHS#140/July-15		Jul-15	1	4	9
231	PP/NP/WAB/SEHI/HH RWHS#141/July-15		Jul-15	1	3	9
232	PP/NP/WAB/SEHI/HH RWHS#142/July-15		Jul-15	1	6	9
233	PP/NP/WAB/SEHI/HH RWHS#143/July-15		Jul-15	1	6	9
234	WAB/PP/NP/SEHI/CTP# 48/Feb-16	Community	Feb-16	6	21	9
235	WAB/PP/NP/SEHI/CWP# 33/Feb-16	Community	Feb-16	14	47	9
236	WAB/PP/NP/SEHI/CWP#31/Oct-15	Community	Oct-15	10	40	9
237	PP/NP/WAB/SEHI/HH RWHS#144/July-15		Jul-15	1	3	9
238	PP/NP/WAB/SEHI/HH RWHS#145/July-15		Jul-15	1	6	9
239	PP/NP/WAB/SEHI/HH RWHS#146/July-15		Jul-15	1	4	9
240	PP/NP/WAB/SEHI/HH RWHS#147/July-15		Jul-15	1	8	9
241	PP/NP/WAB/SEHI/HH RWHS#148/July-16		Jul-15	1	4	9
242	PP/NP/WAB/SEHI/HH RWHS#149/July-16		Jul-15	1	7	9

AIRP	- Arsenic and Iron Removal Plant
RWHS	-Rain Water Harvesting System
CTP	-Pipe Water Supply - Tap Point
CWP	-Pipe Water Supply - Water Point
TW Platform	- Tube Well Plantform

APPENDIX B

DETAILS WATER INTERVENTIONS INFORMATION AT KALAROA, SATKHIRA

Details Water Interventions Information at Kalaroa, Satkhira

Project Sl. No	Water Option	Instalation Date	Level	Ward No	Name of Community	Total HH	Female	Male	Total User
5	AIRP	Mar'14	Community	1	Tulsi Danga Paschim para-1	92	206	205	411
12	AIRP	Sep'14	School	1	Kolaroa Model School	0	189	248	437
14	AIRP	Sep'14	Community	1	Tulsi Danga Paschim para-2	90	189	179	368
33	AIRP	Dec'15	School	1	Amanullah College	0	280	310	590
						182	395	384	779
2	AIRP	Oct'13	Community	2	Sarder Para-01	32	69	69	138
17	AIRP	Jan'15	Community	2	Tulshdanga Ghosh para	98	223	233	456
21	AIRP	Aug'15	School	2	Kalaroa Shisu Lab. School	0	122	161	283
31	AIRP	Nov'15	School	2	Tulshidanga Govt Primary School	0	207	183	390
34	AIRP	Jan'16	School	2	Kalaroa pilot girls high School	0	359	16	375
						2	130	292	302
4	AIRP	Mar'14	School	3	Kolaroa Govt. Primary School	0	383	333	716
9	AIRP	Mar'14	Community	3	College para -02	78	136	120	256
11	AIRP	Sep'14	School	3	GKMK Pilot High Scool	0	118	841	959
27	AIRP	Sep'15	Community	3	Godokhali College para-4	75	159	140	299
36	Sidko	Mar'15	Community	3	Godokhali	236	560	529	1089
						3	389	855	789
15	AIRP	Jan'15	Community	4	Zhikra Poschim (west) para	97	176	196	372
25	AIRP	Aug'15	Community	4	Jhikra Sana Para	82	162	157	319
28	AIRP	Oct'15	Community	4	Jhikra Moddho para	80	152	165	317
						4	259	490	518
1	AIRP	June'13	Community	5	Paruipara	59	115	109	224
3	AIRP	Jan'14	Community	5	Guchho Gram	28	57	50	107
13	AIRP	Sep'14	School	5	Kolaroa Pre Cadate School	0	120	138	258
16	AIRP	Jan'15	Community	5	Sheikh & kha para	78	155	155	310
18	AIRP	Feb'15	Community	5	Karigor & Dhabok para	83	180	181	361
24	AIRP	Aug'15	Community	5	Jhikra Professor Para	84	154	170	324
29	AIRP	Sep'15	Community	5	Jhikra Gain & Gorosthan para	82	159	156	315
						5	414	820	821
7	AIRP	Mar'14	Community	6	Gopinath pur Daxin (south) para-	36	77	95	172
10	AIRP	Sep'14	Community	6	Gopinath pur Gosh para	80	189	185	374
23	AIRP	Aug'15	Community	6	Gopinatpur Majher Para	74	156	163	319
30	AIRP	Oct'15	School	6	Gpinathpur Govt Primary School	0	180	150	330
32	AIRP	Nov'15	Community	6	Gopinatpur Mollik & Sarder para	80	166	178	344
						6	270	588	621
8	AIRP	Mar'14	Community	7	Rajbingsi Para	70	140	149	289
20	AIRP	Mar'15	Community	7	Murarikati Karigor para	97	207	199	406
						7	167	347	348
19	AIRP	Feb'15	School	8	United High School	0	185	172	357
26	AIRP	Aug'15	Community	8	Murarikati Sarder para	84	161	162	323
35	Sidko	Mar'14	Community	8	Murarikati	202	719	872	1591
						8	286	1065	1206
6	AIRP	Mar'14	Community	9	Mirzapur Paschimpara-02	70	143	149	292
22	AIRP	Aug'15	Community	9	Mirzapur Paschimpara-01	85	163	147	310
37	Drink Well	Dec'15	Community	9	Mirzapur	230	546	632	1178
						9	315	709	779
Total						2412	5561	5768	11329

N.B.: AIRP - Arsenic Iron Removal Plant, Sidko - Sidko Plant, Drink Well - Drink Well System, HH - House Hold

APPENDIX C

QUESTIONNAIRE OF SURVEY FORMAT USED AT PAIKGACHA / KOLAROA

Questionnaire of Survey at Paikgacha □ / Kolaroa □

User □ Management □

Household □ Community □ Institution □

Personal information

Name: _____ Age: _____ Sex: _____ Married: _____ Education: _____ Family members: _____

Income: _____/month Job/Profession: _____

Technology Information:

Any treatment of Water? Yes / No

Treatment Process: AIRP / RWHS / SF / Others

Water Supply Point: Functional / Non-functional

Hygiene Status: Hygiene / Not Hygiene

Water Supply/Consumption/Demand:

Water Source: Tap point / Tube well / RWHS / SF / Others

Collection Point: Household / Community / Institutional / Others

Consumption: <20L / >20L / don't know

Collection Frequency: 1-2 / 3-5 / >5

Do you need more water / water points? Yes / No / don't know

Do you stand long time in water points? Yes / No / Not Applicable

Operation and Maintenance (O&M):

Did you receive any training? Yes / No / don't know

Maintenance Frequency? /month

Any maintenance difficulties?

Cost of maintenance? /month

Frequency of water test? /month

Satisfaction:

Are you satisfied? Yes / No / don't know

Do you want to continue this system? Yes / No / don't know

Do you pay? Yes / No / don't know

Do you want to pay for water? Yes / No / don't know

APPENDIX D

WATER ANALYTICAL RESULTS PAIKGACHA MUNICIPALITY, KHULNA DISTRICT

WATER ANALYTICAL RESULTS - Arsenic Iron Removal Plant (AIRP)

Selected Drinking Water Parameters

Paikgacha Municipality, Khulna District, Bangladesh

Project SI No.	Name of facilities/ ID. Number	Type of Water Options	Level	Ward No.	No. of Water Sample	Sample Id	pH	As (mg/L)	Fe (mg/L)	Coliform (Faecal) (N/100mL)	Coliform (Total) (N/100mL)	Turbidity (NTU)	Conductivity (µs/cm)
WHO Guideline Value (2004)							6.5-8.5	0.01	-	0	0	-	-
Bangladesh Standard for Drinking Water (ECR'97)							-	0.05	0.3-1	0	0	10	-
1	PP/NP/WAB/SEHI/Com. AIRP # 10/Oct. '12	AIRP	Community	4	1	A-4-10-C	7.43	0.015	0.4	0	8	-	-
2	PP/NP/WAB/SEHI/Com. AIRP # 11/Jan. '12	AIRP	Community	1	1	A-1-6-C	7.56	0.075	0.53	2	0	-	-
3	PP/NP/WAB/SEHI/Com. AIRP # 12/Jan. '12	AIRP	Community	1	1	A-1-9-C	7.54	0.005	0.085	3	7	-	-
3	PP/NP/WAB/SEHI/Com. AIRP # 12/Jan. '12	AIRP	Community	1	1 (Raw)	A-1-9-C Raw	7.34	0.08	0.56	0	0	-	-
5	PP/NP/WAB/SEHI/HH AIRP # 55/Jan. '13	AIRP	Individual HH	1	1	A-1-2-H	7.52	0.005	0.14	0	11	-	-
5	PP/NP/WAB/SEHI/HH AIRP # 55/Jan. '13	AIRP	Individual HH	1	1 (Raw)	A-1-2-H-Raw	7.3	0.02	3.71	0	0	-	-
6	PP/NP/WAB/SEHI/HH AIRP # 56/Jan. '13	AIRP	Individual HH	1	1	A-1-3-H	7.5	0.015	0.09	22	9	-	-
7	PP/NP/WAB/SEHI/HH AIRP # 57/Jan. '13	AIRP	Individual HH	1	1	A-1-4-H	7.48	0.035	0.32	8	2	-	-
8	PP/NP/WAB/SEHI/HH AIRP # 58/Jan. '13	AIRP	Individual HH	1	1	A-1-5-H	7.44	0.015	0.06	1	3	-	-
11	PP/NP/WAB/SEHI/HH AIRP # 61/Jan. '13	AIRP	Individual HH	2	1	A-2-7-H	7.32	0.04	0.05	2	6	-	-
12	PP/NP/WAB/SEHI/HH AIRP # 62/Jan. '13	AIRP	Individual HH	2	1	A-2-8-H	7.4	0.015	0.25	1	2	-	-
14	PP/NP/WAB/SEHI/HH AIRP # 64/Jan. '13	AIRP	Individual HH	6	1	A-6-16-H	7.5	0.001	0.07	0	0	-	-
15	PP/NP/WAB/SEHI/HH AIRP # 65/Jan. '13	AIRP	Individual HH	6	1	A-6-18-H	7.47	0.001	0.07	16	4	-	-
16	PP/NP/WAB/SEHI/HH AIRP # 66/Jan. '13	AIRP	Individual HH	6	1	A-6-17-H	7.53	0.002	0.01	5	0	-	-
20	PP/NP/WAB/SEHI/HH AIRP # 70/Jan. '13	AIRP	Individual HH	4	1	A-4-15-H	7.4	0.012	0.32	1	2	-	-
23	PP/NP/WAB/SEHI/HH AIRP # 73/Jan. '13	AIRP	Individual HH	4	1	A-4-14-H	7.39	0.015	0.34	1	2	-	-
24	PP/NP/WAB/SEHI/HH AIRP # 74/Jan. '13	AIRP	Individual HH	4	1	A-4-11-H	7.38	0.015	0.45	6	2	-	-
25	PP/NP/WAB/SEHI/HH AIRP # 75/Jan. '13	AIRP	Individual HH	4	1	A-4-13-H	7.38	0	0.33	9	2	-	-
26	PP/NP/WAB/SEHI/HH AIRP # 76/Jan. '13	AIRP	Individual HH	4	1	A-4-12-H	7.41	0.015	0.34	2	3	-	-
28	PP/NP/WAB/SEHI/HH AIRP # 78/Jan. '13	AIRP	Individual HH	4	1	A-4-19-H	7.43	0.002	0.85	0	0	-	-
28	PP/NP/WAB/SEHI/HH AIRP # 78/Jan. '13	AIRP	Individual HH	4	Field Duplicate of A-4-19-H	A-4-19-H-D	7.4	0.002	0.59	0	0	-	-
29	PP/NP/WAB/SEHI/HH AIRP # 79/Jan. '13	AIRP	Individual HH	4	1	A-4-20-H	7.29	0.005	1.64	4	2	-	-
93	PP/NP/WAB/SEHI/Com AIRP#23/Dec-14	AIRP	Community	3	1	A-3-1-C	7.47	0.075	0.08	11	5	-	-

- Not Analyzed
- BOLD** exceeds WHO Guideline Value (2004)
- 0.05** exceeds Bangladesh Standard for Drinking Water (ECR'97)
- TTC Thermotolerant Coliforms (TTC), Unit - N/100mL
- FC Faecal Coliforms (FC), Unit- N/100mL
- N:B: pH has no unit

WATER ANALYTICAL RESULTS - Pipe Water Supply
Selected Drinking Water Parameters
Paikgacha Municipality, Khulna District, Bangladesh

Project SI No.	Name of facilities/ ID. Number	Type of Water Options	Level	Ward No.	No. of Water Sample	Sample Id	pH	As (mg/L)	Fe (mg/L)	Coliform (Faecal) (N/100mL)	Coliform (Total) (N/100mL)	Turbidity (NTU)	Conductivity (µs/cm)
WHO Guideline Value (2004)							6.5-8.5	0.01	-	0	0	-	-
Bangladesh Standard for Drinking Water (ECR'97)							-	0.05	0.3-1	0	0	10	-
-	Water Treatment Plant	Pipe Water Supply	-	3	1 (Raw)	P-3-1-R	7.22	0.01	5.5	0	0	1.65	112.5
-	Water Treatment Plant	Pipe Water Supply	-	3	1 (Raw)	P-3-1-A-R	7.21	0.02	4.27	0	0	2.87	155.26
109	PP/NP/WAB/SEHI/CWP#05/14	Pipe Water Supply	Community	6	1	P-6-10	7.52	0.005	0.03	0	0		
111	PP/NP/WAB/SEHI/CTP#01/Jan-15	Pipe Water Supply	Community	8	1	P-8-17	7.53	0	0.04	0	0		
112	PP/NP/WAB/SEHI/CWP#04/14	Pipe Water Supply	Community	7	1	P-7-14	7.51	0.002	0	0	0		
121	PP/NP/WAB/SEHI/CTP#10/Feb-15	Pipe Water Supply	Community	7	1	P-7-12	7.58	0.001	0	1	0		
139	PP/NP/WAB/SEHI/CTP#6/Feb-15	Pipe Water Supply	Community	6	1	P-6-11	7.46	0	0.03	0	1		
144	PP/NP/WAB/SEHI/Ins.TP#1/Feb-15	Pipe Water Supply	School	9	1	P-9-15	7.53	0.002	0.01	0	0		
146	PP/NP/WAB/SEHI/CWP/#10/SEP-14	Pipe Water Supply	Community	9	1	P-9-20	7.52	0	0.09	0	0		
146	PP/NP/WAB/SEHI/CWP/#10/SEP-14	Pipe Water Supply	Community	9	Field Duplicate of p-9-20	P-9-20-D	7.39	0.005	0.13	0	0		
158	PP/NP/WAB/SEHI/CWP#19/Dec-14	Pipe Water Supply	Community	4	1	P-4-3	7.55	0	0.19	0	0		
163	PP/NP/WAB/SEHI/CTP#12/Feb-15	Pipe Water Supply	Community	5	1	P-4-4	7.48	0	0.01	0	0		
166	PP/NP/WAB/SEHI/CTP#13/Feb-15	Pipe Water Supply	Community	5	1	P-5-7	7.59	0.003	0.08	0	0		
178	PP/NP/WAB/SEHI/CWP/#9/SEP-14	Pipe Water Supply	Community	4	1	P-4-1	7.56	0	0.09	2	1		
179	PP/NP/WAB/SEHI/IWP#03/Mar-15	Pipe Water Supply	Community	4	1	P-4-2	7.56	0.001	0.04	0	0		
180	PP/NP/WAB/SEHI/IWP#02/Mar-15	Pipe Water Supply	Community	5	1	P-5-8	7.59	0.005	0.49	0	0		
182	PP/NP/WAB/SEHI/CTP# 30/May-15	Pipe Water Supply	Community	8	1	P-9-19	7.55	0	0.05	0	0		
183	PP/NP/WAB/SEHI/CTP# 31/May-15	Pipe Water Supply	Community	8	1	P-9-18	7.56	0	0.04	0	0		
189	WAB/PP/NP/SEHI/CTP# 43/Jan-16	Pipe Water Supply	Community	6	1	P-6-9	7.45	0	0	0	0		
190	WAB/PP/NP/SEHI/IWP#6/Dec-15	Pipe Water Supply	School	8	1	P-8-16	7.6	0	0.05	0	0		
191	PP/NP/WAB/SEHI/CTP# 34/June-15	Pipe Water Supply	Community	7	1	P-7-13	7.65	0.002	0.4	0	0		
206	PP/NP/WAB/SEHI/CTP# 35/June-15	Pipe Water Supply	Community	5	1	P-5-6	7.38	0	0.04	0	0		
211	WAB/PP/NP/SEHI/CWP# 32/Feb-16	Pipe Water Supply	Community	5	1	P-5-5	7.52	0	0	0	0		

- Not Analyzed
- BOLD** exceeds WHO Guideline Value (2004)
- 0.05** exceeds Bangladesh Standard for Drinking Water (ECR'97)
- TTC Thermotolerant Coliforms (TTC), Unit - N/100mL
- FC Faecal Coliforms (FC), Unit- N/100mL
- N:B: pH has no unit

WATER ANALYTICAL RESULTS - Rain Water Harvesting System (RWHS)

Selected Drinking Water Parameters

Paikgacha Municipality, Khulna District, Bangladesh

GPS	Coordinate	Type of Water Options	Level	Ward No.	No. of Water Sample	Sample Id	pH	As (mg/L)	Fe (mg/L)	Coliform (Faecal) (N/100mL)	Coliform (Total) (N/100mL)	Turbidity (NTU)	Conductivity (µs/cm)
WHO Guideline Value (2004)							6.5-8.5	0.01	-	0	0	-	-
Bangladesh Standard for Drinking Water (ECR'97)							-	0.05	0.3-1	0	0	10	-
GPS	22.84505,89.05226	RWHS	Individual HH	4	1	R-4-1	7.45	0	0.27	0	0	3.8	227
GPS	22.84505,89.05226	RWHS	Individual HH	4	1	R-4-2	7.67	0	0.03	0	0	2.3	147.8
GPS	22.84505,89.05226	RWHS	Individual HH	9	1	R-9-3	8.05	0	0.28	4	0	3.58	113.7
GPS	22.58818,89.29754	RWHS	Individual HH	9	1	R-9-4	7.75	0	0.07	0	0	2.79	149.7
GPS	22.58422,89.30379	RWHS	Individual HH	9	1	R-9-5	7.8	0	0.04	0	0	2.75	98.1
GPS	22.58421,89.30326	RWHS	Individual HH	9	1	R-9-6	8.15	0	0.06	0	0	1.31	101.5
GPS	22.58904,89.32434	RWHS	Community	7	1	R-7-7	7.63	0.005	0.13	0	0	2.61	1079
GPS	22.60221,89.30925	RWHS	Individual HH	6	1	R-6-8	7.85	0	0.04	0	0	1.01	114.4
GPS	22.60221,89.30925	RWHS	School	6	1	R-6-9	8	0	0.08	0	0	1.93	122.3
GPS	22.60221,89.30925	RWHS	School	6	1	R-6-10	7.89	0	0.05	0	0	1.44	81.5
GPS	22.60221,89.30925	RWHS	Individual HH	5	1	R-5-11	7.7	0	0.36	0	0	2.06	109.1
GPS	22.60221,89.30925	RWHS	Individual HH	5	1	R-5-12	8.01	0	0.03	0	0	1.79	92.6
GPS	22.60221,89.30925	RWHS	Individual HH	5	1	R-5-13	8.55	0	0.06	0	0	1.79	106
GPS	22.60221,89.30925	RWHS	Individual HH	2	1	R-2-14	7.8	0	0.04	0	0	3.29	95.4
GPS	22.59790,89.31032	Tube Well Platform	Community	4	1	TW-4-1	7.34	0.03	1.06	0	0	-	-
GPS	22.60127,89.31061	Tube Well Platform	Community	3	1	TW-3-2	7.31	0.035	0.02	0	0	-	-

- Not Analyzed
BOLD exceeds WHO Guideline Value (2004)
0.05 exceeds Bangladesh Standard for Drinking Water (ECR'97)
TTC Thermotolerant Coliforms (TTC), Unit - N/100mL
FC Faecal Coliforms (FC), Unit- N/100mL
N:B: pH has no unit

FIELD DUPLICATE RPD CALCULATIONS - Arsenic Iron Removal Plant (AIRP)

Selected Drinking Water Parameters

Paikgacha Municipality, Khulna District, Bangladesh

	Sample ID	Units	RPD Alert Limits	A-4-19-H	A-4-19-H-D Field Duplicate of A-4-19-H	RPD
<i>Laboratory Sample No.</i>		na	na	<i>A-4-19-H</i>	<i>A-4-19-H-D</i>	<i>na</i>
<i>Sampling Date</i>		na	na	<i>12-Mar-16</i>	<i>12-Mar-16</i>	<i>na</i>
Arsenic (As)		mg/L	80%	0.002	0.002	nc
Iron (Fe)		mg/L	80%	0.85	0.59	36%
Coliform (Faecal)		(N/100mL)	80%	0	0	nc
Coliform (Total)		(N/100mL)	80%	0	0	nc

mg/L milligrams per litre
 < less than RDL
 RPD Relative Percent Difference (not calculated when one or both results are less than or equal to 5X RDL)
 na not applicable
 nc RPD not calculable
BOLD exceeds alert limit

FIELD DUPLICATE RPD CALCULATIONS - Pipe Water Supply
Selected Drinking Water Parameters
Paikgacha Municipality, Khulna District, Bangladesh

	Sample ID	Units	RPD Alert Limits	P-9-20	P-9-20-D Field Duplicate of P-9-20	RPD
<i>Laboratory Sample No.</i>		na	na	<i>P-9-20</i>	<i>A-4-19-H-D</i>	<i>na</i>
<i>Sampling Date</i>		na	na	<i>12-Mar-16</i>	<i>12-Mar-16</i>	<i>na</i>
Arsenic (As)		mg/L	80%	0	0.005	nc
Iron (Fe)		mg/L	80%	0.09	0.13	36%
Coliform (Faecal)		(N/100mL)	80%	0	0	nc
Coliform (Total)		(N/100mL)	80%	0	0	nc

mg/L milligrams per litre
< less than RDL
RPD Relative Percent Difference (not calculated when one or both results are less than or equal to 5X RDL)
na not applicable
nc RPD not calculable
BOLD exceeds alert limit

APPENDIX E

SUMMARY OF QUESTIONNAIRE SURVEY DATA PAIKGACHA, KHULNA

Summary of Questionnaire Survey Data - Paikgacha, Khulna

Statistics

		Respondent_Age	Family_Members	R_Income_Per_Month	Cost_of_Maintenance_Per_Month
N	Valid	270	270	270	270
	Missing	0	0	0	0
Mean		35.54	4.32	8316.67	35.76
Std. Deviation		9.402	1.253	5849.149	99.895

Frequency Table

Type_of_Interviewer

		Frequency	Valid Percent
Valid	User	192	71.1
	Management	6	2.2
	Household	72	26.7
	Total	270	100.0

Respondent_Sex

		Frequency	Valid Percent
Valid	Male	209	77.4
	Female	61	22.6
	Total	270	100.0

R_Marital_Status

		Frequency	Valid Percent
Valid	Married	260	96.3
	Unmarried	10	3.7
	Total	270	100.0

R_Education

		Frequency	Valid Percent
Valid	Illiterate	138	51.1
	Only Signature	2	.7
	Primary	25	9.3
	Junior Secondary	39	14.4
	SSC	23	8.5
	HSC	14	5.2
	Graduate	25	9.3
	Post Graduate	4	1.5
	Total	270	100.0

Family_Members

		Frequency	Valid Percent
Valid	2	11	4.1
	3	48	17.8
	4	108	40.0
	5	77	28.5
	6	13	4.8
	7	5	1.9
	8	3	1.1
	9	4	1.5
	10	1	.4
	Total	270	100.0

R_Income_Per_Month

		Frequency	Valid Percent
Valid	0	7	2.6
	2000	1	.4
	3000	22	8.1
	3500	1	.4
	4000	21	7.8
	5000	45	16.7
	6000	49	18.1
	7000	14	5.2
	8000	20	7.4
	9000	5	1.9
	10000	42	15.6
	12000	2	.7
	15000	11	4.1
	16000	1	.4
	18000	1	.4
	20000	20	7.4
	25000	5	1.9
	30000	2	.7
	40000	1	.4
	Total	270	100.0

R_Profession

		Frequency	Valid Percent
Valid	Student	6	2.2
	Business	70	25.9
	Farmer	26	9.6
	Government Service	21	7.8
	NonGovernment Service	17	6.3
	Others	130	48.1
	Total	270	100.0

Any_Treatment_of_Water

	Frequency	Valid Percent
Valid Yes	252	93.3
No	18	6.7
Total	270	100.0

Treatment_Process

	Frequency	Valid Percent
Valid AIRP	37	13.7
RWHS	20	7.4
Others	213	78.9
Total	270	100.0

Water_Supply_Point

	Frequency	Valid Percent
Valid Fuctional	270	100.0

Hygiene_Status

	Frequency	Valid Percent
Valid Hygiene	268	99.3
Not Hygiene	2	.7
Total	270	100.0

Water_Source

	Frequency	Valid Percent
Valid Tap Point	81	30.0
Tube well	36	13.3
RWHS	20	7.4
Others	133	49.3
Total	270	100.0

Collection_Point

	Frequency	Valid Percent
Valid Household	119	44.1
Community	146	54.1
Institutional	5	1.9
Total	270	100.0

Consumption

	Frequency	Valid Percent
Valid Less than 20 litre	267	98.9
Greater than 20 litre	3	1.1
Total	270	100.0

Collection_Frequency

	Frequency	Valid Percent
Valid 1-2 times	267	98.9
3-5 times	1	.4
Greater than 5 times	2	.7
Total	270	100.0

Do_You_Need_More_Water_Or_Water_Points

	Frequency	Valid Percent
Valid Yes	144	53.3
No	126	46.7
Total	270	100.0

Do_You_Stand_Long_Time_in_Water_Points

	Frequency	Valid Percent
Valid Yes	69	25.6
No	201	74.4
Total	270	100.0

Did_You_Recive_Any_Training

	Frequency	Valid Percent
Valid Yes	31	11.5
No	239	88.5
Total	270	100.0

Maintenance_Frequency

	Frequency	Valid Percent
Valid 0	3	1.1
1	267	98.9
Total	270	100.0

Any_Maintenance_Difficulties

	Frequency	Valid Percent
Valid Yes	36	13.3
No	234	86.7
Total	270	100.0

Cost_of_Maintenance_Per_Month

	Frequency	Valid Percent
Valid 0	76	28.1
7	2	.7
8	1	.4
10	32	11.9
15	6	2.2
20	50	18.5
25	15	5.6
30	33	12.2
32	20	7.4
35	1	.4
40	2	.7
50	9	3.3
60	8	3.0
62	1	.4
80	1	.4
100	2	.7
150	1	.4
160	3	1.1
400	1	.4
500	3	1.1
600	1	.4
700	1	.4
1000	1	.4
Total	270	100.0

Frequency_of_Water_Test

	Frequency	Valid Percent
Valid 0	268	99.3
2	2	.7
Total	270	100.0

Are_You_Satisfied

	Frequency	Valid Percent
Valid Yes	270	100.0

Do_You_Want_to_Continue_This_System

	Frequency	Valid Percent
Valid Yes	268	99.3
No	2	.7
Total	270	100.0

Do_You_Pay

	Frequency	Valid Percent
Valid Yes	247	91.5
No	23	8.5
Total	270	100.0

Do_You_Want_To_Pay_For_Water

	Frequency	Valid Percent
Valid Yes	242	89.6
No	28	10.4
Total	270	100.0

Word_No

	Frequency	Valid Percent
Valid 1	11	4.1
4	104	38.5
5	26	9.6
6	47	17.4
7	29	10.7
8	19	7.0
9	34	12.6
Total	270	100.0

APPENDIX F

WATER ANALYTICAL RESULTS KALAROA MUNICIPALITY, SATKHIRA DISTRICT

WATER ANALYTICAL RESULTS

Selected Drinking Water Parameters

Kalaroa Municipality, Satkhira District, Bangladesh

Ward No.	Project Unit ID	Name of Water Option	Level	Name of Community	No. of Water Sample	Sample ID	pH	As (mg/L)	Fe (mg/L)	Coliform (Faecal) (N/100mL)	Coliform (Total) (N/100mL)
WHO Guideline Value (2004)							6.5-8.5	0.01	-	0	0
Bangladesh Standard for Drinking Water (ECR'97)							-	0.05	0.3-1	0	0
1	5	Arsenic Iron Removal Plant (AIRP)	Community	Tulsi Danga Paschim para-1	1	T-1-1	7.36	0.015	0.02	2	12
					1 (Raw)	R-1-1	7.19	0.075	3.56	1	0
	12	Arsenic Iron Removal Plant (AIRP)	School	Kolaroa Model School	-	-	-	-	-	-	-
	14	Arsenic Iron Removal Plant (AIRP)	Community	Tulsi Danga Paschim para-2	Lab Duplicate	T-1-14LD	7.25	0.02	0	6	4
					1	T-1-14	7.25	0.02	0	1	26
2	33	Arsenic Iron Removal Plant (AIRP)	School	Amanullah College	-	-	-	-	-	-	-
	2	Arsenic Iron Removal Plant (AIRP)	Community	Sarder Para-01	1	T-2-2	7.29	0.08	0.55	8	24
	17	Arsenic Iron Removal Plant (AIRP)	Community	Tulshdanga Ghosh para	1	T-2-17	7.34	0.02	0.14	3	20
					1 (Raw)	R-2-17	7.15	0.09	5.18	0	20
	21	Arsenic Iron Removal Plant (AIRP)	School	Kalaroa Shisu Lab. School	-	-	-	-	-	-	-
3	31	Arsenic Iron Removal Plant (AIRP)	School	Tulshidanga Govt Primary School	1	T-2-31	7.39	0.075	0.1	8	16
	34	Arsenic Iron Removal Plant (AIRP)	School	Kalaroa pilot girls high School	-	-	-	-	-	-	-
	4	Arsenic Iron Removal Plant (AIRP)	School	Kolaroa Govt. Primary School	1	T-3-4	7.32	0.025	0.43	2	3
	9	Arsenic Iron Removal Plant (AIRP)	Community	College para -02	1	T-3-9	7.41	0	0.06	1	6
	11	Arsenic Iron Removal Plant (AIRP)	School	GKMK Pilot High School	-	-	-	-	-	-	-
4	27	Arsenic Iron Removal Plant (AIRP)	Community	Godokhali College para-4	1	T-3-27	7.37	0.002	0.02	0	27
					1	T-3-36	7.28	0.025	0.37	8	13
	36	Godokhali Sidko Plant	Community	Godokhali	1 (Raw)	R-3-36	7.14	0.08	3.38	0	20
4	15	Arsenic Iron Removal Plant (AIRP)	Community	Zhikra Poschim (west) para	1	T-4-15	7.35	0.01	0.41	3	24
	25	Arsenic Iron Removal Plant (AIRP)	Community	Jhikra Sana Para	-	-	-	-	-	-	-
	28	Arsenic Iron Removal Plant (AIRP)	Community	Jhikra Moddho para	1	T-4-28	7.41	0	0.03	3	10

- Not Analyzed

BOLD exceeds WHO Guideline Value (2004)

0.05 exceeds Bangladesh Standard for Drinking Water (ECR'97)

TTC Thermotolerant Coliforms (TTC), Unit - N/100mL

FC Faecal Coliforms (FC), Unit- N/100mL

N:B: pH has no unit

WATER ANALYTICAL RESULTS

Selected Drinking Water Parameters

Kalaroa Municipality, Satkhira District, Bangladesh

Ward No.	Project Unit ID	Name of Water Option	Level	Name of Community	No. of Water Sample	Sample ID	pH	As (mg/L)	Fe (mg/L)	Coliform (Faecal) (N/100mL)	Coliform (Total) (N/100mL)
WHO Guideline Value (2004)							6.5-8.5	0.01	-	0	0
Bangladesh Standard for Drinking Water (ECR'97)							-	0.05	0.3-1	0	0
5	1	Arsenic Iron Removal Plant (AIRP)	Community	Paruipara	-	-	-	-	-	-	-
	3	Arsenic Iron Removal Plant (AIRP)	Community	Guchho Gram	-	-	-	-	-	-	-
	13	Arsenic Iron Removal Plant (AIRP)	School	Kolaroa Pre Cadate School	1	T-5-13	7.35	0.005	0.31	5	25
	16	Arsenic Iron Removal Plant (AIRP)	Community	Sheikh & kha para	1	T-5-16	7.4	0	0.04	0	60
					1 (Raw)	R-5-16	7.14	0.02	0.46	0	3
	18	Arsenic Iron Removal Plant (AIRP)	Community	Karigor & Dhabok para	1	T-5-18	7.38	0.002	0.02	0	23
	24	Arsenic Iron Removal Plant (AIRP)	Community	Jhikra Professor Para	1	T-5-24	7.37	0.015	0.03	1	19
29	Arsenic Iron Removal Plant (AIRP)	Community	Jhikra Gain & Gorosthan para	1	T-5-29	7.4	0	0.08	3	17	
6	7	Arsenic Iron Removal Plant (AIRP)	Community	Gopinath pur Daxin (south) para-1	-	-	-	-	-	-	-
	10	Arsenic Iron Removal Plant (AIRP)	Community	Gopinath pur Gosh para	-	-	-	-	-	-	-
	23	Arsenic Iron Removal Plant (AIRP)	Community	Gopinatpur Majher Para	1	T-6-23	7.39	0.02	0.09	9	14
					1	T-6-30	7.3	0.01	0.04	3	8
	30	Arsenic Iron Removal Plant (AIRP)	School	Gpinathpur Govt Primary School	1	T-6-30A	7.29	0.01	0.04	3	20
	32	Arsenic Iron Removal Plant (AIRP)	Community	Gopinatpur Mollik & Sarder para	1	T-6-32	7.37	0.02	0.02	4	1
32	Arsenic Iron Removal Plant (AIRP)	Community	Gopinatpur Mollik & Sarder para	1 (Raw)	R-6-32	7.14	0.075	5.45	8	13	
7	8	Arsenic Iron Removal Plant (AIRP)	Community	Raibingsi Para	1	T-7-8	7.47	0.075	0.07	24	23
	20	Arsenic Iron Removal Plant (AIRP)	Community	Murarikati Karigor para	-	-	-	-	-	-	-
8	19	Arsenic Iron Removal Plant (AIRP)	School	United High School	-	-	-	-	-	-	-
	26	Arsenic Iron Removal Plant (AIRP)	Community	Murarikati Sarder para	1	T-8-35	7.33	0.06	0.11	0	0
					1 (Raw)	R-8-35	7.26	0.09	2.07	1	14
	35	Murari kati Sidko Plant	Community	Murarikati	1	T-8-35A	7.32	0.075	0.11	0	31
9	6	Arsenic Iron Removal Plant (AIRP)	Community	Mirzapur Paschimpara-02	1	-	-	-	-	-	-
	22	Arsenic Iron Removal Plant (AIRP)	Community	Mirzapur Paschimpara-01	1	T-9-22	7.45	0.015	0.1	2	12
					1	T-9-37	7.28	0	0.11	2	23
	37	Mirzapur Drink well system	Community	Mirzapur	1 (Raw)	R-9-37	7.18	0.08	3.98	0	15

- Not Analyzed

BOLD exceeds WHO Guideline Value (2004)

0.05 exceeds Bangladesh Standard for Drinking Water (ECR'97)

TTC Thermotolerant Coliforms (TTC), Unit - N/100mL

FC Faecal Coliforms (FC), Unit- N/100mL

N:B: pH has no unit

FIELD DUPLICATE RPD CALCULATIONS - Arsenic Iron Removal Plant (AIRP)

Selected Drinking Water Parameters

Kalaroa Municipality, Satkhira District, Bangladesh

	Sample ID	Units	RPD Alert Limits	T-6-30	T-6-30A Field Duplicate of T-6-30	RPD
<i>Laboratory Sample No.</i>		na	na	<i>T-6-30</i>	<i>T-6-30A</i>	<i>na</i>
<i>Sampling Date</i>		na	na	<i>10-Mar-16</i>	<i>10-Mar-16</i>	<i>na</i>
Arsenic (As)		mg/L	80%	0.01	0.01	0%
Iron (Fe)		mg/L	80%	0.04	0.04	0%
Coliform (Faecal)		(N/100mL)	80%	3	3	nc
Coliform (Total)		(N/100mL)	80%	8	20	86%

mg/L milligrams per litre
 < less than RDL
 RPD Relative Percent Difference (not calculated when one or both results are less than or equal to 5X RDL)
 na not applicable
 nc RPD not calculable
BOLD exceeds alert limit

FIELD DUPLICATE RPD CALCULATIONS - Arsenic Iron Removal Plant (AIRP)

Selected Drinking Water Parameters

Kalaroa Municipality, Satkhira District, Bangladesh

	Sample ID	Units	RPD Alert Limits	T-8-35	T-8-35A Field Duplicate of T-8-35	RPD
<i>Laboratory Sample No.</i>		na	na	<i>T-8-35</i>	<i>T-8-35A</i>	<i>na</i>
<i>Sampling Date</i>		na	na	<i>10-Mar-16</i>	<i>10-Mar-16</i>	<i>na</i>
Arsenic (As)		mg/L	80%	0.06	0.075	22%
Iron (Fe)		mg/L	80%	0.11	0.11	0%
Coliform (Faecal)		(N/100mL)	80%	0	0	nc
Coliform (Total)		(N/100mL)	80%	0	31	nc

mg/L milligrams per litre
 < less than RDL
 RPD Relative Percent Difference (not calculated when one or both results are less than or equal to 5X RDL)
 na not applicable
 nc RPD not calculable
BOLD exceeds alert limit

LAB DUPLICATE RPD CALCULATIONS - Asevic Iron Removal Plant (AIRP)

Selected Drinking Water Parameters

Kalaroa Municipality, Satkhira District, Bangladesh

	Sample ID	Units	RPD Alert Limits	T-1-14	T-1-14LD Lab Duplicate of T-1-14	RPD
<i>Laboratory Sample No.</i>		na	na	<i>T-1-14</i>	<i>T-1-14D</i>	<i>na</i>
<i>Sampling Date</i>		na	na	<i>10-Mar-16</i>	<i>10-Mar-16</i>	<i>na</i>
Arsenic (As)		mg/L	80%	0.02	0.02	0%
Iron (Fe)		mg/L	80%	0	0	nc
Coliform (Faecal)		(N/100mL)	80%	6	1	nc
Coliform (Total)		(N/100mL)	80%	4	26	nc

mg/L milligrams per litre
 < less than RDL
 RPD Relative Percent Difference (not calculated when one or both results are less than or equal to 5X RDL)
 na not applicable
 nc RPD not calculable
BOLD exceeds alert limit

APPENDIX G

SUMMARY OF QUESTIONNAIRE SURVEY DATA KALAROA, SATKHIRA

Summary of Questionnaire Survey Data - Kalaroa, Satkhira

Statistics

		Respondent_Age	Family_Memb ers	R_Income_Pe r_Month	Cost_of_Maint enance_Per_ Month
N	Valid	273	273	265	273
	Missing	0	0	8	0
Mean		39.26	4.74	10212.08	20.00
Std. Deviation		14.055	1.941	6640.532	.000

Frequency Table

Type_of_Interviewer

		Frequency	Valid Percent
Valid	User	268	98.2
	Management	5	1.8
	Total	273	100.0

Respondent_Sex

		Frequency	Valid Percent
Valid	Male	157	57.5
	Female	116	42.5
	Total	273	100.0

R_Marital_Status

		Frequency	Valid Percent
Valid	Married	263	96.3
	Unmarried	10	3.7
	Total	273	100.0

R_Education

	Frequency	Valid Percent
Valid Illiterate	87	31.9
Only Signature	18	6.6
Primary	41	15.0
Junior Secondary	57	20.9
SSC	32	11.7
HSC	14	5.1
Graduate	19	7.0
Post Graduate	5	1.8
Total	273	100.0

Family_Members

	Frequency	Valid Percent
Valid 2	15	5.5
3	42	15.4
4	96	35.2
5	61	22.3
6	25	9.2
7	11	4.0
8	10	3.7
9	3	1.1
10	4	1.5
11	3	1.1
12	1	.4
14	1	.4
15	1	.4
Total	273	100.0

R_Income_Per_Month

		Frequency	Valid Percent
Valid	0	4	1.5
	1200	1	.4
	1500	1	.4
	2000	2	.8
	3000	3	1.1
	3500	3	1.1
	4000	5	1.9
	5000	41	15.5
	6000	40	15.1
	7000	13	4.9
	8000	13	4.9
	9000	9	3.4
	10000	51	19.2
	11000	4	1.5
	12000	12	4.5
	13000	1	.4
	14000	2	.8
	15000	21	7.9
	16000	2	.8
	18000	1	.4
	20000	26	9.8
	25000	5	1.9
	30000	2	.8
	40000	2	.8
	50000	1	.4
	Total	265	100.0
Missing	System	8	
Total		273	

R_Profession

		Frequency	Valid Percent
Valid	Student	10	3.7
	Business	58	21.2
	Farmer	62	22.7
	Government Service	10	3.7
	NonGovernment Service	29	10.6
	Others	104	38.1
	Total	273	100.0

Any_Treatment_of_Water

	Frequency	Valid Percent
Valid Yes	273	100.0

Treatment_Process

	Frequency	Valid Percent
Valid AIRP	273	100.0

Water_Supply_Point

	Frequency	Valid Percent
Valid Fuctional	273	100.0

Hygiene_Status

	Frequency	Valid Percent
Valid Hygiene	273	100.0

Water_Source

	Frequency	Valid Percent
Valid Tube well	273	100.0

Collection_Point

	Frequency	Valid Percent
Valid Community	273	100.0

Consumption

	Frequency	Valid Percent
Valid Less than 20 litre	273	100.0

Collection_Frequency

	Frequency	Valid Percent
Valid 1-2 times	273	100.0

Do_You_Need_More_Water_Or_Water_Points

	Frequency	Valid Percent
Valid Yes	141	51.6
No	132	48.4
Total	273	100.0

Do_You_Stand_Long_Time_in_Water_Points

	Frequency	Valid Percent
Valid Yes	139	50.9
No	134	49.1
Total	273	100.0

Did_You_Recive_Any_Training

	Frequency	Valid Percent
Valid Yes	61	22.3
No	212	77.7
Total	273	100.0

Maintenance_Frequency

	Frequency	Valid Percent
Valid 1	273	100.0

Any_Maintenance_Difficulties

	Frequency	Valid Percent
Valid Yes	20	7.3
No	252	92.3
Total	273	100.0

Cost_of_Maintenance_Per_Month

	Frequency	Valid Percent
Valid 20	273	100.0

Frequency_of_Water_Test

	Frequency	Valid Percent
Valid 0	273	100.0

Are_You_Satisfied

	Frequency	Valid Percent
Valid Yse	273	100.0

Do_You_Want_to_Continue_This_System

	Frequency	Valid Percent
Valid Yse	273	100.0

Do_You_Pay

	Frequency	Valid Percent
Valid Yes	273	100.0

Do_You_Want_To_Pay_For_Water

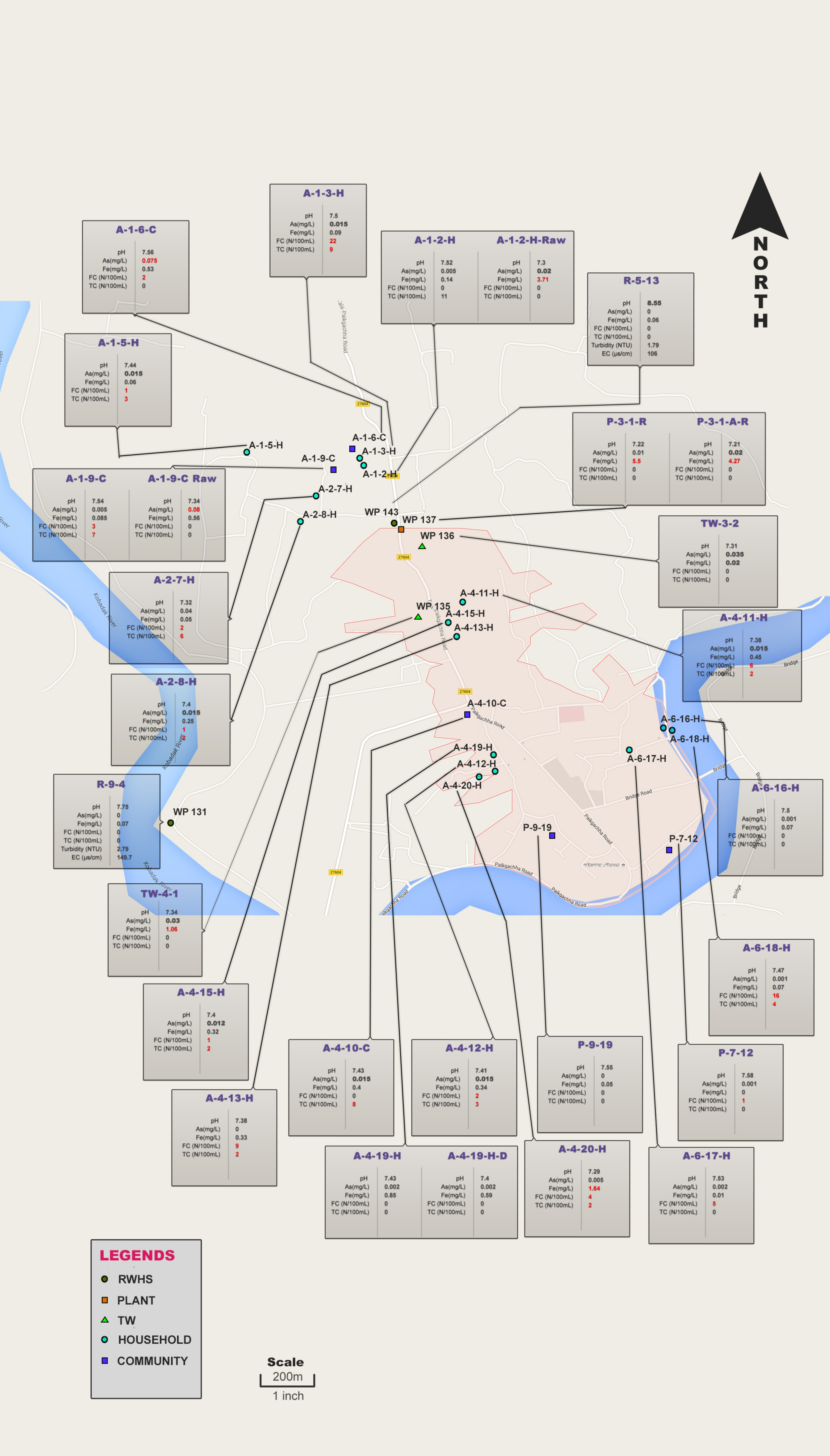
	Frequency	Valid Percent
Valid Yes	118	43.2
No	155	56.8
Total	273	100.0

WORD_NUMBER

	Frequency	Valid Percent
Valid 1	31	11.4
2	28	10.3
3	57	20.9
4	21	7.7
5	31	11.4
6	26	9.5
7	13	4.8
8	47	17.2
9	19	7.0
Total	273	100.0

APPENDIX H

SAMPLE LOCATION PLAN PAIKGACHA MUNICIPALITY, KHULNA DISTRICT



LEGENDS

- RWHS
- PLANT
- ▲ TW
- HOUSEHOLD
- COMMUNITY

Scale
 200m
 1 inch

A-1-6-C

pH	7.56
As(mg/L)	0.075
Fe(mg/L)	0.53
FC (N/100mL)	2
TC (N/100mL)	0

A-1-3-H

pH	7.5
As(mg/L)	0.015
Fe(mg/L)	0.09
FC (N/100mL)	22
TC (N/100mL)	9

A-1-2-H		A-1-2-H-Raw	
pH	7.52	pH	7.3
As(mg/L)	0.005	As(mg/L)	0.02
Fe(mg/L)	0.14	Fe(mg/L)	3.71
FC (N/100mL)	0	FC (N/100mL)	0
TC (N/100mL)	11	TC (N/100mL)	0

R-5-13

pH	8.55
As(mg/L)	0
Fe(mg/L)	0.06
FC (N/100mL)	0
TC (N/100mL)	0
Turbidity (NTU)	1.79
EC (µs/cm)	106

A-1-5-H

pH	7.44
As(mg/L)	0.015
Fe(mg/L)	0.06
FC (N/100mL)	1
TC (N/100mL)	3

P-3-1-R		P-3-1-A-R	
pH	7.22	pH	7.21
As(mg/L)	0.01	As(mg/L)	0.02
Fe(mg/L)	5.5	Fe(mg/L)	4.27
FC (N/100mL)	0	FC (N/100mL)	0
TC (N/100mL)	0	TC (N/100mL)	0

A-1-9-C		A-1-9-C Raw	
pH	7.54	pH	7.34
As(mg/L)	0.005	As(mg/L)	0.08
Fe(mg/L)	0.085	Fe(mg/L)	0.56
FC (N/100mL)	3	FC (N/100mL)	0
TC (N/100mL)	7	TC (N/100mL)	0

TW-3-2

pH	7.31
As(mg/L)	0.035
Fe(mg/L)	0.02
FC (N/100mL)	0
TC (N/100mL)	0

A-2-7-H

pH	7.32
As(mg/L)	0.04
Fe(mg/L)	0.05
FC (N/100mL)	2
TC (N/100mL)	6

A-4-11-H

pH	7.38
As(mg/L)	0.015
Fe(mg/L)	0.45
FC (N/100mL)	6
TC (N/100mL)	2

A-2-8-H

pH	7.4
As(mg/L)	0.015
Fe(mg/L)	0.25
FC (N/100mL)	1
TC (N/100mL)	0

R-9-4

pH	7.75
As(mg/L)	0
Fe(mg/L)	0.07
FC (N/100mL)	0
TC (N/100mL)	0
Turbidity (NTU)	2.79
EC (µs/cm)	149.7

A-6-16-H

pH	7.5
As(mg/L)	0.001
Fe(mg/L)	0.07
FC (N/100mL)	0
TC (N/100mL)	0

TW-4-1

pH	7.34
As(mg/L)	0.03
Fe(mg/L)	1.06
FC (N/100mL)	0
TC (N/100mL)	0

A-4-15-H

pH	7.4
As(mg/L)	0.012
Fe(mg/L)	0.32
FC (N/100mL)	1
TC (N/100mL)	2

A-4-10-C

pH	7.43
As(mg/L)	0.015
Fe(mg/L)	0.4
FC (N/100mL)	0
TC (N/100mL)	8

A-4-12-H

pH	7.41
As(mg/L)	0.015
Fe(mg/L)	0.34
FC (N/100mL)	2
TC (N/100mL)	3

P-9-19

pH	7.55
As(mg/L)	0
Fe(mg/L)	0.05
FC (N/100mL)	0
TC (N/100mL)	0

P-7-12

pH	7.58
As(mg/L)	0.001
Fe(mg/L)	0
FC (N/100mL)	1
TC (N/100mL)	0

A-6-18-H

pH	7.47
As(mg/L)	0.001
Fe(mg/L)	0.07
FC (N/100mL)	16
TC (N/100mL)	4

A-4-13-H

pH	7.38
As(mg/L)	0
Fe(mg/L)	0.33
FC (N/100mL)	9
TC (N/100mL)	2

A-4-19-H

pH	7.43
As(mg/L)	0.002
Fe(mg/L)	0.85
FC (N/100mL)	0
TC (N/100mL)	0

A-4-19-H-D

pH	7.4
As(mg/L)	0.002
Fe(mg/L)	0.59
FC (N/100mL)	0
TC (N/100mL)	0

A-4-20-H

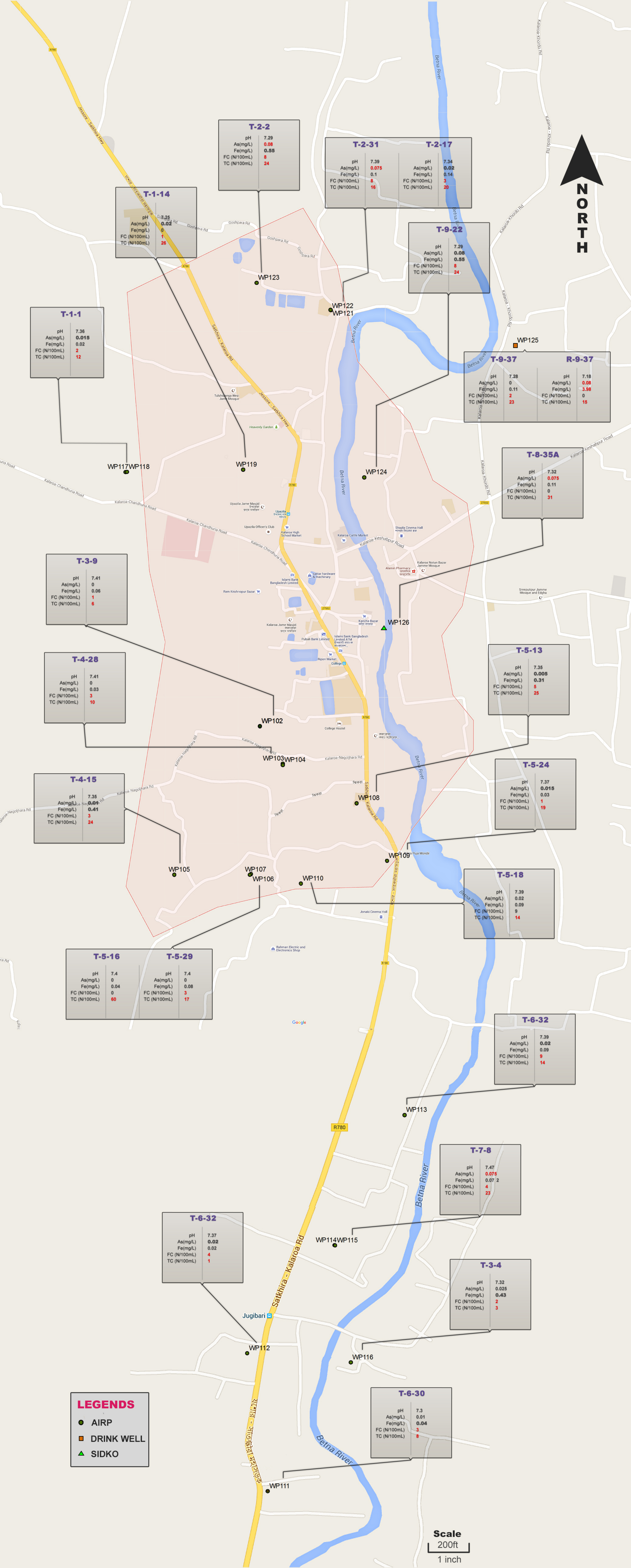
pH	7.29
As(mg/L)	0.005
Fe(mg/L)	1.64
FC (N/100mL)	4
TC (N/100mL)	2

A-6-17-H

pH	7.53
As(mg/L)	0.002
Fe(mg/L)	0.01
FC (N/100mL)	5
TC (N/100mL)	0

APPENDIX I

SAMPLE LOCATION PLAN KALAROA MUNICIPALITY, SATKHIRA DISTRICT



LEGENDS

- AIRP
- DRINK WELL
- SIDKO

Scale
200ft
1 inch

T-2-2

pH	7.29
As(mg/L)	0.08
Fe(mg/L)	0.55
FC (N/100mL)	8
TC (N/100mL)	24

T-2-31		T-2-17	
pH	7.39	pH	7.34
As(mg/L)	0.075	As(mg/L)	0.02
Fe(mg/L)	0.1	Fe(mg/L)	0.14
FC (N/100mL)	8	FC (N/100mL)	3
TC (N/100mL)	16	TC (N/100mL)	20

T-1-14

pH	7.25
As(mg/L)	0.02
Fe(mg/L)	0
FC (N/100mL)	1
TC (N/100mL)	26

T-9-22

pH	7.29
As(mg/L)	0.08
Fe(mg/L)	0.55
FC (N/100mL)	8
TC (N/100mL)	24

T-1-1

pH	7.36
As(mg/L)	0.015
Fe(mg/L)	0.02
FC (N/100mL)	2
TC (N/100mL)	12

T-9-37		R-9-37	
pH	7.28	pH	7.18
As(mg/L)	0	As(mg/L)	0.08
Fe(mg/L)	0.11	Fe(mg/L)	3.98
FC (N/100mL)	2	FC (N/100mL)	0
TC (N/100mL)	23	TC (N/100mL)	15

T-8-35A

pH	7.32
As(mg/L)	0.075
Fe(mg/L)	0.11
FC (N/100mL)	0
TC (N/100mL)	31

T-3-9

pH	7.41
As(mg/L)	0
Fe(mg/L)	0.06
FC (N/100mL)	1
TC (N/100mL)	6

T-4-28

pH	7.41
As(mg/L)	0
Fe(mg/L)	0.03
FC (N/100mL)	3
TC (N/100mL)	10

T-5-13

pH	7.35
As(mg/L)	0.005
Fe(mg/L)	0.31
FC (N/100mL)	5
TC (N/100mL)	25

T-4-15

pH	7.35
As(mg/L)	0.01
Fe(mg/L)	0.41
FC (N/100mL)	3
TC (N/100mL)	24

T-5-24

pH	7.37
As(mg/L)	0.015
Fe(mg/L)	0.03
FC (N/100mL)	1
TC (N/100mL)	19

T-5-18

pH	7.39
As(mg/L)	0.02
Fe(mg/L)	0.09
FC (N/100mL)	9
TC (N/100mL)	14

T-5-16		T-5-29	
pH	7.4	pH	7.4
As(mg/L)	0	As(mg/L)	0
Fe(mg/L)	0.04	Fe(mg/L)	0.08
FC (N/100mL)	0	FC (N/100mL)	3
TC (N/100mL)	60	TC (N/100mL)	17

T-6-32

pH	7.39
As(mg/L)	0.02
Fe(mg/L)	0.09
FC (N/100mL)	9
TC (N/100mL)	14

T-6-32

pH	7.37
As(mg/L)	0.02
Fe(mg/L)	0.02
FC (N/100mL)	4
TC (N/100mL)	1

T-7-8

pH	7.47
As(mg/L)	0.075
Fe(mg/L)	0.072
FC (N/100mL)	4
TC (N/100mL)	23

T-3-4

pH	7.32
As(mg/L)	0.025
Fe(mg/L)	0.43
FC (N/100mL)	2
TC (N/100mL)	3

T-6-30

pH	7.3
As(mg/L)	0.01
Fe(mg/L)	0.04
FC (N/100mL)	3
TC (N/100mL)	8

APPENDIX J

SITE PHOTOGRAPHS PAIKGACHA AND KALAROA



Picture 1: Household Rain Water Harvesting System at Paikgacha



Picture 2: Household Rain Water Harvesting System at Paikgacha



Picture 3: Community based Rain Water Harvesting System at Paikgacha



Picture 4: Household based Tap Point at Paikgacha



Picture 5: Community based Water Point at Paikgacha



Picture 6: Water treatment plant at Paikgacha



Picture 7: Water treatment plant at Paikgacha



Picture 8: Household based AIRP unit at Paikgacha



Picture 9: Community based AIRP unit at Kalaroa



Picture 10: Community based Drinking Well system at Kalaroa



Picture 11: Community based Sidko Plant at Kalaroa

