5.6 Core Sample Analysis

5.6.1 Geological Features of Core Samples

The core boring was carried out up to a depth of 300 m in Chuadanga, Damurhuda, Moheshpur, Jhenaidah, Jessore and Keshabpur. Those strata were classified into five formations, i.e. from E formation to A formation in ascending order as shown in Table 5.1.1 in **Section 5.1**. Table 5.6.1 shows the geological feature of stratigraphy in each core boring site. Figures 5.6.1 to 5.6.6 show the geological columnar section in each core boring site.

1) Chuadanga [CH-2 Site, Girls College]

a. E formation

It mainly consists of fine to medium sand and medium to coarse sand and is gray in color. The upper part is intercalated by clay layers, silt layers and alternation (silt and fine sand). The middle part is intercalated by very fine to fine sand. This layer has a thickness of 92.50 m+.

Parallel laminae are developed at some horizons. Cross laminae are partly developed. Gravels (orthoquartzite) 1 to 3 cm in diameter are contained at the top, middle and bottom of the layer. Tube-shaped trace fossils are contained in the lower part of the layer. A few wooden fragments (max 1 cm) are contained. Silt blocks 0.5 to 6 cm in diameter are contained at some horizons.

b. D formation

b.1. D2 member

It consists of fine to medium sand with pebble and is gray and dark olive gray in color. It is intercalated by medium to coarse sand layers 40 cm thick. This layer has a thickness of 12.5 m.

Parallel laminae are developed in this member. Gravels (orthoquartzite) 1 to 5 cm in diameter are contained at some horizons. Silt blocks 0.5 to 6 cm in diameter are contained in the upper part of layer.

b.2 D1 member

It consists of fine to medium sand and is gray in color. It is intercalated by very fine to fine sand beds 17 to 30 cm thick in the lower part of the layer. This layer has a thickness of 31 m.

Parallel laminae are developed in this member. Silt blocks 2 to 5 cm in diameter are contained in the top and lower part of the layer.

c. C formation

It mainly consists of fine sand, fine to medium sand with pebble and gravel and is gray, dark olive gray and grayish olive in color. The lower part is intercalated by reddish gray laminae with heavy minerals 0.5 cm thick. The upper part is intercalated by silt layers and peaty silt layers, 13 to 15 cm thick. This layer has a thickness of 61.5 m.

Gravels (orthoquartzite) 0.5 to 7 cm in diameter are contained in this formation. Shell fragments are contained in the upper part. Tube-shaped trace fossils with a 1 to 3 cm internal diameter are contained in the upper part of the layer. A few wooden fragments (1 cm) are contained.

d. B formation

It mainly consists of very fine to fine sand, fine to medium sand and medium sand and is gray, olive gray and grayish olive in color. It is intercalated by silt layers and sandy silt layers, 2 to 13 cm thick. The upper part is intercalated by coarse sand layers, 8 to 90 cm thick. This layer has a thickness of 59.88 m.

Many mica are contained in the layer. Parallel laminae are developed in this formation. Gravels (orthoquartzite) 0.5 to 5 cm in diameter are contained in the lower part of the layer. Tube-shaped trace fossils with a 1 to 3 cm internal diameter are contained in the top and lower part of the layer. Wooden fragments (max 1 cm) are contained. Clay and silt blocks 1 to 5 cm in diameter are partly contained.

e. A formation

e.1 A2 member

It mainly consists of very fine sand and fine sand and is gray, olive gray and grayish olive in color. It is intercalated by clay layers and silt layers, 1 to 8 cm thick. It is intercalated by fine to medium sand layers and medium to coarse sand layers that are 10 to 75 cm thick. This layer has a thickness of 35.02 m.

Many mica minerals are contained in the layer. Tube-shaped trace fossils with a 1 to 5 cm internal diameter are contained in this member. Wooden fragments (max 1 cm) are contained. Clay and silt blocks 2 to 6 cm in diameter are contained.

e.2. A1 member

It mainly consists of clay and silt, and is gray and olive brown in color. This layer has a thickness of 7.6 m.

Tube-shaped trace fossils with a 0.5 cm internal diameter are contained.

2) Damurhuda [CH-BD Site, Bara Dudpatila Village]

a. E formation

The lower part mainly consists of very fine to fine sand that is gray and olive gray in color. The upper part mainly consists of fine sand and fine to medium sand, and is gray, olive gray and dark olive gray in color. It is intercalated by silt layers, very fine sand layers and alternations (silt and very fine sand), 0.5 to 50 cm thick. It is intercalated by medium sand layers and coarse sand layers, 7 to 65 cm thick. This layer has a thickness of 79 m.

Parallel laminae are developed in this formation. Gravels (orthoquartzite), 0.5 to 5 cm in diameter, are partly contained. A few wooden fragments (max 1 cm) are contained. Clay and silt blocks 1 to 6 cm in diameter are contained at some horizons.

b. D formation

b.1. D2 member

It consists of fine to medium sand with pebble and medium to coarse sand with pebble, and is gray in color. It is intercalated by very fine to fine sand layers 7 to 20 cm thick. This layer has a thickness of 13 m.

Parallel laminae are developed in this member. Gravels (orthoquartzite) 0.5 to 6 cm in diameter are contained in this member. A few silt blocks 4 cm in diameter are contained.

b.2. D1 member

It consists of fine sand and fine to medium sand, and is gray in color. It is intercalated by silt layers and very fine sand layers that are 5 to 10 cm thick. This layer has a thickness of 39 m.

Parallel laminae are developed in this member. A few tube-shaped trace fossils with a 2 cm internal diameter are contained in the lower part of the layer. A few wooden fragments (1 cm) are contained in the upper part of the layer. Clay blocks 0.4 cm in diameter are partly contained. Silt blocks, 1 to 2 cm in diameter, are partly contained.

c. C formation

It mainly consists of fine to medium sand with pebble and medium to coarse sand with pebble, and is gray in color. It is intercalated by silt layers and very fine sand layers, 8 to 45 cm thick. This layer has a thickness of 65 m.

Parallel laminae are developed in the upper part of the layer. Gravels (orthoquartzite) 0.5 to 7 cm in diameter are contained in this formation. A little wooden fragments (1 cm) are contained.

d. B formation

The lower part mainly consists of fine sand and fine to medium sand, and is gray in color. The upper part mainly consists of fine sand, and is gray in color. It is intercalated by very fine sand layers and very fine to fine sand layers, 5 to 20 cm thick. It is intercalated by medium sand layers and medium to coarse sand layers, 15 to 80 cm thick. This layer has a thickness of 69 m.

Many mica minerals are contained in the layer. Parallel and cross laminae are developed in the upper part of the layer. Gravels (orthoquartzite) 0.5 to 5 cm in diameter are contained in the lower part of the layer. Wooden fragments (max 1.5 cm) are contained. Clay blocks 1 to 5 cm in diameter are partly contained. Silt blocks 0.5 to 1.5 cm in diameter are partly contained.

e. A formation

e.1. A2 member

It mainly consists of very fine sand and very fine to fine sand, and is gray in color. It is intercalated by silt layers 23 cm thick. This layer has a thickness of 28 m.

Many mica minerals are contained in the layer. Bioturbation are developed in the top of the layer. Tube-shaped trace fossils with a 1 to 2 cm internal diameter are contained in this member. Clay blocks with 1 to 4 cm in diameter are contained.

e.2. A1 member

It mainly consists of silt and very fine sand, and is grayish olive and dull yellow in color. This layer has a thickness of 7 m.

Tube-shaped trace fossils with a 1 to 2 cm internal diameter are contained. Silt blocks 1 to 4 cm in diameter are contained.

3) Moheshpur [JH-KC Site, Krishna Chandrapur Village]

a. E formation

The lower and upper part mainly consists of silt rich alternation (silt and very fine sand), and is gray and olive gray in color. The middle part mainly consists of silt and is olive gray in color. The middle part is intercalated by thin very fine sand layers 0.1 to 10 cm thick. This layer has a thickness of 76 m.

Parallel laminae are developed in this formation. Cross laminae are developed in this formation partly. Tube-shaped trace fossils with a 1 cm internal diameter are contained in the bottom of the layer. A few silt and very fine sand blocks 1 to 4 cm in diameter are contained.

b. D formation

b.1. D2 member

It consists of alternation (silt and very fine sand) and is gray and olive gray in color. This layer has a thickness of 4 m.

Silt blocks 1 to 3 cm in diameter are contained.

b.2. D1 member

It consists of silt and alternation (silt and very fine sand) and is gray, olive gray and grayish olive in color. This layer has a thickness of 25 m.

Parallel laminae are developed in this member. A few gravels (orthoquartzite) 0.5 to 2 cm in diameter are contained in the top of the layer. Silt and sand blocks 2 to 4 cm in diameter are contained in the top of the layer.

c. C formation

It mainly consists of fine to medium sand with pebble and medium to coarse sand with pebble and is gray and olive gray in color. It is intercalated by reddish gray laminae with heavy mineral in the upper part of the layer. This layer has a thickness of 95.22 m.

Parallel laminae are developed in this formation. Gravels (orthoquartzite) 0.5 to 7 cm in diameter are contained in this formation. Tube-shaped trace fossils with a 0.5 to 1.5 cm internal diameter are contained in the middle part of the layer. Clay and silt blocks 1 to 3 cm in diameter are partly contained.

d. B formation

The lower part mainly consists of fine to medium sand and medium sand and is gray in color. The upper part mainly consists of fine sand and fine to medium sand and is gray in color. The lower part is intercalated by very by reddish gray laminae with heavy minerals. The upper part is intercalated by clay layers, silt layers and very fine sand layers 4 to 17 cm thick. This layer has a thickness of 69.78 m.

A lot of mica is contained in the layer. Bioturbation are developed in this formation. Parallel laminae are developed in the lower part of the layer. Parallel and cross laminae are developed in the upper part of the layer. Gravels (orthoquartzite) 0.5 to 7 cm in diameter are contained in the lower part of the layer. Tube-shaped trace fossils with a 0.5 to 1.5 cm internal diameter are contained at some horizons. Wooden fragments (max 2 cm) are contained in the upper part of the layer. Clay and silt blocks 0.5 to 4 cm in diameter are contained at some horizons.

e. A formation

e.1. A2 member

It mainly consists of very fine sand and fine sand and is gray in color. It is intercalated by clay layers and tuffaceous sandy clay layers, 9 to 41 cm thick. This layer has a thickness of 25.36 m.

A lot of mica is contained in the layer. Bioturbation are developed in the middle of the layer. Cross laminae are developed in this member. Clay blocks 0.5 to 6 cm in diameter are contained.

e.2. A1 member

It mainly consists of silt and is grayish olive and olive yellow in color. It is intercalated by clay layers and very fine sand layers, 20 to 30 cm thick. This layer has a thickness of 4.64 m.

Silt and very fine sand blocks 1 to 3 cm in diameter are contained.

4) Jhenaidah [JH-1 Site, Arabpur]

a. E formation

It is mainly consists of alternation (silt and fine sand), fine sand and fine to medium sand and is

gray, olive gray and greenish gray in color. The middle part is intercalated by silt layers and medium sand layers, 3 to 20 cm thick. It is intercalated by reddish gray laminae with heavy minerals in the middle part of the layer. This layer has a thickness of 58 m.
Parallel laminae are developed in the lower part of the layer. Cross laminae are developed in the upper and middle of the layer. A few wooden fragments are contained in the top of the layer. A few silt blocks 1 to 4 cm in diameter are contained.

b. D formation

b.1. D2 member

It consists of very fine to fine sand and fine to medium sand and is gray in color. It is intercalated by thin silt layers 0.5 to 2 cm thick. This layer has a thickness of 9 m.
Parallel and cross laminae are developed in this member.

b.2. D1 member

It consists of alternation (silt and fine to medium sand) and is gray, olive gray, greenish gray and grayish olive in color. It is intercalated by medium to coarse sand with pebble 17 to 175 cm thick in the middle part of the layer. This layer has a thickness of 38.4 m.
Parallel laminae are developed in this member. Bioturbation are partly developed. A few gravels (orthoquartzite) 0.5 to 2.5 cm in diameter are contained in the middle of the layer. Tube-shaped trace fossils with a 1 to 2 cm internal diameter are contained in the middle part of the layer. A few silt blocks 0.5 cm in diameter are contained in the bottom of the layer.

c. C formation

It mainly consists of fine to medium sand with pebble, medium sand with pebble and medium to coarse sand with pebble and is gray in color. It is intercalated by silt, very fine sand and fine sand, 5 to 55 cm thick. This layer has a thickness of 89.25 m.
Parallel laminae are developed in this formation. Cross laminae are partly developed in the upper part of the layer. Gravels (orthoquartzite) 0.5 to 7 cm in diameter are contained in this formation. A few wooden fragments (0.4 cm) are contained in the upper part of the layer. A few clay and sand blocks 1 to 5 cm in diameter are contained in the upper part of the layer.

d. B formation

The lower part mainly consists of medium to coarse sand with pebble and is gray in color. The upper part mainly consists of fine to medium sand and medium sand and is gray in color. It is intercalated by clay layers 7 to 43 cm thick. It is partly intercalated by reddish gray laminae with heavy minerals in the upper part of the layer. This layer has a thickness of 57.35 m.
A lot of mica is contained in the layer. Parallel laminae are developed in the lower part of the

layer. Parallel and cross laminae are developed in the upper part of the layer. Gravels (orthoquartzite) 0.5 to 4 cm in diameter are contained in the top and lower part of the layer. Shell fragments (4 cm) are contained in the upper part of layer. Tube-shaped trace fossils with a 2 to 3 cm internal diameter are contained in the upper part of the layer. Clay and silt blocks 0.5 to 7 cm in diameter are contained at some horizons.

e. A formation

e.1. A2 member

The lower part mainly consists of fine sand and is gray in color. The upper part mainly consists of fine to medium sand and is gray and grayish olive in color. The lower part is intercalated by clay layers and silt layers 8 to 32 cm thick. The upper part is intercalated by medium sand layers and medium to coarse sand layers, 5 to 105 cm thick. This layer has a thickness of 43.38 m.

A lot of mica is contained in this member. Parallel laminae are developed in the lower part of the layer. Parallel and cross laminae are developed in the upper part of the layer. Wooden fragments (max 2.5 cm) are contained at some horizons. A few clay and silt blocks 1 to 6 cm in diameter are contained.

e.2. A1 member

It mainly consists of clay and silt and is grayish olive, dark grayish yellow and olive black in color. It is intercalated by very fine sand layers 0.2 to 20 cm thick. This layer has a thickness of 4.62 m.

Clay blocks 4 cm in diameter are contained.

5) Jessore [JS-2 Site, Kharki]

a. E formation

It is mainly consists of fine sand and fine to medium sand and is gray and greenish gray in color. The lower part is intercalated by clay layers and silt layers 0.2 to 20 cm thick. The middle part is intercalated by reddish gray laminae with heavy minerals. This layer has a thickness of 44 m.

A lot of mica is contained in this formation. Parallel laminae are developed in the lower part of the layer. Cross laminae are developed in the upper and middle of the layer. A few gravels (orthoquartzite) 1.5 to 3.5 cm in diameter are contained. Clay and silt blocks 0.5 to 6 cm in diameter are contained in the upper part of the layer.

b. D formation

b.1. D2 member

It consists of very medium to coarse sand with pebble and gravel and is gray and olive gray in

color. The matrix is medium to coarse sand and silty fine sand in a gravel layer. It is intercalated by silt layers 2 to 25 cm thick. This layer has a thickness of 16 m.
Gravels (orthoquartzite) 0.5 to 6 cm in diameter are contained in this member. Silt blocks 1 to 5 cm in diameter are contained.

b.2. D1 member

It consists of silt and is gray and dark olive gray in color. It is intercalated by silt rich alternation (silt and very fine sand) in the upper part of the layer. This layer has a thickness of 24 m.
Parallel laminae are developed in this member. A few silt and fine sand blocks 2 to 6 cm in diameter are contained in the upper part of the layer.

c. C formation

It mainly consists of fine to medium sand with pebble, medium sand with pebble and medium to coarse sand with pebble and is gray and grayish olive in color. It is intercalated by clay and silt layers 6 to 25 cm thick in the upper and middle part of the layer. This layer has a thickness of 111 m.
Parallel laminae are developed in this formation. Cross laminae are partly developed. Gravels (orthoquartzite) 0.5 to 6 cm in diameter are contained in this formation. Tube-shaped trace fossils with a 1 to 3 cm internal diameter are partly contained. A few wooden fragments (max 3 cm) are contained. Clay and silt blocks 0.5 to 5 cm in diameter are contained in the top of the layer.

d. B formation

The lower part mainly consists of fine to medium sand and is gray and grayish olive in color. The upper part mainly consists of fine to medium sand and medium sand and is grayish olive and yellowish brown in color. The lower part is intercalated by silt layers and very fine sand layers 8 to 9 cm thick. The upper part is intercalated by medium to coarse sand layers and coarse sand layers 15 to 50 cm thick. It is intercalated by reddish gray laminae with heavy minerals in the bottom of the layer. This layer has a thickness of 64.4 m.
A lot of mica is contained in the layer. Parallel laminae are developed in this formation. Cross laminae are developed in the top of the layer. Tube-shaped trace fossils with a 0.5 to 3 cm internal diameter are contained at some horizons. Wooden fragments (max 5 cm) are contained in the top of the layer. Clay and silt blocks 0.5 to 6 cm in diameter are contained at some horizons.

e. A formation

e.1. A2 member

It mainly consists of fine sand and is gray, grayish olive and yellowish olive in color. It is intercalated by silt layers and tuffaceous sandy clay layers 10 to 327 cm thick in middle part of the layer. This layer has a thickness of 20.6 m.

Bioturbation are developed in the top of the layer. Shell fragments (0.2 cm) are contained in the upper part of the layer. Tube-shaped trace fossils with a 0.5 to 3 cm internal diameter are contained in the top and bottom of layer. Clay and silt blocks 0.5 to 2 cm in diameter are contained in the middle and lower part of the layer.

e.2. A1 member

It mainly consists of clay and silt and is olive gray and dark olive gray in color. It is intercalated by peat layers and very fine sand layers 5 to 33 cm thick. This layer has a thickness of 20 m.

Shell fragments (0.1 to 3 cm) are contained. Many wooden fragments (max 20 cm) are contained in this member. Clay and silt blocks 0.5 to 4 cm in diameter are contained.

6) Keshabpur [JS-RB Site, Rajnagar Bankabarsi Village]

a. E formation

It is mainly consists of clayey silt and silt and is olive gray and dark olive gray in color. It is intercalated by very fine sand layers 0.1 to 3 cm thick. It is intercalated by medium sand layers 0.1 to 0.2 cm thick in the bottom of the layer. This layer has a thickness of 46.44 m.

Parallel laminae are developed in this formation.

b. D formation

b.1. D2 member

It consists of fine sand with pebble and is gray in color. This layer has a thickness of 1.08 m.

Gravels (orthoquartzite) 0.5 to 5 cm in diameter are contained in this member. A lot of silt blocks 1 to 5 cm in diameter are contained.

b.2. D1 member

It consists of alternation (silt and very fine sand) and is olive gray in color. This layer has a thickness of 20.48 m.

Parallel laminae are developed in this member. A few silt blocks 0.5 to 4 cm in diameter are contained in this member.

c. C formation

It mainly consists of silt and alternation (silt and very fine sand) and is gray, olive gray and dark olive gray in color. It is intercalated by very fine to fine sand layers and medium to coarse sand layers 32 to 80 cm thick in the bottom of the layer. It is intercalated by silty, very fine sand layers 6 to 488 cm thick in the top of the layer. This layer has a thickness of 141.7 m.

Parallel laminae are developed in this formation. Gravels (orthoquartzite) 0.5 to 4.5 cm in diameter are contained in the bottom of the layer. Shell fragments (1 to 2 cm) are contained in the bottom of the layer. A few tube-shaped trace fossils with a 1 to 2 cm internal diameter are contained in the lower part of the layer. Silt blocks 0.5 to 11 cm in diameter are contained in the bottom of the layer.

d. B formation

It mainly consists of fine sand and medium sand and is gray in color. It is intercalated by very fine sand layers, medium sand layers and medium to coarse sand layers 14 to 50 cm thick in the middle part of the layer. It is intercalated by reddish gray laminae with heavy minerals in the lower part of the layer. This layer has a thickness of 41.3 m.

A lot of mica is contained in the layer. Parallel laminae are developed in this formation. Cross laminae are developed in the top of the layer. Gravels (hard silt) 1 to 1.5 cm in diameter are contained in the bottom of the layer. Shell fragments (1 to 2 cm) are contained in the bottom of the layer. Tube-shaped trace fossils with a 1 to 2 cm internal diameter are contained in the lower part of the layer. A few wooden fragments (max 3 cm) are contained. Silt and very fine sand blocks 1 to 4 cm in diameter are contained.

e. A formation

e.1. A2 member

It mainly consists of very fine sand and fine sand and is gray in color. It is intercalated by silt layers 5 to 80 cm thick. This layer has a thickness of 36 m.

A lot of mica is contained in the layer. Bioturbation are partly developed in this layer. Wooden fragments (max 6 cm) are contained in the lower part of the layer. Clay and silt blocks 1 to 6 cm in diameter are contained at some horizons.

e.2. A1 member

It mainly consists of clay and peat and is olive gray, yellowish brown and black in color. It is intercalated by silt layers and very fine sand layers 7 to 50 cm thick. This layer has a thickness of 13 m.

Wooden fragments (max 3 cm) are contained in this member.

5.6.2 Core Sample Collection for Arsenic Analysis

Core samples for arsenic analysis were collected in 509 samples from each core boring site. Table 5.6.2 shows the details of the number of samples from each core boring site.

The layers for the arsenic analysis were selected based on the results of observations of core samples by a hydrogeologist. As for the interval of core samples for arsenic analysis, one sample from each bed was provided in the case of muddy layers, and one sample at each 3 to 5 m interval in the case of sandy layers.

The core samples for arsenic analysis were collected soon after deciding the layer for arsenic analysis. The core samples collected were divided in half or one third, and about 500g (about length of 30 to 100 cm) not including the oxidized surface part were taken up. The rest of the core samples were kept in core boxes for supplementary geological observation and reserve analysis. The core samples for arsenic analysis were wrapped in polyethylene sheet, and packed in polyethylene bags. Then the core samples for arsenic analysis were carried to the laboratory after marking it with a sample number.

5.6.3 Methodology of Core Sample Analysis

It is necessary to judge the safety of deep groundwater not only by water quality analysis but also by soil analysis. Because of variation in the physical and chemical condition which may occur by the use of groundwater, arsenic bound to soil may leach out into groundwater at a later time.

In this study, core samples taken from the six (6) core borings were analyzed for arsenic by both leaching test and total digestion procedures. The data are used for the aquifer evaluation for arsenic.

1) Arsenic Leachate Test

a. Sample Preparation

If a representative sample is wet, dry the sample in an air forced drying oven at 40 degrees C. Crush and grind the air dried sample to pass through a 60 mesh sieve.

b. Extraction:

Weigh 20g of the prepared sample into a BOD bottle, add the leachant, the mixture of de-ionized water and H_2SO_4 +HNO_3 (80+20) with pH 5.The ratio of extraction solution is 10 times (ml) to weight (g) of the sample. Shake the sample on an agitator for 18 hours.

c. Centrifugation:

Centrifugation at 3,000rpm for 10 minutes is usually sufficient to clear the supernatant.

d. Filtration:

Filter and collect the supernatant separately through a 0.45 micron membrane filter.

e. Analysis:

Analyze filtrate with a Hydride Atomic Absorption Spectrometer.

2) Total Arsenic Content Test

The procedure of the total arsenic content test is as follows:

a. Weigh out a 0.5g sample into a dry beaker.
b. Add 5 ml of HNO_3, and 5 ml of HCl.
c. Digest on a hotplate to boil for 15 minutes.
d. Add 4 ml of $HClO_4$.
e. Continue heating on hotplate until the sample has gone to white fume for 10 minutes.
f. Add 10 ml of HCl and wash the rim of beaker with deionised water.
g. Heat on hotplate to leach and make sure salts are well dissolved.
h. Cool. Make the solution to 50 ml.
i. Analyze filtrate by Hydride Atomic Absorption Spectrometer.

3) Quality Control

Since the evaluation of soil core has critical importance on the study, a considerably strict QC measure was applied. The following are the details of the quality control measure.

a. Blank

Reagent Blanks should be carried out for 5% of the total number of each batch processed.

b. Duplicate Samples:

(2.1) Duplicate samples should be carried out on 50% of the total number of each lot in SGS laboratory and 20% should be carried out at an outside laboratory.

(2.2) Criteria of duplicate results

Re-analysis should be conducted if duplicate results are more than 20% different from each other.

(2.2.1) If the number of samples with different results in each lot is less than 5, individual sample should be re-analyzed.

(2.2.2) If the number of samples with different results in each lot is more than 5, samples of the whole lot should be re-analyzed.

c. Spiked Samples:

Spiked samples equivalent to 5% of the total number in each lot should be included with samples processed.

5.6.4 Results of Arsenic Analysis in Core Samples

Tables 5.6.3 to 5.6.8 show the results of arsenic analysis done by the study. The result of each drilling site is mentioned below.

1) CH-2 Site [Girls College, Chuadanga Pourashava]

Figure 5.6.7 shows the results of the arsenic content test and leachate test at CH-2 site.

The total arsenic content is generally lower than 10 ppm at depths from 0 to 204 m. In the shallow portion, clay and silt samples at depths from 0.17 to 6.50 m have slightly elevated total arsenic contents ranging from 5.6 to 9.7 ppm. However, the samples from 13.3 to 91.2 m have small total arsenic contents ranging from 0.5 to 2.1 ppm. The peaty silt sample collected from 102.50 to 102.63 m in depth has 17.73 ppm. But some samples taken at depths from 206.0 to 245.2 m have a high total arsenic content from 20 to 117 ppm. The highest total arsenic content of 117.26 ppm, which is also the highest in the study, was detected in a silty clay sample at depths from 207.50 to 207.72 m. It should be noted that such a higher value of arsenic content in the deep layers exceeding 200 m in depth has not been found in the previous studies in Bangladesh. The samples below 245.3 m have total arsenic contents ranging from 3.7 to 6.4 ppm.

The results of the leachate test show that the samples from 0.1 to 45. 7 m in depth have almost less than 5ppb of leached arsenic. In the samples from 52.0 to 192.5 m, slightly elevated leached arsenic was found at depths from 52.05 to 57.50 m (8.0 to 8.8ppb) and from 135.00 to 141.36 m (7.1 to 9.6ppb). At depths from 199.60 to 268.60 m, some samples show more than 10ppb of leached arsenic. The highest value of 20.5ppb was detected from fine to medium sand samples having 5.08 ppm in total arsenic content. The sample having the highest total arsenic content of 117.26 ppm shows only 11.0ppb. The samples below a depth of 271.3 m have less than 6ppb.

2) CH-CB Site [Bara Dudpatila Village, Damurhuda Upazila]

Figure 5.6.8 shows the results of the arsenic content test and leachate test at CH-BD site.

The samples from 0.0 to 100.8 m in depths have a total arsenic content of less than 10 ppm. The clayey silt samples at depths from 111.65 to 111.85 m have a total arsenic content of 42.71 ppm. The total arsenic content in the samples at depths from 119.3 to 223.5 m tends to increase with depth, from 3 to 14 ppm. The clayey samples at depths from 228.50 to 229.00 m have the highest total arsenic content of 93.57 ppm at the site. Below this, the arsenic content ranged from 2.2 to 8.3 ppm at depths from 233.0 to 268.2 m. In the samples below 270 m in depth, there are two (2) samples having more than 20 ppm in total arsenic content. One is a fine to medium sand sample from 272.40 to 273.00 m (29.76 ppm) and the other is very fine to fine sand sample from 290.00 to 290.40 m (47.09 ppm).

The result of the leachate test shows that the shallow core samples within 100 m in depth have a very small value of leached arsenic, almost less than 5 ppb. However, the leached arsenic gradually increases with depth in the samples from 100 to 300 m. The leached arsenic ranges from 5 to 12ppb from 100 to 260 m, whereas the value ranges from 10 to 20ppb at depths from 264.5 to 290.4 m.

3) JH-1 Site [Arabpur, Jhenaidah Pourashava]

Figure 5.6.9 shows the results of the arsenic content test and leachate test at JH-1 site.

The vertical distribution of the total arsenic content at the site is characterized by relatively higher values within 200 m in depth and very low arsenic content below that depth. Although the values range from 0 to 20 ppm, relatively higher values more than 10 ppm are found in fine sand samples (8.40 to 9.00 m, 11.88 ppm), silty fine sand samples (63.00 to 63.60 m, 17.95 ppm), silty clay samples (100.55 to 100.37 m, 19.48 ppm), very fine to fine sand samples (143.28 to 143.85 m, 16.68 ppm), and fine to medium sand samples (183.00 to 195.85 m, 10.61 to 14.38 ppm). It is noted that the baseline of the total arsenic content increases with depth particularly from 100 to 200 m in depth. The samples taken at depths from 210 to 277 m have a small total arsenic content within 3 ppm.

The result of the leachate test shows that the amount of leached arsenic is almost less than 5ppb from 0 to 300 m in depth except in the samples from 61.6 to 67.0 m. The highest value of 90.5ppb was recorded in a silty fine sand sample (63.00 to 63.60 m) with a total arsenic content of 17.95 ppm. The second and third highest values are found in a fine to medium sand sample (66.40 to 67.00 m, 59.9ppb) and a fine to medium sand sample (61.60 to 62.00 m, 47.9ppb), respectively. Compared with the distribution of total arsenic content, only this portion has the appearance of arsenic both in the total content test and leachate test.

4) JH-KC Site [Krishna Chandrapur Village, Moheshpur Upazila]

Figure 5.6.10 shows the results of the arsenic content test and leachate test at JH-KC site.

The values of the total arsenic content vary between 0 and 15 ppm at the site. The general vertical distribution pattern is characterized by slightly higher values in the shallow portion within 30 m in depth, lower values less than 5 ppm from 30 to 140 m, a gradual increase from 2 to 5 ppm at 150 m to 5 to 10 ppm at 210 m, and continuation of the range of variation up to 300 m in depth. The highest value of 12.96 ppm at the site was recorded in the sample of sandy clay at depths from 25.70 to 25.85 m. It is noted that the background value of arsenic content is higher in the fine sediments occurring below 195 m in depth.

The result of the leachate test shows that there is no sample having more than 5ppb.

5) JS-2 Site [Kharki, Jessore Pourashava]

Figure 5.6.11 shows the results of the arsenic content test and leachate test at JS-2 site.

The result of total arsenic content test shows that higher values ranging from 40 to 60 ppm are found at depths from 5 to 20 m. In the deeper portion, slightly elevated arsenic contents around 10 ppm were found at depths around 160 m and 210 to 250 m. The highest value of 63.15 ppm in the site was found in a sample of peaty silt (14.45 to 14.78 m). The samples of peat, peaty silt, and clayey sediments at depths from 8.4 to 19.2 m have higher arsenic contents, which can be regarded as the source of arsenic contamination at the site. In the deeper portion, the samples having more than 10 ppm are silty clay (159.50 to 159.65 m, 14.62 ppm), silt (217.30 to 217.73 m, 10.57 ppm), and sandy silt (252.00 to 252.15 m, 13.71 m). There is no increase in the baseline value of arsenic content below 250 m in depth.

The result of the leachate test also shows that the arsenic is leached from the samples at shallow depths within 20 m as high as 20ppb. The maximum value of 20.3ppb was found in the peat sample at depths from 19.08 to 19.18 m with a total arsenic content of 50.70 ppm. In the lower portion, the results show almost less than 5ppb except the samples taken from 252.0 to 273.9 m. The samples consist of sandy silt, fine to medium sand, and medium sand and have 5.2 to 8.6ppb.

6) JS-2 Site [Rajnagar Bankabarsi Village, Keshabpur Upazila]

Figure 5.6.12 shows the results of the arsenic content test and leachate test at JS-RB site.

The result of total arsenic content test shows that the values are more than 50 ppm in shallow samples within 10 m in depth and deeper samples obtained at depths from 250 to 260 m. The baseline value tends to increase from 1 to 15 ppm with depth. The highest arsenic content of 67.61 ppm was found in a silt sample taken at a depth from 254.54 to 254.91 m. The clayey silt sample (256.23 to 256.66 m) beneath the silt sample also has a higher value of 60.22 ppm. In the shallow portion, a peat sample (8.00 to 8.21 m) has 57.12 ppm. The other samples of peat, peaty clay, and clay at depths from 7.0 to 9.9 m have values from 10.0 to 29.4 ppm. It is noted that the baseline values of arsenic content are higher than 10 ppm, which is below the highly contaminated samples at depths from 254.54 to 256.66 m. That is clearly different from the baseline values in the upper layers.

The result of the leachate test shows that the leached arsenic was found in some samples above 160 m in depth. The samples below 160 m in depth show less than 5ppb. The highest value of 16.6ppb was found from clayey silt at depths from 131.08 to 131.45 m. In the shallow portion, the peat samples having 29.4 to 57.1 ppm of arsenic content show only 7.3 to 10.3ppb. Since there is a peaty very fine sand sample having 10.81 ppm of arsenic at 61.8 to 62.0 m, the samples at depths from 61.8 to 75.0 m have 6.5 to 7.3ppb in leached arsenic.

5.6.5 Evaluation of Arsenic Analysis

From the quality control test, secondary contaminations of core samples were not observed. It is evaluated that the sampling method and procedures employed in the study were satisfactorily performed.

The results of the total arsenic content test show the existence of arsenic in the soil not only in the shallow portion but also in the deeper portion up to 300 m in depth in some places. The occurrence of arsenic in the deeper layers indicates that there is a possibility that arsenic contamination originated from the deeper source. In other words, there is a potential of arsenic contamination in some places in the study area. However, the total arsenic content test does not show the form of arsenic occurrence. Therefore, it is difficult to judge whether or not the arsenic in deeper layers can easily be released into the groundwater. Moreover, there would be many complicated factors that control the release of arsenic from soil into groundwater. In the next step, it is necessary to research the occurrence and behaviors of the arsenic that exists in the deeper layers.

Regarding the leachate test, the results are sometimes not in good agreement with the results of the arsenic content test. It is expected that one of the reasons is the in-situ groundwater conditions and laboratory conditions are different. For example, the extraction solution is controlled under acidic conditions, although the general groundwater quality in the study area shows that the pH is generally above 7. Due to the difference in the leaching environment, some arsenic in the samples may not be released into the solution. Therefore, based on the results of this study, further detailed tests are required for research purposes.

It is also necessary to consider more sophisticated sampling methods to satisfy further detailed arsenic analysis, particularly for analyzing the form of the arsenic in the soil.

Table 5.6.1(1) Characterisitcs of stratigraphy in each core boring site

			Chuadanga	Damurhuda
Shallow	A1	facies (main)	clay, silt	silt, vf.s
		facies (intercalated)		
		thickness (m)	7.6	7
		lamina		
		gravel		
		fossil	trace fossil (ϕ0.5cm)	trace fossil (ϕ1-2cm)
		block		silt (1-4cm)
	A2	facies (main)	vf.s, f.s mica rich	vf.s, vf-f.s mica rich
		facies (intercalated)	clay, silt, f-m.s, m-c.s	silt bioturbation in top
		thickness (m)	35.02	28
		lamina		parallel, cross(top)
		gravel		
		fossil	trace fossil (ϕ1-5cm) wodden fragment (max 1cm)	trace fossil (ϕ1-2cm)
		block	clay and silt (2-6cm)	clay (1-4cm)
	B	facies (main)	vf-f.s, f-m.s, m.s mica rich	upper: f.s lower: f.s, f-m.s mica rich
		facies (intercalated)	silt, c.s	upper: vf.s, m.s lower: vf.s, m.s, m-c.s
		thickness (m)	59.88	69
		lamina	parallel	cross and parellel (upper)
		gravel	orthoquarzite (0.5-5cm) in lower part	orthoquarzite (0.5-5cm) in lower part
		fossil	trace fossil (ϕ1-3cm) in top and lower part wodden fragment (max 1cm)	wodden fragment (max 1.5cm)
		block	clay and silt (1-5cm)	clay (1-5cm), silt (0.5-1.5cm)
Middle	C	facies (main)	f.s, f-m.s with pwbble	f-m.s with pebble, m-c.s with pebble
		facies (intercalated)	peaty silt in top layer, silt in upper part lower: readish gray laminae with hevy mineral	silt, vf-f.s
		thickness (m)	61.5	65
		lamina		parellel
		gravel	orthoquarzite (0.5-7cm)	orthoquarzite (0.5-7cm)
		fossil	trace fossil (ϕ1-3cm) in upper part shell in upper part, wooden fragment (a little, 1cm)	wodden fragment (a little, 1cm)
		block		
Deep	D1	facies (main)	f-m.s	f.s, f-m.s
		facies (intercalated)	vf-f.s in lower part	silt, vf.s
		thickness (m)	31	39
		lamina	parallel	parellel
		gravel		
		fossil		trace fossil (a little, ϕ2cm) in lower part wodden fragment (a little, 1cm) in upper part
		block	silt (2-5cm)	clay (0.4cm), silt (1-2cm)
	D2	facies (main)	f-m.s with pwbble	f-m.s with pebble, m-c.s with pebble
		facies (intercalated)	m-c.s	vf-f.s
		thickness (m)	12.5	13
		lamina	parallel	parellel
		gravel	orthoquarzite (1-5cm)	orthoquarzite (0.5-6cm)
		fossil		
		block	silt (1-5cm)	silt (a little, 4cm)
	E	facies (main)	f-m.s, m-c.s	upper: f.s, f-m.s lower: vf-f.s
		facies (intercalated)	clay, silt and alternation (silt/f.s) in upper part vf-f.s in middle part	silt, vf.s, m.s, c.s alternation of silt and vf.s
		thickness (m)	92.5	79
		lamina	mainly parallel, partly cross	parallel
		gravel	orthoquarzite (1-3cm) in top, middle and base	orthoquarzite (0.5-5cm)
		fossil	trace fossil (ϕ0.5-2cm) in lower part wooden fragment (a little, max 3cm)	wooden fragment (a little, max 1cm)
		block	clay and silt (0.5-6cm)	clay and silt (1-6cm)

Table 5.6.1 (2) Characterisitcs of stratigraphy in each core boring site

			Moheshpur	Jhenaidah
Shallow	A1	facies (main)	silt	clay, silt
		facies (intercalated)	clay, vf-f.s	vf.s
		thickness (m)	4.64	4.62
		lamina		
		gravel		
		fossil		
		block	silt and vf.s (1-3cm)	clay (4cm)
	A2	facies (main)	vf.s, f.s mica rich	upper: f-m.s, mica rich lower: f.s
		facies (intercalated)	clay, tuffaceous sandy clay bioturbation in middle part	upper: m.s, m-c.s lower: clay
		thickness (m)	25.36	43.38
		lamina	cross	upper: parallel and cross lower: parallel
		gravel		
		fossil		wodden fragment (max 2.5cm)
		block	clay (0.5-6cm)	clay and silt (a little, 1-6cm)
	B	facies (main)	upper: f.s, f-m.s lower: f-m.s, m.s mica rich	upper: f-m.s, m.s, mica rich lower: m-c.s with pebble, mica rich
		facies (intercalated)	upper: clay, silt, vf-f.s, bioturbation lower: readish gray laminae (heavy mineral), bioturbation	upper: clay, c.s with pebble, redish gray laminae lower: clay, f-m.s, redish gray laminae with heavy mineral
		thickness (m)	69.78	57.35
		lamina	upper: parallel and cross lower: parallel	upper: parallel and cross lower: parallel
		gravel	orthoquarzite (0.5-7cm) in lower part	orthoquarzite (0.5-4cm)
		fossil	trace fossil (ϕ 0.5-1.5cm) wodden fragment (max 2cm) inupper part	shell fragment (4cm) in upper part trace fossil (ϕ 2-3cm) in upper part
		block	clay and silt (0.5-4cm)	clay and silt (0.5-7cm)
Middle	C	facies (main)	f-m.s with pebble, m-c.s with pebble	f-m.s with pebble, m.s with pebble m-c.s with pebble
		facies (intercalated)	upper: readish gray laminae with heavy mineral	silt, f.s, f-m.s
		thickness (m)	95.22	89.25
		lamina	parallel	parallel
		gravel	orthoquarzite (0.5-7cm)	orthoquarzite (0.5-7cm)
		fossil	trace fossil (ϕ 0.5-1.5cm) in middle part	wodden fragment (a little, 0.4cm)
		block	silt (1-3cm)	clay and sand (a little, 1-5cm) in upper part
Deep	D1	facies (main)	silt, alternation of silt and vf.s	alternation of silt and f-m.s
		facies (intercalated)		m-c.s with pebble (orthoquarzite, 0.5-2.5cm)
		thickness (m)	25	38.4
		lamina	parallel	paralle, bioturbation (partly)
		gravel	orthoquarzite (a little, 0.5-2cm)	
		fossil		trace fossil (ϕ 1-2cm) in middle part
		block	silt and sand (2-4cm) in top	silt (a little, 0.5cm) in bottom
	D2	facies (main)	alrternation of silt and vf.s	f-m.s
		facies (intercalated)		silt (thin)
		thickness (m)	4	9
		lamina		cross
		gravel		
		fossil		
		block	silt (1-3cm)	
	E	facies (main)	upper and lower: silt rich alternation (silt/vf.s) middle: silt	f.s, f-m.s alternation of silt and f.s
		facies (intercalated)	thin vf.s in middle	silt (thin), m.s in middle part redish gray laminae with heavy mineral
		thickness (m)	76	58
		lamina	parallel (mainly), cross (partly)	upper and middle: cross lower: parallel
		gravel		
		fossil	trace fossil (ϕ 1cm) in bottom	wodden fragment (a little) in top
		block	silt and vf-f.s (a little, 1-4cm)	silt (a little, 1-4cm)

Table 5.6.1(3) Characterisitcs of stratigraphy in each core boring site

			Jessore	Keshabpur
Shallow	A1	facies (main)	clay, silt	clay, peat
		facies (intercalated)	peat, vf.s	silt, vf.s
		thickness (m)	20	13
		lamina		
		gravel		
		fossil	shell fragment (0.1-3cm) wodden fragment (a lot of, max 20cm)	wodden fragment (max 3cm)
		block	clay, silt (0.5-4cm)	
	A2	facies (main)	f.s	vf.s, f.s mica rich
		facies (intercalated)	tuffaseous sandy clay in middle part bioturbation in top	silt, f.s bioturbation (partly)
		thickness (m)	20.6	36
		lamina	top: cross	
		gravel		
		fossil	shell fragment (0.2cm) in upper part trace fossil (ϕ 0.5-3cm) in top and bottom	wodden fragment (max 0.5-6cm) in lower part
		block	clay, silt (0.5-2cm) in middle and lower part	clay, silt (1-6cm)
	B	facies (main)	upper: f-m.s, m.s, mica rich lower: f-m.s, mica rich	f.s, m.s mica rich
		facies (intercalated)	upper: m-c.s, c.s lower: silt, vf.s redish gray laminae with heavy mineral(bottom)	vf.s and m-c.s in middle part redish gray laminae with heavy mineral
		thickness (m)	64.4	41.3
		lamina	parallel, cross(top)	parallel, cross(top)
		gravel		silt (hard, 1-1.5cm) in bottom
		fossil	trace fossil (ϕ 0.5-3cm) wodden fragment (max 5cm) in top	shell (1-2cm) in bottom, trace fossil (ϕ 1-2cm) in lower wodden fragment (a little, max 3cm)
		block	clay, silt (0.5-6cm)	silt, vf.s (1-4cm)
Middle	C	facies (main)	f-m.s with pebble, m.s with pebble m-c.s with pebble	silt, alternation of silt and vf.s
		facies (intercalated)	upper and middle: clay, silt organic matter (a little, max 5cm)	top: silty vf.s bottom: vf-f.s, m-c.s
		thickness (m)	111	141.7
		lamina	mainly parallel, partly cross	parallel
		gravel	orthoquarzite (0.5-6cm)	orthoquarzite (0.5-4.5cm) in bottom
		fossil	trace fossil (partly, ϕ 1-3cm) wodden fragment (a little, max 3cm)	shell fragment (1-2cm) in bottom trace fossil (a little, ϕ 1-2cm) in lower part
		block	clay, silt (0.5-5cm) in top	silt (0.5-11cm) in bottom
Deep	D1	facies (main)	silt	alternation of silt and vf.s
		facies (intercalated)	silt rich alternation of silt and vf.s	
		thickness (m)	24	20.48
		lamina	parallel	parallel
		gravel		
		fossil		
		block	silt and f.s (a little, 2-6cm) in upper part	silt (a little, 0.5-4cm)
	D2	facies (main)	m-c.s with pebble gravel (matrix: m-c.s, silty f.s)	f-m.s with pebble
		facies (intercalated)	silt	
		thickness (m)	16	1.08
		lamina		
		gravel	orthoquarzite (0.5-6cm)	orthoquarzite (0.5-5cm)
		fossil		
		block	silt (1-5cm)	silt (a lot of, 1-5cm)
	E	facies (main)	f.s, f-m.s mica rich	clayey silt, silt
		facies (intercalated)	middle: redish gray laminae with heavy mineral lower: clay, silt	vf.s (thin, 0.1-3cm) m.s (thin, 0.1-0.2cm) in bottom
		thickness (m)	44	46.44
		lamina	upper and middle: cross lower: parallel	parallel
		gravel	orthoquarzite (a little, 1.5-3.5cm)	
		fossil		
		block	clay, silt (0.5-6cm) in upper part	

Table 5.6.2 Number of Core Samples Collected for Arsenic Analysis

Facies \ Location	Chuadanga	Damurhuda	Moheshpur	Jhenaidah	Jessore	Keshabpur	Total
clay	4	0	4	5	16	10	39
silt	9	6	24	2	15	38	94
very fine sand	2	7	5	3	3	29	49
very fine to fine sand	5	6	9	7	1	6	34
fine sand	17	21	7	21	20	7	93
fine to medium sand	18	23	15	27	22	5	110
medium sand	12	6	16	17	15	0	66
medium to coarse sand	5	1	8	5	1	0	20
coarse sand	1	0	2	0	0	1	4
Total	73	70	90	87	93	96	509

Table 5.6.3 Result of Core Analysis at Girls College, Chuadanga (1/2)

Site No.: **CH-2** **Core Boring No.:** **GeCC-1**

Sample No.	Depth (m)			Sampling date	Facies	Result	
	from	to	center			Total As (ppm)	Leachate (ppb)
GeCC-1-1	0.13	0.37	0.25	16/12/2000	Clayey silt	9.74	<5
GeCC-1-2	1.40	1.60	1.50	16/12/2000	Silt,clayey silt	7.59	<5
GeCC-1-3	2.30	2.60	2.45	20/12/2000	sandy silt	7.09	<5
GeCC-1-4	3.16	3.54	3.35	20/12/2000	Clay	7.38	<5
GeCC-1-5	4.10	4.50	4.30	20/12/2000	Clay	5.56	<5
GeCC-1-6	5.33	5.66	5.50	21/12/2000	Clay	7.29	<5
GeCC-1-7	6.00	6.50	6.25	21/12/2000	Clayey silt	5.96	<5
GeCC-1-8	7.00	7.60	7.30	21/12/2000	sandy silt, silt, clay,clayey silt	3.74	<5
GeCC-1-9	8.50	9.25	8.88	21/12/2000	Fine sand	8.45	<5
GeCC-1-10	13.30	14.00	13.65	21/12/2000	Very fine - fine - medium sand	1.91	<5
GeCC-1-11	19.14	19.55	19.35	21/12/2000	Medium -coarse sand	2.11	<5
GeCC-1-12	20.00	21.50	20.75	23/12/2000	Silty very fine sand, fine sand	1.75	5.4
GeCC-1-13	28.75	29.35	29.05	23/12/2000	Fine sand	1.37	<5
GeCC-1-14	33.00	33.50	33.25	23/12/2000	Fine sand	1.73	5.9
GeCC-1-15	37.50	38.00	37.75	24/12/2000	Fine and	1.40	<5
GeCC-1-16	42.00	42.50	42.25	24/12/2000	Fine sand	1.60	<5
GeCC-1-17	45.10	45.70	45.40	24/12/2000	Coarse sand	1.34	<5
GeCC-1-18	52.05	52.25	52.15	31/12/2000	Medium sand	1.00	8.8
GeCC-1-19	57:00	57.50	57.25	31/12/2000	Fine sand	0.77	8.0
GeCC-1-20	64.05	64.50	64.28	01/01/2001	Fine - medium sand	0.50	7.5
GeCC-1-21	67.70	68.23	67.97	01/01/2001	Medium sand	0.57	6.5
GeCC-1-22	72.00	73.00	72.50	03/01/2001	Very fine - fine sand	0.75	<5
GeCC-1-23	78.50	79.20	78.85	04/01/2001	Medium sand	0.87	6.1
GeCC-1-24	82.00	82.40	82.20	01/01/2001	Fine-Medium sand	0.70	5.7
GeCC-1-25	85.80	86.50	86.15	04/01/2001	Medium sand	0.65	5.2
GeCC-1-26	90.50	91.20	90.85	04/01/2001	Fine-Medium sand	0.57	<5
GeCC-1-27	102.50	102.63	102.57	06/01/2001	Peaty Silt	17.73	<5
GeCC-1-28	107.20	107.70	107.45	07/01/2001	Fine sand	0.98	6.0
GeCC-1-29	111.00	111.70	111.35	07/01/2001	Fine sand	1.92	6.1
GeCC-1-30	118.00	118.80	118.40	07/01/2001	Fine sand	2.42	5.4
GeCC-1-31	120.00	120.44	120.22	07/01/2001	Fine sand	7.65	<5
GeCC-1-32	129.50	130.00	129.75	07/01/2001	Medium sand	2.03	<5
GeCC-1-33	131.00	131.60	131.30	07/01/2001	Medium sand	2.54	<5
GeCC-1-34	135.00	135.50	135.25	08/01/2001	Silty fine - medium sand	1.93	7.1
GeCC-1-35	141.00	141.36	141.18	08/01/2001	Medium sand	2.44	9.6
GeCC-1-36	154.30	154.65	154.48	28/01/2001	Fine-Medium sand	1.97	5.6
GeCC-1-37	162.10	162.40	162.25	28/01/2001	Fine-Medium sand	4.13	<5
GeCC-1-38	165.48	165.70	165.59	28/01/2001	Fine-Medium sand	2.60	5.9
GeCC-1-39	178.55	179.00	178.78	29/01/2001	Fine-Medium sand	2.48	<5
GeCC-1-40	180.00	180.60	180.30	29/01/2001	Fine-Medium sand	5.17	7.9

Table 5.6.3 Result of Core Analysis at Girls College, Chuadanga (2/2)

Site No.: CH-2 Core Boring No.: GeCC-1

Sample No.	Depth (m)			Sampling date	Facies	Result	
	from	to	center			Total As (ppm)	Leachate (ppb)
GeCC-1-41	185.00	185.35	185.18	29/01/2001	Medium sand	2.29	<5
GeCC-1-42	192.00	192.50	192.25	29/01/2001	Fine - very fine sand	8.46	<5
GeCC-1-43	199.60	200.00	199.80	29/01/2001	Medium - coarse sand	4.29	11.4
GeCC-1-44	203.00	203.65	203.33	02/02/2001	Fine - medium sand	5.08	20.5
GeCC-1-45	206.00	206.20	206.10	02/02/2001	Fine - medium sand	10.88	9.5
GeCC-1-46	207.50	207.72	207.61	02/02/2001	Silty clay	117.26	11.0
GeCC-1-47	208.74	209.00	208.87	02/02/2001	Clayey silt	22.89	<5
GeCC-1-48	210.65	211.30	210.98	03/02/2001	Fine - medium sand	5.56	7.8
GeCC-1-49	211.60	211.74	211.67	03/02/2001	Clayey silt	24.43	<5
GeCC-1-50	215.30	216.00	215.65	03/02/2001	Fine-medium sand	3.09	12.3
GeCC-1-51	219.40	219.90	219.65	03/02/2001	Medium - coarse sand	9.78	15.7
GeCC-1-52	221.50	222.00	221.75	03/02/2001	Fine - medium sand	4.66	6.1
GeCC-1-53	224.00	224.70	224.35	03/02/2001	Medium sand	6.54	10.6
GeCC-1-54	228.00	228.70	228.35	03/02/2001	Fine - medium sand	51.20	<5
GeCC-1-55	231.30	232.00	231.65	03/02/2001	Fine sand	20.36	<5
GeCC-1-56	233.00	233.50	233.25	03/02/2001	Fine sand, silt	10.27	<5
GeCC-1-57	235.30	235.78	235.54	03/02/2001	Fine sand, silt	21.90	<5
GeCC-1-58	238.00	238.70	238.35	03/02/2001	Fine sand	8.67	5.7
GeCC-1-59	241.00	241.70	241.35	03/02/2001	Fine sand	7.88	10.7
GeCC-1-60	244.74	245.17	244.96	03/02/2001	Very fine sand, silt	35.39	<5
GeCC-1-61	245.30	246.00	245.65	03/02/2001	Medium sand	5.82	8.6
GeCC-1-62	250.00	250.70	250.35	03/02/2001	Medium sand	6.03	<5
GeCC-1-63	254.40	255.00	254.70	03/02/2001	Fine - medium sand	3.94	<5
GeCC-1-64	257.00	257.60	257.30	03/02/2001	Fine - medium sand	4.32	7.8
GeCC-1-65	262.00	262.65	262.33	03/02/2001	Very fine - fine sand	6.43	<5
GeCC-1-66	266.50	267.20	266.85	06/02/2001	Medium - coarse sand	3.67	12.9
GeCC-1-67	268.00	268.60	268.30	06/02/2001	Fine-medium sand	3.98	7.9
GeCC-1-68	271.35	272.00	271.68	06/02/2001	Medium sand	4.82	<5
GeCC-1-69	274.20	274.80	274.50	06/02/2001	Fine sand	5.51	<5
GeCC-1-70	278.00	278.60	278.30	06/02/2001	Fine-medium sand	5.43	5.6
GeCC-1-71	282.50	283.25	282.88	06/02/2001	Fine sand	4.78	5.2
GeCC-1-72	286.10	286.80	286.45	06/02/2001	Fine sand	3.72	<5
GeCC-1-73	298.50	299.25	298.88	06/02/2001	Fine sand	5.78	<5

Table 5.6.4 Result of Core Analysis at Bara Dudpatila, Damurhuda (1/2)

Site No.: **CH-BD** **Core Boring No.:** **GeCD-1**

Sample No.	Depth (m)			Sampling date	Facies	Result	
	from	to	center			Total As (ppm)	Leachate (ppb)
GeCD-1-1	0.00	0.70	0.35	13/01/2001	Silt	5.31	5.4
GeCD-1-2	1.00	2.00	1.50	13/01/2001	Very fine sand	7.99	9.0
GeCD-1-3	3.50	4.00	3.75	13/01/2001	Very fine sand, sandy silt	6.93	<5
GeCD-1-4	4.50	4.80	4.65	13/01/2001	Silty very fine sand	5.02	<5
GeCD-1-5	8.60	9.40	9.00	14/01/2001	Very fine sand	2.18	<5
GeCD-1-6	13.00	13.70	13.35	14/01/2001	Silty very fine sand	1.74	<5
GeCD-1-7	14.00	14:75	14.38	14/01/2001	Silty very fine sand	2.74	<5
GeCD-1-8	18.10	18.73	18.42	14/01/2001	Silty very fine sand	2.67	<5
GeCD-1-9	22.10	22.70	22.40	14/01/2001	Very fine sand	5.59	<5
GeCD-1-10	26.50	27.35	26.93	14/01/2001	Very fine - fine sand	2.54	<5
GeCD-1-11	30.30	31.00	30.65	14/01/2001	Fine sand	1.06	<5
GeCD-1-12	36.30	37.00	36.65	16/01/2001	Fine sand	1.08	<5
GeCD-1-13	41.20	42.00	41.60	16/01/2001	Fine sand	1.68	<5
GeCD-1-14	47.20	48.00	47.60	16/01/2001	Fine sand	7.98	7.3
GeCD-1-15	53.10	53.65	53.38	16/01/2001	Fine sand	0.82	<5
GeCD-1-16	57.50	58.20	57.85	16/01/2001	Fine sand	1.05	<5
GeCD-1-17	62.20	63.00	62.60	16/01/2001	Fine - medium sand	1.01	<5
GeCD-1-18	66.00	67.00	66.50	16/01/2001	Fine sand	1.45	<5
GeCD-1-19	71.10	71.75	71.43	17/01/2001	Fine sand	1.14	<5
GeCD-1-20	76.30	77.00	76.65	17/01/2001	Fine sand	0.76	5.5
GeCD-1-21	82.00	82.70	82.35	17/01/2001	Fine - medium sand	1.16	5.4
GeCD-1-22	87.80	88.60	88.20	17/01/2001	Fine - medium sand, fine sand	1.52	<5
GeCD-1-23	93.10	94.00	93.55	17/01/2001	Fine - medium sand	1.06	<5
GeCD-1-24	96.50	97.20	96.85	17/01/2001	Fine - medium sand	0.67	<5
GeCD-1-25	100.50	100.80	100.65	18/01/2001	Fine - medium sand	1.17	7.2
GeCD-1-26	111.65	111.85	111.75	18/01/2001	Clayey silt	42.71	<5
GeCD-1-27	113.30	114.00	113.65	18/01/2001	Fine sand	9.98	8.8
GeCD-1-28	119.30	120.00	119.65	18/01/2001	Medium sand	2.88	<5
GeCD-1-29	112.15	122.80	117.48	18/01/2001	Fine - medium sand	2.83	6.2
GeCD-1-30	127.80	128.50	128.15	18/01/2001	Medium sand	4.88	11.7
GeCD-1-31	131.00	132.00	131.50	20/01/2001	Fine - medium sand	2.25	11.0
GeCD-1-32	138.50	139.55	139.03	20/01/2001	Fine - medium sand	2.86	9.7
GeCD-1-33	149.00	149.80	149.40	20/01/2001	Medium - coarse sand	4.62	6.0
GeCD-1-34	151.00	151.80	151.40	21/01/2001	Medium sand	4.27	<5
GeCD-1-35	156.50	157.30	156.90	21/01/2001	Fine sand, fine - medium sand	7.64	<5

Table 5.6.4 Result of Core Analysis at Bara Dudpatila, Damurhuda (2/2)

Site No.: **CH-BD** **Core Boring No.:** **GeCD-1**

Sample No.	Depth (m)			Sampling date	Facies	Result	
	from	to	center			Total As (ppm)	Leachate (ppb)
GeCD-1-36	169.30	170.00	169.65	21/01/2001	Fine sand	8.50	8.2
GeCD-1-37	173.20	173.80	173.50	21/01/2001	Fine sand	7.22	5.6
GeCD-1-38	179.15	180.00	179.58	21/01/2001	Fine sand	14.40	<5
GeCD-1-39	181.15	181.80	181.48	21/01/2001	Fine - medium sand	8.10	9.3
GeCD-1-40	185.30	186.00	185.65	23/01/2001	Medium sand	7.67	7.3
GeCD-1-41	191.00	191.50	191.25	23/01/2001	Fine sand, medium sand	4.63	6.1
GeCD-1-42	197.00	197.70	197.35	23/01/2001	Fine - medium sand	11.75	8.7
GeCD-1-43	200.30	201.00	200.65	24/01/2001	Fine - medium sand	7.91	5.1
GeCD-1-44	202.30	203.00	202.65	24/01/2001	Fine sand	5.32	9.6
GeCD-1-45	206.30	207.00	206.65	24/01/2001	Medium sand	13.51	6.7
GeCD-1-46	208.00	208.70	208.35	24/01/2001	Medium sand	11.97	8.6
GeCD-1-47	213.20	213.80	213.50	24/01/2001	Fine - medium sand	6.21	10.2
GeCD-1-48	216.50	217.00	216.75	24/01/2001	Fine - medium sand	6.51	6.5
GeCD-1-49	221.50	222.00	221.75	24/01/2001	Fine sand	4.50	9.8
GeCD-1-50	223.00	223.50	223.25	24/01/2001	Fine sand	4.85	9.8
GeCD-1-51	228.50	229.00	228.75	24/01/2001	Clayey silt	93.57	8.7
GeCD-1-52	233.00	233.47	233.24	25/01/2001	Fine sand	4.12	6.7
GeCD-1-53	234.00	234.40	234.20	25/01/2001	Very fine - fine sand, silt	7.58	6.8
GeCD-1-54	236.25	236.90	236.58	25/01/2001	Fine sand, silt	8.31	6.1
GeCD-1-55	239.40	240.00	239.70	25/01/2001	Fine sand, silt	5.62	<5
GeCD-1-56	241.30	241.90	241.60	25/01/2001	Fine - medium sand	2.38	10.2
GeCD-1-57	243.30	244.00	243.65	25/01/2001	Fine - medium sand	2.97	10.4
GeCD-1-58	247.00	247.60	247.30	25/01/2001	Fine - medium sand	2.19	10.9
GeCD-1-59	252.00	252.70	252.35	25/01/2001	Fine - medium sand	2.59	11.1
GeCD-1-60	258.50	259.20	258.85	25/01/2001	Fine - medium sand	2.72	10.9
GeCD-1-61	264.50	265.20	264.85	25/01/2001	Fine sand	4.31	18.6
GeCD-1-62	267.50	268.20	267.85	25/01/2001	Fine sand	4.76	12.6
GeCD-1-63	272.40	273.00	272.70	25/01/2001	Fine - medium sand	29.76	16.9
GeCD-1-64	275.30	275.90	275.60	25/01/2001	Fine - medium sand	5.06	13.8
GeCD-1-65	281.30	282.00	281.65	25/01/2001	Fine sand	3.64	12.4
GeCD-1-66	284.00	284.70	284.35	25/01/2001	Very fine - fine sand	4.78	6.6
GeCD-1-67	288.50	289.00	288.75	25/01/2001	Fine sand	7.66	10.9
GeCD-1-68	290.00	290.40	290.20	25/01/2001	Very fine - fine sand	47.09	14.9
GeCD-1-69	297.50	298.00	297.75	25/01/2001	Very fine - fine sand	7.85	8.1
GeCD-1-70	299.40	300.00	299.70	25/01/2001	Very fine sand, silt	8.85	7.9

Table 5.6.5 Result of Core Analysis at Arabpur, Jhenaidah Pourashava (1/2)

Site No.: **JH-1** **Core Boring No.:** **GeHJ-1**

Sample No.	Depth (m)			Sampling date	Facies	Result	
	from	to	center			Total As (ppm)	Leachate (ppb)
GeHJ-1-1	1.10	1.30	1.20	04/03/2001	Very fine sand, sandy silt	8.26	<5
GeHJ-1-2	2.30	2.60	2.45	04/03/2001	Clay	9.46	<5
GeHJ-1-3	3.30	3.60	3.45	04/03/2001	Silty clay	9.30	<5
GeHJ-1-4	4.05	4.45	4.25	04/03/2001	Sandy silt	8.24	<5
GeHJ-1-5	6.40	7.00	6.70	04/03/2001	Very fine sand	1.20	<5
GeHJ-1-6	8.40	9.00	8.70	04/03/2001	Fine sand	11.88	<5
GeHJ-1-7	12.50	13.00	12.75	04/03/2001	Very fine - fine sand	1.03	<5
GeHJ-1-8	15.40	16.00	15.70	04/03/2001	Fine sand	0.77	<5
GeHJ-1-9	18.00	18.60	18.30	04/03/2001	Medium sand	3.73	<5
GeHJ-1-10	19.00	19.70	19.35	04/03/2001	Fine - medium sand	2.27	<5
GeHJ-1-11	21.00	21.55	21.28	04/03/2001	Fine sand	1.14	<5
GeHJ-1-12	24.00	24.55	24.28	04/03/2001	Medium sand	2.02	<5
GeHJ-1-13	29.00	29.60	29.30	04/03/2001	Fine sand	1.07	<5
GeHJ-1-14	36.00	36.32	36.16	04/03/2001	Silty clay	8.39	<5
GeHJ-1-15	37.00	37.70	37.35	04/03/2001	Fine sand	1.25	<5
GeHJ-1-16	42.40	43.00	42.70	04/03/2001	Fine sand	0.67	<5
GeHJ-1-17	45.40	46.00	45.70	04/03/2001	Fine sand	1.03	<5
GeHJ-1-18	48.40	49.00	48.70	04/03/2001	Medium sand	1.13	<5
GeHJ-1-19	52.50	53.20	52.85	05/03/2001	Medium sand	1.17	<5
GeHJ-1-20	57.10	57.60	57.35	05/03/2001	Fine - medium sand	1.29	<5
GeHJ-1-21	61.60	62.00	61.80	05/03/2001	Fine - medium sand	9.15	47.9
GeHJ-1-22	63.00	63.60	63.30	05/03/2001	Silty fine sand	17.95	90.5
GeHJ-1-23	66.40	67.00	66.70	05/03/2001	Fine - medium sand	5.96	59.9
GeHJ-1-24	69.70	69.94	69.82	05/03/2001	Silty clay	1.61	<5
GeHJ-1-25	71.00	71.60	71.30	05/03/2001	Fine - medium sand	4.19	13.2
GeHJ-1-26	75.50	76.00	75.75	05/03/2001	Medium sand	0.49	<5
GeHJ-1-27	77.00	77.60	77.30	05/03/2001	Fine - medium sand	0.18	<5
GeHJ-1-28	81.40	82.00	81.70	05/03/2001	Fine - medium sand	0.38	<5
GeHJ-1-29	83.20	84.00	83.60	05/03/2001	Medium sand	0.15	<5
GeHJ-1-30	86.00	86.60	86.30	05/03/2001	Very fine - fine sand	0.84	<5
GeHJ-1-31	89.00	89.65	89.33	05/03/2001	Medium sand	0.77	<5
GeHJ-1-32	90.40	91.00	90.70	06/03/2001	Medium - coarse sand	0.95	<5
GeHJ-1-33	93.40	94.00	93.70	06/03/2001	Medium sand	0.84	<5
GeHJ-1-34	97.60	97.95	97.78	06/03/2001	Medium sand	0.87	<5
GeHJ-1-35	99.05	99.40	99.23	06/03/2001	Fine - medium sand	1.28	<5
GeHJ-1-36	100.55	100.37	100.46	06/03/2001	Silty clay	19.48	<5
GeHJ-1-37	103.70	103.90	103.80	06/03/2001	Very fine - fine sand	2.67	5.5
GeHJ-1-38	105.05	105.30	105.18	06/03/2001	Fine sand	4.03	<5
GeHJ-1-39	109.75	110.00	109.88	06/03/2001	Medium - coarse sand	1.78	5.1
GeHJ-1-40	117.10	117.35,	117.10	06/03/2001	Fine - medium sand	1.39	7.3
GeHJ-1-41	119.64	120.00	119.82	06/03/2001	Fine - medium sand	2.19	8.2
GeHJ-1-42	121.50	122.00	121.75	06/03/2001	Fine - medium sand	4.94	8.6
GeHJ-1-43	123.50	124.00	123.75	06/03/2001	Medium sand	2.60	7.7
GeHJ-1-44	124.70	125.00	124.85	06/03/2001	Medium - coarse sand	3.39	<5
GeHJ-1-45	125.40	126.00	125.70	10/03/2001	Medium - coarse sand	2.79	<5

Table 5.6.5 Result of Core Analysis at Arabpur, Jhenaidah Pourashava (2/2)

Site No.: **JH-1** **Core Boring No.:** **GeHJ-1**

Sample No.	Depth (m)			Sampling date	Facies	Result	
	from	to	center			Total As (ppm)	Leachate (ppb)
GeHJ-1-46	128.40	129.00	128.70	10/03/2001	Medium sand	6.52	8.7
GeHJ-1-47	129.50	130.00	129.75	10/03/2001	Fine - medium sand	9.49	<5
GeHJ-1-48	130.30	130.90	130.60	10/03/2001	Fine - medium sand	6.91	6.0
GeHJ-1-49	132.40	133.00	132.70	10/03/2001	Fine - medium sand	2.71	<5
GeHJ-1-50	135.00	135.40	135.20	10/03/2001	Medium sand	2.85	<5
GeHJ-1-51	136.50	137.00	136.75	10/03/2001	Fine - medium sand	5.82	<5
GeHJ-1-52	141.00	141.38	141.19	10/03/2001	Medium sand	1.89	<5
GeHJ-1-53	141.38	141.90	141.64	10/03/2001	Fine - medium sand	1.83	5.2
GeHJ-1-54	143.28	143.85	143.57	10/03/2001	Very fine - fine sand	16.68	7.0
GeHJ-1-55	145.00	145.60	145.30	10/03/2001	Silty fine - medium sand	1.46	5.5
GeHJ-1-56	146.50	146.91	146.71	10/03/2001	Medium sand	1.76	6.9
GeHJ-1-57	147.50	148.00	147.75	10/03/2001	Fine sand	7.62	5.7
GeHJ-1-58	153.50	153.90	153.70	21/05/2001	Medium - coarse sand	4.76	<5
GeHJ-1-59	159.00	159.45	159.23	21/05/2001	Fine - medium sand	1.88	<5
GeHJ-1-60	163.50	164.00	163.75	21/05/2001	Medium sand	7.38	<5
GeHJ-1-61	169.00	169.50	169.25	21/05/2001	Fine sand	7.67	<5
GeHJ-1-62	171.10	171.60	171.35	23/05/2001	Fine sand	7.63	<5
GeHJ-1-63	175.50	176.00	175.75	23/05/2001	Fine - medium sand	6.02	<5
GeHJ-1-64	183.00	183.50	183.25	23/05/2001	Fine sand	10.61	<5
GeHJ-1-65	186.35	186.85	186.60	23/05/2001	Fine sand	14.38	<5
GeHJ-1-66	192.50	193.00	192.75	23/05/2001	Fine - medium sand	12.84	<5
GeHJ-1-67	195.50	195.85	195.68	23/05/2001	Sandy silt, fine sand	12.82	<5
GeHJ-1-68	203.00	203.50	203.25	03/06/2001	Fine sand	6.90	<5
GeHJ-1-69	205.50	206.00	205.75	03/06/2001	Fine sand	5.71	<5
GeHJ-1-70	210.00	210.35	210.18	03/06/2001	Medium sand	2.20	<5
GeHJ-1-71	218.60	219.00	218.80	03/06/2001	sandy silt, fine - medium sand	2.66	<5
GeHJ-1-72	223.00	223.35	223.18	03/06/2001	Very fine - fine sand	1.87	<5
GeHJ-1-73	226.30	226.75	226.53	03/06/2001	Sandy silt , fine sand	1.37	<5
GeHJ-1-74	229.00	229.50	229.25	03/06/2001	Fine sand	1.70	<5
GeHJ-1-75	236.00	236.40	236.20	03/06/2001	Very fine - fine sand	1.62	<5
GeHJ-1-76	243.00	243.40	243.20	03/06/2001	Fine sand	1.60	<5
GeHJ-1-77	248.00	248.40	248.20	03/06/2001	Fine - medium sand	1.97	<5
GeHJ-1-78	252.00	252.40	252.20	12/07/2001	Fine sand	1.60	<5
GeHJ-1-79	257.00	257.40	257.20	12/07/2001	Fine - medium sand	0.90	<5
GeHJ-1-80	261.00	261.50	261.25	12/07/2001	Fine - medium sand	0.76	<5
GeHJ-1-81	267.50	267.90	267.70	12/07/2001	Fine - medium sand	1.17	<5
GeHJ-1-82	271.50	271.83	271.67	12/07/2001	Fine - medium sand	1.16	<5
GeHJ-1-83	276.60	277.00	276.80	12/07/2001	Medium sand	0.68	<5
GeHJ-1-84	281.50	281.90	281.70	12/07/2001	Very fine - fine sand	4.71	<5
GeHJ-1-85	287.25	287.60	287.43	12/07/2001	Sandy silt, fine - medium sand	2.32	<5
GeHJ-1-86	291.00	291.40	291.20	12/07/2001	Fine - medium sand	2.35	<5
GeHJ-1-87	297.00	297.40	297.20	12/07/2001	Fine - medium sand	1.94	<5

Table 5.6.6 Result of Core Analysis at Krishna Chandrapur (1/2)

Site No.: JH-KC **Core Boring No.:** GeHM-1

Sample No.	Depth (m)			Sampling date	Facies	Result	
	from	to	center			Total As (ppm)	Leachate (ppb)
GeHM-1-1	1.00	1.35	1.18	22/07/2001	Sandy clay	7.72	<5
GeHM-1-2	3.40	3.75	3.58	22/07/2001	Sandy silt	5.72	<5
GeHM-1-3	4.64	5.00	4.82	22/07/2001	Silty very fine sand	4.78	<5
GeHM-1-4	14.10	14.50	14.30	22/07/2001	Very fine sand	2.47	<5
GeHM-1-5	17.00	17.40	17.20	22/07/2001	Clay	7.24	<5
GeHM-1-6	17.65	18.00	17.83	22/07/2001	Silty very fine sand	6.85	<5
GeHM-1-7	21.60	22.00	21.80	22/07/2001	Fine sand	1.41	<5
GeHM-1-8	25.70	25.85	25.78	22/07/2001	Sandy clay	12.96	<5
GeHM-1-9	28.00	28.42	28.21	22/07/2001	Fine sand	1.28	<5
GeHM-1-10	31.50	32.00	31.75	25/07/2001	Fine sand	1.44	<5
GeHM-1-11	35.60	36.00	35.80	25/07/2001	Fine sand	1.19	<5
GeHM-1-12	44.50	45.00	44.75	25/07/2001	Fine - medium sand	1.10	<5
GeHM-1-13	47.15	47.50	47.33	25/07/2001	Fine sand	1.29	<5
GeHM-1-14	54.00	54.50	54.25	25/07/2001	Fine sand	1.20	<5
GeHM-1-15	56.00	56.50	56.25	25/07/2001	Very fine - fine sand	3.66	<5
GeHM-1-16	64.45	64.90	64.68	25/07/2001	Fine - medium sand	1.00	<5
GeHM-1-17	67.50	67.75	67.63	25/07/2001	Medium sand	1.23	<5
GeHM-1-18	71.50	72.00	71.75	25/07/2001	Fine - medium sand	1.06	<5
GeHM-1-19	74.50	74.90	74.70	25/07/2001	Medium sand	0.80	<5
GeHM-1-20	76.20	76.70	76.45	25/07/2001	Medium - coarse sand	0.85	<5
GeHM-1-21	77.20	77.70	77.45	25/07/2001	Medium sand	0.87	<5
GeHM-1-22	81.00	81.50	81.25	25/07/2001	Medium sand	0.84	<5
GeHM-1-23	83.50	84.00	83.75	25/07/2001	Medium sand	0.77	<5
GeHM-1-24	86.50	87.00	86.75	25/07/2001	Medium sand	0.62	<5
GeHM-1-25	87.45	88.00	87.73	25/07/2001	Fine - medium sand	0.87	<5
GeHM-1-26	95.60	96.00	95.80	25/07/2001	Fine - medium sand	0.72	<5
GeHM-1-27	99.00	99.50	99.25	25/07/2001	Fine - medium sand	1.31	<5
GeHM-1-28	100.00	100.47	100.24	25/07/2001	Medium - coarse sand	1.15	<5
GeHM-1-29	103.10	103.60	103.35	25/07/2001	Fine - medium sand	1.36	<5
GeHM-1-30	106.00	106.32	106.16	25/07/2001	Medium sand	1.01	<5
GeHM-1-31	113.60	114.00	113.80	28/07/2001	Medium - coarse sand	1.99	<5
GeHM-1-32	114.60	115.00	114.80	28/07/2001	Medium sand	0.83	<5
GeHM-1-33	116.50	116.85	116.68	28/07/2001	Coarse sand	1.38	<5
GeHM-1-34	118.00	118.40	118.20	28/07/2001	Fine - medium sand	0.89	<5
GeHM-1-35	122.45	123.00	122.73	28/07/2001	Fine - medium sand	1.41	<5
GeHM-1-36	125.00	125.45	125.23	28/07/2001	Medium sand	1.70	<5
GeHM-1-37	129.10	129.60	129.35	28/07/2001	Fine - medium sand	2.39	<5
GeHM-1-38	130.60	131.00	130.80	28/07/2001	Medium - coarse sand	2.37	<5
GeHM-1-39	132.10	132.60	132.35	28/07/2001	Medium sand	2.12	<5
GeHM-1-40	138.15	138.60	138.38	28/07/2001	Medium sand	1.89	<5
GeHM-1-41	139.60	140.00	139.80	28/07/2001	Fine - medium sand	3.94	<5
GeHM-1-42	141.10	141.50	141.30	28/07/2001	Fine - medium sand	2.77	<5
GeHM-1-43	142.55	143.00	142.78	28/07/2001	Medium sand	0.96	<5
GeHM-1-44	147.10	147.60	147.35	28/07/2001	Medium sand	5.67	<5
GeHM-1-45	151.30	151.73	151.52	31/07/2001	Medium sand	1.45	<5

Table 5.6.6 Result of Core Analysis at Krishna Chandrapur (2/2)

Site No.: **JH-KC** **Core Boring No.:** **GeHM-1**

Sample No.	Depth (m)			Sampling date	Facies	Result	
	from	to	center			Total As (ppm)	Leachate (ppb)
GeHM-1-46	154.00	154.35	154.18	31/07/2001	Medium - coarse sand	1.41	<5
GeHM-1-47	157.45	157.85	157.65	31/07/2001	Fine - medium sand	5.25	<5
GeHM-1-48	160.55	160.90	160.73	31/07/2001	Medium sand	2.30	<5
GeHM-1-49	162.00	162.22	162.11	31/07/2001	fine sand	2.24	<5
GeHM-1-50	166.50	166.90	166.70	31/07/2001	Fine - medium sand	2.82	<5
GeHM-1-51	172.50	173.00	172.75	31/07/2001	Coarse sand	5.29	<5
GeHM-1-52	174.54	175.00	174.77	31/07/2001	Fine - medium sand	3.79	<5
GeHM-1-53	175.10	175.55	175.33	31/07/2001	Medium - coarse sand	2.37	<5
GeHM-1-54	177.50	178.00	177.75	31/07/2001	Medium - coarse sand	3.49	<5
GeHM-1-55	182.00	182.30	182.15	31/07/2001	Medium sand	3.63	<5
GeHM-1-56	185.00	185.50	185.25	31/07/2001	Medium - coarse sand	3.40	<5
GeHM-1-57	197.31	197.63	197.47	31/07/2001	Silt	8.17	<5
GeHM-1-58	199.00	199.40	199.20	31/07/2001	Silty very fine - fine sand	5.06	<5
GeHM-1-59	200.30	200.70	200.50	05/08/2001	Silt, Silt very fine sand	8.61	<5
GeHM-1-60	203.60	204.00	203.80	05/08/2001	Silt, very fine sand	7.19	<5
GeHM-1-61	205.00	205.40	205.20	05/08/2001	sandy silt	7.93	<5
GeHM-1-62	207.00	207.50	207.25	05/08/2001	Silt, very fine sand	4.75	<5
GeHM-1-63	211.00	211.45	211.23	05/08/2001	Silt	7.00	<5
GeHM-1-64	213.00	213.40	213.20	05/08/2001	Clayey silt	9.66	<5
GeHM-1-65	216.00	216.40	216.20	05/08/2001	Clayey silt	5.79	<5
GeHM-1-66	218.60	219.00	218.80	05/08/2001	Clayey silt, silt	11.11	<5
GeHM-1-67	224.00	224.30	224.15	05/08/2001	Clayey silt, silt	8.59	<5
GeHM-1-68	225.73	226.00	225.87	05/08/2001	Silt	8.85	<5
GeHM-1-69	228.00	228.40	228.20	05/08/2001	Clayey silt, very fine sand	7.51	<5
GeHM-1-70	230.60	231.00	230.80	05/08/2001	Silt	6.20	<5
GeHM-1-71	234.00	234.40	234.20	05/08/2001	Clayey silt, silt	8.68	<5
GeHM-1-72	236.40	236.80	236.60	05/08/2001	Clayey silt, silt	5.33	<5
GeHM-1-73	243.00	243.40	243.20	05/08/2001	Clayey silt, silt	8.56	<5
GeHM-1-74	245.50	245.90	245.70	05/08/2001	Clayey silt, silt	9.64	<5
GeHM-1-75	246.40	246.80	246.60	05/08/2001	Clayey silt, silt, very fine sand	6.60	<5
GeHM-1-76	251.20	251.60	251.40	05/08/2001	Clayey silt, silt	7.36	<5
GeHM-1-77	253.54	253.89	253.72	05/08/2001	Very fine sand	3.29	<5
GeHM-1-78	256.00	256.40	256.20	05/08/2001	Silt	6.84	<5
GeHM-1-79	260.00	260.40	260.20	05/08/2001	Silt	7.37	<5
GeHM-1-80	262.00	262.40	262.20	05/08/2001	Silt	8.23	<5
GeHM-1-81	268.20	269.00	268.60	05/08/2001	Silt	6.71	<5
GeHM-1-82	271.10	271.50	271.30	05/08/2001	Silt	7.97	<5
GeHM-1-83	275.60	276.00	275.80	05/08/2001	Silt	8.07	<5
GeHM-1-84	279.23	279.37	279.30	05/08/2001	Very fine sand	4.16	<5
GeHM-1-85	282.50	283.00	282.75	06/08/2001	Clayey silt, silt	7.82	<5
GeHM-1-86	285.60	286.00	285.80	06/08/2001	Silt	8.25	<5
GeHM-1-87	287.11	287.47	287.29	06/08/2001	Very fine sand	3.40	<5
GeHM-1-88	291.75	292.00	291.88	06/08/2001	Clay	7.83	<5
GeHM-1-89	292.48	292.93	292.71	06/08/2001	Very fine sand	4.08	<5
GeHM-1-90	296.00	296.50	296.25	06/08/2001	Silt	8.94	<5

Table 5.6.7 Result of Core Analysis at Kharki, Jessore Pourashava (1/2)

Site No.: **JS-2** **Core Boring No.:** **GeJJ-1**

Sample No.	Depth (m)			Sampling date	Facies	Result	
	from	to	center			Total As (ppm)	Leachate (ppb)
GeJJ-1-1	1.30	1.65	1.48	13/05/2001	Sandy silt	5.92	<5
GeJJ-1-2	2.30	2.60	2.45	13/05/2001	Clay	9.70	<5
GeJJ-1-3	4.50	4.80	4.65	13/05/2001	Sandy silt	7.13	<5
GeJJ-1-4	6.30	6.70	6.50	13/05/2001	Sandy silt	6.73	7.4
GeJJ-1-5	8.00	8.35	8.18	13/05/2001	Silty clay	7.64	5.8
GeJJ-1-6	8.40	8.60	8.50	13/05/2001	Peat	56.55	11.5
GeJJ-1-7	9.15	9.30	9.23	13/05/2001	Peat	45.00	7.3
GeJJ-1-8	10.60	10.90	10.75	13/05/2001	Peaty clay	22.60	<5
GeJJ-1-9	13.00	13.50	13.25	13/05/2001	Clay	46.86	<5
GeJJ-1-10	14.00	14.45	14.23	13/05/2001	Clay	46.87	<5
GeJJ-1-11	14.45	14.78	14.62	13/05/2001	Peaty silt	63.15	<5
GeJJ-1-12	15.35	15.80	15.58	13/05/2001	Silty clay	35.11	<5
GeJJ-1-13	15.80	16.30	16.05	13/05/2001	Clay	5.41	5.6
GeJJ-1-14	17.00	17.60	17.30	13/05/2001	Clayey silt	4.99	9.1
GeJJ-1-15	18.00	18.50	18.25	13/05/2001	Silty clay	41.52	6.6
GeJJ-1-16	19.08	19.18	19.13	13/05/2001	Peaty silt	50.70	20.3
GeJJ-1-17	19.50	20.00	19.75	13/05/2001	Clay	5.70	6.1
GeJJ-1-18	20.00	20.60	20.30	14/05/2001	Very fine sand	1.40	<5
GeJJ-1-19	26.00	26.50	26.25	14/05/2001	Fine sand	0.54	<5
GeJJ-1-20	29.48	29.58	29.53	14/05/2001	Peaty silt	6.21	<5
GeJJ-1-21	30.30	30.70	30.50	14/05/2001	Sandy clay	2.08	<5
GeJJ-1-22	31.30	31.70	31.50	14/05/2001	Sandy clay	8.17	<5
GeJJ-1-23	32.20	32.60	32.40	14/05/2001	Sandy clay	8.33	<5
GeJJ-1-24	33.00	33.50	33.25	14/05/2001	Clayey silt	5.26	<5
GeJJ-1-25	35.00	35.60	35.30	14/05/2001	Fine sand	1.09	<5
GeJJ-1-26	38.50	39.00	38.75	14/05/2001	Fine sand	0.65	<5
GeJJ-1-27	43.00	43.60	43.30	14/05/2001	Fine - medium sand	0.39	<5
GeJJ-1-28	47.10	47.70	47.40	14/05/2001	Medium sand	0.37	<5
GeJJ-1-29	53.00	53.60	53.30	14/05/2001	Medium sand	1.05	<5
GeJJ-1-30	56.00	56.60	56.30	14/05/2001	Medium sand	0.86	<5
GeJJ-1-31	62.00	62.50	62.25	14/05/2001	Medium - coarse sand	1.20	<5
GeJJ-1-32	67.40	67.90	67.65	14/05/2001	Medium sand	0.84	<5
GeJJ-1-33	72.00	72.60	72.30	17/05/2001	Fine sand	0.72	<5
GeJJ-1-34	76.00	76.60	76.30	17/05/2001	Medium sand	0.79	<5
GeJJ-1-35	83.00	83.50	83.25	17/05/2001	Medium sand	0.82	<5
GeJJ-1-36	89.00	89.50	89.25	17/05/2001	Very fine - fine sand	1.07	<5
GeJJ-1-37	90.50	91.00	90.75	17/05/2001	Fine sand	0.68	<5
GeJJ-1-38	93.50	94.00	93.75	17/05/2001	Fine sand	1.53	<5
GeJJ-1-39	97.00	97.60	97.30	17/05/2001	Medium sand	0.72	<5
GeJJ-1-40	103.00	103.50	103.25	19/05/2001	Fine - medium sand	0.62	<5
GeJJ-1-41	108.00	108.60	108.30	19/05/2001	Medium sand	1.15	<5
GeJJ-1-42	109.40	110.00	109.70	19/05/2001	Fine - medium sand	0.93	<5
GeJJ-1-43	113.50	114.00	113.75	19/05/2001	Fine - medium sand	0.95	<5
GeJJ-1-44	119.00	119.60	119.30	19/05/2001	Medium sand	1.86	<5
GeJJ-1-45	122.00	122.65	122.33	19/05/2001	Fine - medium sand	1.42	<5

Table 5.6.7 Result of Core Analysis at Kharki, Jessore Pourashava (2/2)

Site No.: JS-2 **Core Boring No.:** GeJJ-1

Sample No.	Depth (m)			Sampling date	Facies	Result	
	from	to	center			Total As (ppm)	Leachate (ppb)
GeJJ-1-46	128.00	128.50	128.25	19/05/2001	Fine sand, fine - medium sand	1.19	<5
GeJJ-1-47	131.00	131.50	131.25	19/05/2001	Fine sand	1.20	<5
GeJJ-1-48	137.10	137.55	137.33	19/05/2001	Fine sand	0.97	5.9
GeJJ-1-49	138.60	138.70	138.65	19/05/2001	Clayey silt	1.31	<5
GeJJ-1-50	140.00	140.50	140.25	19/05/2001	Fine - medium sand	1.31	<5
GeJJ-1-51	146.50	147.00	146.75	19/05/2001	Medium sand	1.06	<5
GeJJ-1-52	152.20	152.70	152.45	20/05/2001	Fine - medium sand	1.71	<5
GeJJ-1-53	159.50	159.65	159.58	20/05/2001	Silty clay	14.97	<5
GeJJ-1-54	161.30	161.80	161.55	20/05/2001	Fine sand	1.95	<5
GeJJ-1-55	167.20	167.70	167.45	26/05/2001	Fine - medium sand	1.49	<5
GeJJ-1-56	173.00	173.50	173.25	26/05/2001	medium sand	1.18	<5
GeJJ-1-57	177.00	177.50	177.25	26/05/2001	Fine - medium sand	1.30	<5
GeJJ-1-58	181.50	182.00	181.75	27/05/2001	medium sand	1.68	<5
GeJJ-1-59	188.50	188.85	188.68	27/05/2001	Fine sand	2.51	<5
GeJJ-1-60	193.00	193.50	193.25	31/05/2001	Fine sand	5.87	<5
GeJJ-1-61	196.00	196.50	196.25	31/05/2001	Medium sand	1.63	<5
GeJJ-1-62	204.50	205.00	204.75	31/05/2001	Fine - medium sand	2.37	<5
GeJJ-1-63	206.00	206.30	206.15	31/05/2001	Fine sand	3.10	<5
GeJJ-1-64	217.30	217.73	217.52	31/05/2001	Silt	10.57	<5
GeJJ-1-65	219.50	219.80	219.65	31/05/2001	Silt, very fine sand	9.81	<5
GeJJ-1-66	221.00	221.40	221.20	31/05/2001	Silt clay	8.50	<5
GeJJ-1-67	228.00	228.40	228.20	31/05/2001	Silt, very fine sand	8.14	<5
GeJJ-1-68	231.55	231.93	231.74	31/05/2001	Clayey silt	5.11	<5
GeJJ-1-69	236.15	236.50	236.33	31/05/2001	Silty clay	8.95	<5
GeJJ-1-70	243.00	243.50	243.25	01/06/2001	Fine - medium sand	1.41	<5
GeJJ-1-71	245.50	245.80	245.65	01/06/2001	Fine - medium sand	2.79	<5
GeJJ-1-72	251.50	251.75	251.63	01/06/2001	Clayey silt	5.68	<5
GeJJ-1-73	252.00	252.15	252.08	01/06/2001	Sandy silt	13.71	8.5
GeJJ-1-74	256.50	256.85	256.68	01/06/2001	Silty fine - medium sand	1.99	<5
GeJJ-1-75	260.50	260.70	260.60	01/06/2001	Fine - medium sand	1.15	6.1
GeJJ-1-76	263.60	264.00	263.80	01/06/2001	Fine - medium sand	0.99	8.6
GeJJ-1-77	264.50	265.00	264.75	01/06/2001	Fine - medium sand	1.26	<5
GeJJ-1-78	267.50	267.70	267.60	01/06/2001	Medium sand	2.14	7.4
GeJJ-1-79	269.00	269.50	269.25	01/06/2001	Fine sand	1.18	<5
GeJJ-1-80	270.60	271.00	270.80	01/06/2001	Fine - medium sand	0.92	<5
GeJJ-1-81	273.50	273.85	273.68	01/06/2001	Fine - medium sand	1.07	5.2
GeJJ-1-82	277.20	277.60	277.40	01/06/2001	Medium sand	1.12	<5
GeJJ-1-83	277.60	278.00	277.80	01/06/2001	Fine - medium sand	0.90	<5
GeJJ-1-84	281.00	281.50	281.25	01/06/2001	Fine sand	1.52	<5
GeJJ-1-85	283.30	283.70	283.50	01/06/2001	Fine sand	0.88	<5
GeJJ-1-86	286.50	286.70	286.60	01/06/2001	Silt	6.96	<5
GeJJ-1-87	287.00	287.50	287.25	01/06/2001	Fine - medium sand	0.99	<5
GeJJ-1-88	289.00	289.40	289.20	01/06/2001	Fine sand	0.88	<5
GeJJ-1-89	291.65	292.00	291.83	01/06/2001	Fine sand	0.95	<5
GeJJ-1-90	293.30	293.70	293.50	01/06/2001	Fine sand	0.96	<5
GeJJ-1-91	295.00	295.40	295.20	01/06/2001	Fine sand	0.91	<5
GeJJ-1-92	296.60	297.00	296.80	01/06/2001	Fine sand	0.95	<5
GeJJ-1-93	298.00	298.40	298.20	01/06/2001	Fine - medium sand	1.01	<5

Table 5.6.8 Result of Core Analysis at Rajnagar Bankabarsi, Keshabpur (1/2)

Site No.: JS-RB **Core Boring No.:** GeJK-1

Sample No.	Depth (m)			Sampling date	Facies	Result	
	from	to	center			Total As (ppm)	Leachate (ppb)
GeJK-1-1	2.65	3.00	2.83	12/06/2001	Silt	7.36	<5
GeJK-1-2	3.64	3.90	3.77	12/06/2001	Silty very fine sand	5.91	<5
GeJK-1-3	6.00	6.30	6.15	12/06/2001	Clay	8.29	<5
GeJK-1-4	7.00	7.30	7.15	12/06/2001	Peat	29.38	10.3
GeJK-1-5	8.00	8.21	8.11	12/06/2001	Peat	57.12	7.3
GeJK-1-6	8.60	9.00	8.80	12/06/2001	Clay	10.01	<5
GeJK-1-7	9.00	9.40	9.20	12/06/2001	Peaty clay	13.62	<5
GeJK-1-8	9.50	9.90	9.70	12/06/2001	Clay	10.51	<5
GeJK-1-9	12.60	13.00	12.80	12/06/2001	Silty Clay	6.95	<5
GeJK-1-10	16.00	16.50	16.25	12/06/2001	Silty very fine - fine sand	4.25	8.2
GeJK-1-11	23.20	23.60	23.40	12/06/2001	Very fine sand	6.86	<5
GeJK-1-12	27.50	27.85	27.68	13/06/2001	Very fine - fine sand	1.11	<5
GeJK-1-13	33.00	33.40	33.20	17/06/2001	Very fine - fine sand	1.74	<5
GeJK-1-14	37.60	38.00	37.80	17/06/2001	Clayey silt	11.02	<5
GeJK-1-15	40.60	41.00	40.80	17/06/2001	Fine sand	1.25	<5
GeJK-1-16	42.20	42.80	42.50	17/06/2001	Fine sand	1.52	<5
GeJK-1-17	47.00	47.50	47.25	17/06/2001	Very fine - fine sand	1.15	<5
GeJK-1-18	51.50	52.00	51.75	18/06/2001	Fine sand	2.04	5.5
GeJK-1-19	55.60	56.00	55.80	18/06/2001	Fine - medium sand	1.17	<5
GeJK-1-20	58.50	59.00	58.75	18/06/2001	Fine - medium sand	2.20	5.8
GeJK-1-21	61.80	62.00	61.90	18/06/2001	Peaty very fine sand	10.81	7.3
GeJK-1-22	63.50	64.00	63.75	18/06/2001	Fine - medium sand	1.77	6.7
GeJK-1-23	62.20	65.70	63.95	18/06/2001	Fine sand	1.88	6.5
GeJK-1-24	67.00	67.38	67.19	18/06/2001	Coarse sand	1.23	7.5
GeJK-1-25	74.40	75.00	74.70	21/06/2001	Fine - medium sand	1.49	6.9
GeJK-1-26	78.50	79.00	78.75	21/06/2001	Fine - medium sand	1.28	<5
GeJK-1-27	82.20	82.70	82.45	21/06/2001	Fine sand	1.05	<5
GeJK-1-28	86.50	87.00	86.75	21/06/2001	Fine sand	1.10	<5
GeJK-1-29	91.60	92.00	91.80	23/06/2001	Clayey silt, very fine - fine sand	4.83	<5
GeJK-1-30	94.40	94.80	94.60	23/06/2001	Clayey silt, fine sand	13.86	<5
GeJK-1-31	96.60	97.00	96.80	23/06/2001	Clayey silt, very fine - fine sand	5.70	6.8
GeJK-1-32	98.60	99.00	98.80	23/06/2001	Clayey silt, very fine - fine sand	5.36	<5
GeJK-1-33	101.00	101.50	101.25	23/06/2001	Clayey silt, very fine - fine sand	5.97	<5
GeJK-1-34	103.50	104.00	103.75	23/06/2001	Clayey silt, very fine - fine sand	7.71	<5
GeJK-1-35	106.00	107.00	106.50	23/06/2001	Silty very fine sand	5.80	7.2
GeJK-1-36	109.00	109.50	109.25	23/06/2001	Silty very fine sand	5.61	7.2
GeJK-1-37	111.50	112.00	111.75	23/06/2001	Silty very fine sand	5.88	<5
GeJK-1-38	113.50	114.00	113.75	23/06/2001	Clayey silt, very fine sand	7.06	<5
GeJK-1-39	116.00	116.50	116.25	23/06/2001	Clayey silt, very fine sand	7.02	<5
GeJK-1-40	118.50	119.00	118.75	23/06/2001	Clayey silt, very fine sand	7.76	<5
GeJK-1-41	121.00	121.50	121.25	24/06/2001	Sandy silt	7.80	<5
GeJK-1-42	123.50	124.00	123.75	24/06/2001	Silt, very fine sand	5.52	<5
GeJK-1-43	126.60	127.00	126.80	24/06/2001	Sandy silt	4.66	<5
GeJK-1-44	128.60	129.00	128.80	24/06/2001	Sandy silt	4.65	<5
GeJK-1-45	131.08	131.45	131.27	25/06/2001	Clayey silt	4.57	16.6
GeJK-1-46	133.60	134.00	133.80	25/06/2001	Sandy silt	5.06	<5
GeJK-1-47	136.00	136.40	136.20	25/06/2001	Sandy silt	6.39	<5
GeJK-1-48	139.30	139.63	139.47	25/06/2001	Silt	5.06	<5
GeJK-1-49	141.40	141.80	141.60	25/06/2001	Sandy silt	5.45	<5
GeJK-1-50	143.40	143.77	143.59	25/06/2001	sandy silt	5.84	5.9

Table 5.6.8 Result of Core Analysis at Rajnagar Bankabarsi, Keshabpur (2/2)

Site No.: **JS-RB** **Core Boring No.:** **GeJK-1**

Sample No.	Depth (m)			Sampling date	Facies	Result	
	from	to	center			Total As (ppm)	Leachate (ppb)
GeJK-1-51	146.00	146.40	146.20	25/06/2001	Sandy silt	6.80	<5
GeJK-1-52	148.00	148.40	148.20	25/06/2001	Silt	7.37	<5
GeJK-1-53	151.00	151.40	151.20	02/07/2001	Silty very fine sand	7.14	<5
GeJK-1-54	157.30	157.70	157.50	02/07/2001	Silty very fine sand	8.69	6.4
GeJK-1-55	163.00	163.40	163.20	02/07/2001	Sandy silt	9.20	<5
GeJK-1-56	166.20	166.50	166.35	02/07/2001	Silty very fine sand	6.98	<5
GeJK-1-57	168.60	169.00	168.80	02/07/2001	Silty very fine sand	6.87	<5
GeJK-1-58	173.60	174.00	173.80	02/07/2001	Silty very fine sand	8.96	<5
GeJK-1-59	177.60	178.00	177.80	02/07/2001	Sandy silt	7.40	<5
GeJK-1-60	182.50	182.74	182.62	03/07/2001	Clayey silt, sandy silt	7.79	<5
GeJK-1-61	183.10	183.40	183.25	03/07/2001	Clayey silt, sandy silt	9.25	<5
GeJK-1-62	186.00	186.40	186.20	03/07/2001	Sandy silt	8.01	<5
GeJK-1-63	188.75	189.00	188.88	03/07/2001	Silty very fine sand	5.70	<5
GeJK-1-64	192.65	192.90	192.78	03/07/2001	Silty very fine sand	4.27	<5
GeJK-1-65	193.20	193.50	193.35	03/07/2001	Silt	10.11	<5
GeJK-1-66	195.50	195.85	195.68	03/07/2001	Silt	7.53	<5
GeJK-1-67	198.60	199.00	198.80	03/07/2001	Silt very fine sand	5.56	<5
GeJK-1-68	201.70	202.00	201.85	07/07/2001	Silt, sandy Silt	8.02	<5
GeJK-1-69	205.60	206.00	205.80	07/07/2001	Silty very fine sand	3.71	<5
GeJK-1-70	209.30	209.70	209.50	07/07/2001	Silt , sandy silt	5.94	<5
GeJK-1-71	213.30	213.70	213.50	07/07/2001	Clayey silt, silt	9.72	<5
GeJK-1-72	216.20	216.60	216.40	07/07/2001	Very fine sand	6.62	<5
GeJK-1-73	221.30	221.70	221.50	14/07/2001	Very fine - fine sand	3.33	<5
GeJK-1-74	225.00	225.40	225.20	14/07/2001	Sandy silt, silty very fine sand	7.16	<5
GeJK-1-75	231.00	231.35	231.18	14/07/2001	Silt	9.52	<5
GeJK-1-76	233.40	233.80	233.60	14/07/2001	Silty very fine sand	5.59	<5
GeJK-1-77	236.69	237.00	236.85	14/07/2001	Silty very fine - fine sand	4.96	<5
GeJK-1-78	240.60	241.00	240.80	14/07/2001	Silt , sandy silt	8.68	<5
GeJK-1-79	243.60	244.00	243.80	14/07/2001	Silty very fine sand	4.39	<5
GeJK-1-80	245.60	246.00	245.80	14/07/2001	Sandy silt	6.74	<5
GeJK-1-81	251.74	252.10	251.92	14/07/2001	Fine sand	2.28	<5
GeJK-1-82	254.54	254.91	254.73	14/07/2001	Silt	67.61	<5
GeJK-1-83	256.23	256.66	256.45	14/07/2001	Clayey silt	60.22	<5
GeJK-1-84	258.60	259.00	258.80	14/07/2001	Clayey silt	11.16	<5
GeJK-1-85	262.00	262.40	262.20	14/07/2001	Clayey silt	11.75	<5
GeJK-1-86	267.34	267.60	267.47	14/07/2001	Clay	11.35	<5
GeJK-1-87	268.00	268.40	268.20	14/07/2001	Clayey silt	12.84	<5
GeJK-1-88	271.55	271.95	271.75	22/07/2001	Silt	13.13	<5
GeJK-1-89	274.00	274.40	274.20	22/07/2001	Clayey silt	11.47	<5
GeJK-1-90	277.00	277.40	277.20	22/07/2001	Clayey silt	9.71	<5
GeJK-1-91	282.60	283.00	282.80	22/07/2001	Clayey silt	9.30	<5
GeJK-1-92	288.50	289.00	288.75	22/07/2001	Silt	10.27	<5
GeJK-1-93	289.60	290.00	289.80	22/07/2001	Clay	23.37	<5
GeJK-1-94	291.53	292.00	291.77	22/07/2001	Silt	15.22	<5
GeJK-1-95	293.50	293.75	293.63	22/07/2001	Clay	12.47	<5
GeJK-1-96	299.61	300.00	299.81	22/07/2001	Silt	11.82	<5

No. 1

Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Chuadanga	Drilling No.	GeCC-1
Union	Pourashava	Depth	0 m ~ 100m
Mouza	Hat Kaluganj		
Location	Girl School (Urban-2)	Recorder	Suenaga

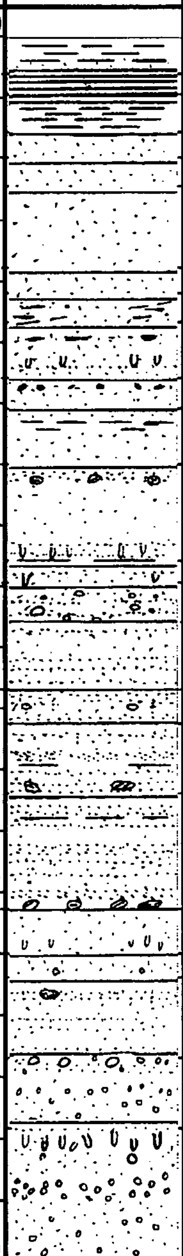
Depth (m)	Lithological Symbol	Facies	Color	Desription	Bottom of Layer (GL-m)
0					
		silt	olive brown	2.00-3.00 parallel laminae with vf.s lense	3.16
		clay	gray	3.23 organic 4.35-45 trace fossil	4.85
		silt-clayey silt	gray	fine parallel laminae	7.60
10		vf-f.s.	grayish olive	mica rich	10.00
		f-m.s.	grayish olive	mica rich	12.00
		vf-f.s.	grayish olive-gray	mica rich 14.08-09 c.s, 20.16-17 silt	19.00
20		f-m.s	gray	21.69-70, 22.10 wood fragment	21.00
		Silty vf-fs	grayish olive		23.00
		vf-f.s.	grayish olive	mica rich 24.70 wood fragment 26.15-20 trace fossil	28.00
30		f-m.s.	gray	mica rich 28.60-70, 29.28 wood fragment	30.30
		f.s.	gray -grayish olive	mica rich 30.50-53 clay- silt, 31.22-23 clay-silt	35.00
40		vf-f.s.	gray -grayish olive	mica rich 35.58-62 sandy silt block , 41.65-42.50trace fossil 42.39-40 clay	42.62
		f-m.s.	olive gray	mica rich, clay block, trace fossil	44.60
		c.s.	dark olive gray - grayish olive	mica rich, with pebble (max 3cm)	47.59
50		m.s.	grayish olive - gray		53.60
		f-m.s.	gray	mica rich 54.80-90 c.s.	56.80
60		v.f-f.s.	olive gray	mica rich, 57.60-59.00 cross laminae, 59.25 clay, 61.25-36 silt block	62.00
70		f-m.s.	gray - dark olive gray	63.45-50 sandy silt, 63.61-66 sandy silt 64.02-04 pebble (max 2.5 cm), 65.30-32pebble (max 2.5 cm), 68.33-35 sandy silt, 69.30-36 sandy silt, 71.15025 silt block .	71.25
		v.f-f.s.	gray	mica rich, 73.70-74.50 trace fossil	75.00
		m.s	grayish olive	76.55-56 pebble (1cm)	77.00
80		f-m.s.	grayish olive	77.00-78.35 mica rich, 78.05-07 silt block(3cm) 82.30-33 silty f.s. block (3cm)	83.00
		m.s.	gray	83.00-60 pebble (max 4cm), 86.50-70 pebble (max 4cm), 87.50-60 pebble (max 4cm)	89.00
90 100		f-m.s.	gray	89.00-90 trace fossil 90.60-91.30 pebble (max 2cm) 94.00-94.20 pebble (max 1cm) 96.50-99.18pebble (max 3cm)	100.00

Figure 5.6.1(1) Geological columnar section

No. 2

Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Chuadanga	Drilling No.	GeCC-1
Union	Pourashava	Depth	100 m ~ 200 m
Mouza	Hat Kaluganj		
Location	Girl School (Urban-2)	Recorder	Suenaga

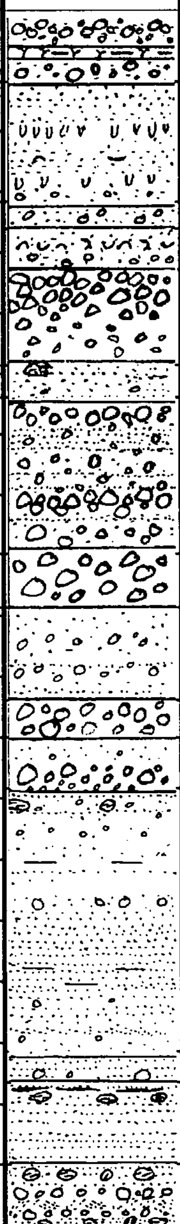
Depth (m)	Lithological Symbol	Facies	Color	Desription	Bottom of Layer (GL-m)
100					
		m-c.s. with pebble	gray	100.00-101.70 pebble (max 5cm), 102.50-70 peaty silt (olive black), 104.65-105.80 pebble (max 3cm)	106.00
110		f.s.	gray	mica rich 107.15-107.17trace fossil 109.00-110.50 trace fossil 112.90 shell fragment1 13.00-113.50 trace fossil	116.00
		f - m.s.	gray	with pebble (max 4 cm)	117.70
120		f.s.	gray - dark olive gray	119.35-50 shell fragment (hard 2cm) 119.50-121.00 pebble (max 4cm)	121.00
		pebble	gray - dark olive gray	orthoquartzite (max 5cm)	129.00
130		m.s.	gray	129.20-25 peaty silt block	132.00
140		f - m.s. with pebble	gray - grayish olive	with pebble (orthoquartzite, max 6cm) 132.10-133.20 max 4cm 133.50-139.00 max 2-3cm 139.00-145.00 max 4-6cm	145.00
150		pebble		orthoquartzite (max 5cm)	149.00
		f - m.s.	gray	with pebble (max 2.5cm) 154.70 heavy mineral densly	157.00
160		pebble	gray	orthoquartzite (max 4cm)	160.00
		f - m.s.	gray	162.00-10 pebble (orthoquartzite, max 4cm)	164.00
170 180		f - m.s.	gray	165.65-72 silt block (max 5cm) 174.00-03 pebble (max 3cm) 181.80-182.00 m-c.s., mica rich 185.35-52 vf.s	186.00
		m.s.	gray	187.87-89 pebble (orthoquartzite .2cm)	188.00
190		vf-f.s.	gray	188.14-15 organic 189.00-10 silt block (3 * 4 cm)	195.00
200		f - m.s.	gray - dark olive gray	195.22-29 silt block (max 5cm), 196.60-198.50 pebble (orthoquartzite, max 5cm), 199.60-200.00m c.s., silt block (1-2cm)	200.00

Figure 5.6.1(2) Geological columnar section

No. 3

Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Chuadanga	Drilling No.	GeCC-1
Union	Pourashava	Depth	200 m ~ 300 m
Mouza	Hat Kaluganj		
Location	Girl School (Urban-2)	Recorder	Suenaga

Depth (m)	Lithological Symbol	Facies	Color	Desription	Bottom of Layer (GL-m)
200					
		f-m.s.	gray	with pebble (orthoquartzite, max 3.5cm) 203.26 organic	207.50
210		alteration of f-m.s and silt	gray - dark olive gray	thickness (f-m.s. 3-80cm : silt 0.5-26cm), 208.70-209. 00 pebble (oq, max 3cm), 209.60-210.00 clay, silt block, 212.10-212.40clay, silt block	213.00
		f-m.s.	gray	213.03-04 charcoal wood fragment, 213.80-214.30 (orthoquartzite, max 3.5cm), 217.45-60 silt, clay block (max 2cm)	217.75
220		m-c.s.	gray	mica rich 219.27-40 silt	221.00
230		f-m.s.	gray - olive gray	mica rich 221.45-50 silt, 222.06-16 silt block (max 6cm) 223.85-92 silt, 224.30-55 cross laminae 224.90-225.00 silt	230.00
		f.s.	olive gray	mica rich, cross laminae	232.20
		alteration of f.s. and silt	olive gray - dark olive gray	thickness (f.s.0.1-20cm : silt 0.2-1cm)	237.50
240		f.s.	olive gray - dark olive gray	mica rich 241.85-96 m.s.	242.49
		m-c.s	gray - dark olive	243.78-87 clayey silt	244.00
		alteration of f.s and silt	gray gray - dark greenish gray	Thickness (f.s.0.3-20cm : silt 0.2-4cm), 245.17-246-20 m.s	247.00
250		f-m.s.	gray	247.35-45 orthoquartzite (max 2.5cm), 249.00-60 cross laminae	250.00
		m.s.	olive gray	251.20-252.00 silty vf.s. block (1 cm)	253.70
260		f - m.s.	gray - dark olive gray	253.77-82 silt, 253.88-92 silt, 255.00-50 with pebble (orthoquartzite, max 2cm), 258.30-50with pebble (orthoquartzite, max 2cm)	261.00
		vf-f.s.	gray	261.50-262.30 cross laminae, 262.24-29 charcoal wood fragment, 265.40-265.70 cross laminae	266.00
		m - c.s.	gray	cross laminae, reverse grading	267.65
270		f - m.s.	gray	cross laminae silt, sandy silt block (0.5-3cm)	276.50
		m - c.s.	gray	with pebble (orthoquartzite, max 2cm)	277.90
280		f - m.s.	gray		279.15
290		f.s.	gray	280.54 charcoal wood fragment (1*3cm), 283.30-75 trace fossil, 283.55-60 silt block (hard, 5cm), 287.00-60 cross laminae, 287.60-288.00 with pebble (max 3cm), 288.39-41 silt (hard)	289.60
		c.s. with pebble	gray	pebble (orthoquartzite, max 5cm) 291.30-50 alternation of c.s. and sandy silt 292.94-98 silt block (hard, 6cm)	297.00
300		f.s.	gray	parallel laminae	

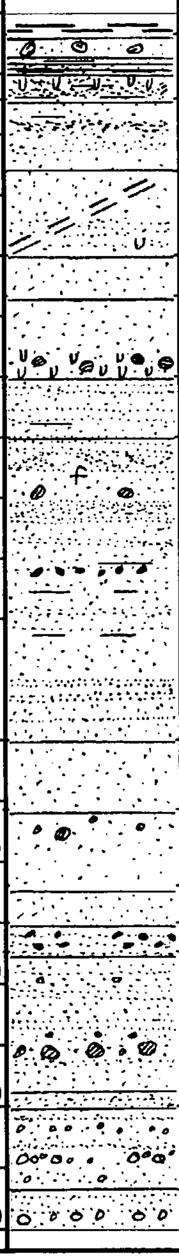
Figure 5.6.1(3) Geological columnar section

No. 1

Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS
FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Chuadanga	Drilling No.	GeCD-1
Union	Howli	Depth	0 m ~ 100 m
Mouza	Dudpatila		
Location	Boro Dudpatila Village	Recorder	Suenaga



Depth (m)	Lithological Symbol	Facies	Color	Desription	Bottom of Layer (GL-m)
0		Silt	dark olove brown	mica rich	1.00
		Silt, Vf.s	olove brown dull yellow	mica rich, 1.20 - 1.50 silt block (14 cm), 2.80 - 4.50 alteration of Vf.s and Sandy Silt, 4.00 - 5.00 trace fossil, 5.10- 5.30 cross laminae, 6.00 - 6.30 sandy silt	7.00
10		V.f.S	grayish olive gray	8.50 - 9.40 bioturbation	13.00
20		Silty Vf.S	gray	16.00 and 16.23 sandy silt 18.57 and 18.63 trace fossill	20.00
		V.f.S	gray	mica rich	23.00
30		Vf - f.s.	gray	mica rich 28.00 - 30.00 trace fossil , clay block	30.00
		f. s.	gray	mica rich 32.45-75 Vf - f.s, 34.18- 80 Vf - f.s	35.00
40 50 60		f. s.	gray	mica rich 36.60 - 36.80 cross laminae 38.00 - 40.00 clay block (max 5cm) 40.00-40.30 cross laminae 42.50-55 Vf - f.s 44.00-32 m.s. 47.30- 47.90 charcoal wooden fragment (max 1.5 cm) 51.00-10 Vf.-f.s. 55.00-20 v.f.-f.s.	60.00
		f - m.s.	gray	mica rich	66.00
70		f.s.	gray	mica rich, 66.20 - 66.70 silt block (hard) 67.08 - 67.10 clay block (1.5 cm)	71.75
		m. s.	gray	mica rich	75.00
		f. s.	gray	mica rich, charcoal wooden fragment (1-4 mm)	77.30
80		f - m.s.	gray	mica rich 78.10 - 78.20 silt block (hard . 1cm) 84.24 and 84.30 charcoal wooden fragment (5 mm) 85.60 and 85.80 clay block (max 3cm)	89.00
90		m. s.	gray	mica rich	90.00
		f - m.s.	gray	with pebble (orthoquartzite, max 2cm)	97.00
100		m - c.s	gray	with pebble (orthoquartzite, max 4cm)	100.00

Figure 5.6.2(1) Geological columnar section

No. 2

Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS
FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana: Chuadanga
Union: Howli
Mouza: Dudpatila
Location: Boro Dudpatila Village

Drilling No.: GeCD-1
Depth: 100 m ~ 200 m
Recorder: Suenaga

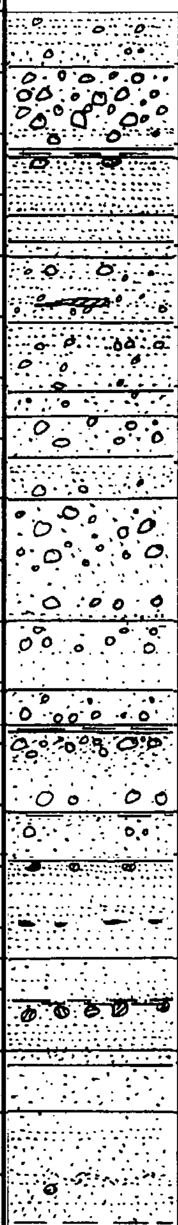
Depth (m)	Lithological Symbol	Facies	Color	Desription	Bottom of Layer (GL-m)
100		f – m. s.	gray	mica rich, with pebble (orthoquartzite, max 5cm)	104.00
110		m – c.s with pebble	gray	with pebble – cobble (orthoquartzite, max 7cm)	111.65
		clayey silt	dark greenish gray	mica rich 11.85 – 87m pebble (2 cm)	111.85
		vf. – f.s.	gray	mica rich	117.00
120		f – m.s	gray		119.00
		m.s	gray		120.00
		f – m.s.	gray	mica rich with pebble (orthoquartzite, max 4cm) clay lense (5m.m.)	126.50
130		m.s.	gray	mica rich with pebble (orthoquartzite, max 1.5cm)	130.75
		f – m.s.	gray	mica rich, with pebble (max 3cm)	133.00
		m.s.	gray	with pebble (orthoquartzite. max 5cm)	137.00
140		f – m.s.	gray	mica rich	140.00
150		m – c.s.	gray	with pebble (orthoquartzite, max 6cm) 147.50-60 Silty f – m.s.	150.00
		m.s.	gray	with pebble (orthoquartzite, max 3cm)	156.00
		f – m.s.	gray	mica rich, with pebble (max 4.4 cm)	158.05
160		Clayey Silt	dark greenish gray		158.13
		f – m.s.	gray		166.00
170		vf. – f.s.	dark olive gray	167.50-62m pebble (max 5 cm)	169.00
		f.s.	gray	mica rich charcoal wooden fragment (2*10mm)	177.00
180		f – m.s.	gray	182.00-10 Silt 182.10-60 silt block (max 2.m)	185.00
		m.s.	gray	mica rich	186.00
190		f-m.s.	gray	mica rich	190.00
200		f – m.s.	gray	196.62-64 silt block (1*2 cm) 199.14 – 21 silt 199. 39–48 silt 199.39 – 44 trace fossil (hard, 4*5 cm)	

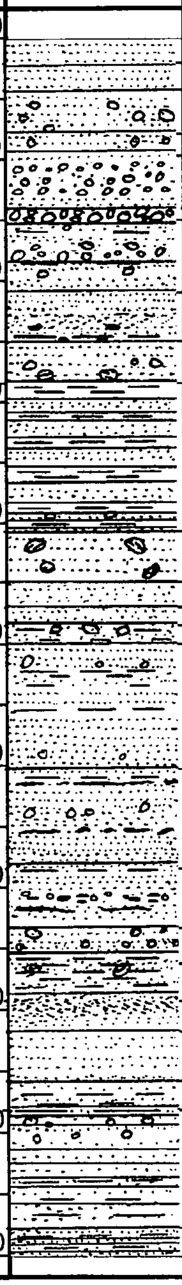
Figure 5.6.2(2) Geological columnar section

No. 3

Geological Log Sheet (JICA Study Team)

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS
FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Chuadanga	Drilling No.	GeCD-1
Union	Howli	Depth	200 m ~ 300 m
Mouza	Dudpatila		
Location	Boro Dudpatila Village	Recorder	Suenaga



Depth (m)	Lithological Symbol	Facies	Color	Desription	Bottom of Layer (GL-m)
200					
		f - m.s.	gray		202.00
		f.s.	gray		204.00
		f -m.s.	gray	with pebble (orthoquartzite, max 5cm)	208.00
210		m - c.s.	gray	with pebble (orthoquartzite, max 3cm)	209.30
		f -m.s.	gray	with pebble (orthoquartzite, max 5cm)	214.00
		m - c.s.	gray	with pebble (orthoquartzite, max 5cm)	215.00
220		f - m.s.	gray	with pebble (orthoquartzite, max 6cm) 215.08-12 silt block (hard,4 cm) 218.30-31 silt (hard) with pebble (orthoquartzite, max 6cm)	221.00
		f.s.	gray	223.99- 224.00m and 224.96 charcoal wooden fragment 224.91-92. 94-95 silty clay	225.00
		f- m	gray	226.60-68 pebble (max 3cm) 228-228.30 m-cs (with clay,silt block), 228.30-229.00 Silt- clayey silt	228.30
230		alternation of silt and vf-f.s.	gray - dark olive gray	thickness (silt 0.5-16cm : vf-f.s 0.5-50 cm)	
240					241.00
		f - m.s.	olive gray	with silt block	245.00
		m.s.	olive gray		247.00
		f - m.s.	olive gray olive		248.40
250		Silty m- c.s.	gray	with pebble (max 4.5cm)	250.00
		f- m.s.	gray - dark greenish gray	251.80- 253.00 with pebble (max 5cm) 253.10- 24 sandy silt 255.80 - 256.00 vf.s - silt 258.82 - 84 pebble (4 cm)	
260					260.20
		vf-f.s.	gray	261.50-70 reverse grading, 261.77-78 organic, 264.00-06 pebble (max 5cm), 265.35-43 organic	268.35
270		m.s.	gray	270.97-98 charcoal wooden fragment, 272.10 organic	273.77
		f-m.s.	gray	with pebble (max 1.5cm), 277.26-30 silt block (5cm., hard)	276.78
280		silt-silty f.s	gray - dark olive gray	mica rich	279.00
		f.s.	gray	279.50-280.51 cross laminae	282.00
		vf-f.s.	gray	285.50-285.80 cross laminae	286.00
		f- m.s.	gray	287.31-50 c.s.	288.00
290		alternation of vf - f.s and f - m.s	gray	290.00-40 pebble (max 3cm), 291.50-65 m-c.s. 293.00-15 m-c.s, 297.62-63 silt	298.00
300		alternation of silt and vf-f.s	gray - dark olive gray	sand rich, thickness (silt 0.5-4cm : v.f.s. 3-20cm)	

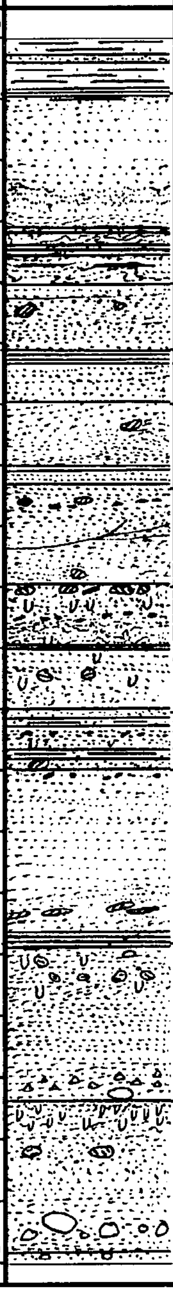
Figure 5.6.2(3) Geological columnar section

No. 1

Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Moheshpur	Drilling No.	GeHM-1
Union	Fatehpur	Depth	0 m ~ 100 m
Mouza	Chandpur		
Location	Krishna Chandrapur	Recorder	Suenaga



Depth (m)	Lithological Symbol	Facies	Color	Desription	Bottom of Layer (GL-m)
0		sandy silt	garayish olive olive yellow	1.50-.80 vf-f.s 4.44-.64 clay	4.64
10 20		vf.s	gray	mica rich 4.64-5.00 silty vf.s 11.80-12.00 vf-f.s 12.00-20.08 bioturbation 16.50-.63 and 17.00-.40 clay 17.55-.65 sandy silt	20.08
		f.s	gray	mica rich 22.04-.10 clay block	25.67
		clay	dark olive gary	mica rich, tuffaceous	26.59
30		vf - f.s	gary	mica rich	30.00
		f.s	gary	mica rich 32.61-.64 clay block 35.55-.58 clay	37.00
40		f - m.s	gary	mica rich 38.04-.07 and 44.64 clay block 38.11-.12 wooden fragment	45.00
50		f.s	gray	mica rich 45.12-.28 clay block, 45.14-.15 and 47.00-.03 wooden fragment, 46.00-.22 and 49.60-.70 and 52.86-.91 trace fossil, 49.50-.58 clay, 52.60-.75 silt block	55.32
60		vf - f.s	gray	mica rich 55.32-.39 and 58.88-.96 sandy silt	60.00
70		f - m.s	gray	mica rich 60.09-.11 charcoal wooden fragment 67.50-.75 m.s 71.44-.77 and 71.79-.80 clay lense 73.00-.10 silty clay	74.00
80		m.s	gray	mica rich 74.79-.80 pebble (orthoquartzite, 1.5cm), 75.42-.45 and 76.70-77.00 silt block(0.5-3cm), 75.44-.48 and 75.53-.66 trace fossil, 83.74-84.19 reddish gray laminae(with heavy mineral), 84.57-.61 pebble(O.Q. 4cm)	87.00
90		f - m.s	gray	miac rich 87.00-88.40 trace fossil and bioturbation 89.55-.65 silt block 96.60-98.00 pebble (O.Q. max 7cm)	99.78
100		m - c.s	gray	mica rich, with pebble (O.Q. 0.5-1.5cm)	

Figure 5.6.3(1) Geological columnar section

No. 2

Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Moheshpur	Drilling No.	GeHM-1
Union	Fatehpur	Depth	100 m ~ 200 m
Mouza	Chandpur		
Location	Krishna Chandrapur	Recorder	Suenaga

Depth (m)	Lithological Symbol	Facies	Color	Desription	Sample G.W.L
100					
		m－c.s	gray	mica rich, with pebble (O.Q. 0.5-3cm)	103.00
		f－m.s	gray	with pebble (O.Q. 0.5-6cm)	107.00
110 120		m－c.s with gravel		gravel (O.Q. 0.5-7cm) 107.70-108.00, 111.50-.70, 115.65-116.00, 118.00-.60, 119.46-.80 f-m.s	121.00
		f－m.s	gray	mica rich, with pebble (O.Q. 1-5.5cm) 122.50-.70 reddish gray laminae (with heavy mineral)	125.00
		m－c.s	gray, grayish olive	with pebble (O.Q. 0.5-3.5cm)	127.78
130		f－m.s	gray		129.65
		m.s	gray	mica rich, with pebble (O.Q. 0.5-4cm) 130.60-131.00 m-c.s, 133.61-.64 silt block (3cm)	135.50
140		f－m.s	gray, olive gray, yellowish brown	mica rich, with pebble (O.Q. 0.5-2.5cm)	142.00
150		m.s	gray	mica rich 142.55-144.75 pebble (O.Q. 0.5-1.5cm) 145.60-146.18 m-c.s, 148.60-149.90 trace fossil	150.38
		f－m.s	gray	mica rich, with pebble (O.Q. 1-5.5cm) , trace fossil	153.25
		m－c.s	gray	mica rich, with pwbble (O.Q. 0.5-1.5cm)	155.50
160		f－m.s	gray	mica rich with pebble (O.Q. 0.5-4cm)	163.00
		gravel		pebble (O.Q. 1-6cm), matrix m-c.s	165.10
		f－m.s	gray	mica rich, with pebble (O.Q. 0.5-3cm)	168.00
170 180 190		m－c.s with pebble	olive gray gray	with pebble (O.Q. 0.5-5cm) 168.00-175.00 mica rich 171.16-.34 f-m.s 174.54-175.00 f-m.s 180.71-.78 sandy silt block (4cm) 181.25-.40 silty f-m.s	195.00
200		alternation of silt and vf.s	olive gary gray	195.00-.30 with pwbble (O.Q. 1-2cm), sand block (hard, 3-4cm), silt block (4cm), 196.50-.61 clay	200.00

Figure 5.6.3(2) Geological columnar section

No. 3

Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Moheshpur	Drilling No.	GeHM-1
Union	Fatehpur	Depth	200 m ~ 300 m
Mouza	Chandpur		
Location	Krishna Chandrapur	Recorder	Suenaga

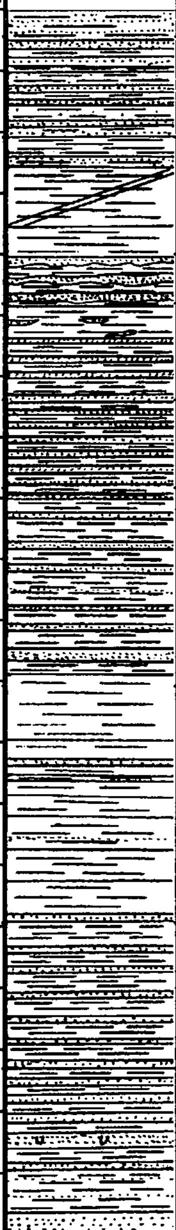
Depth (m)	Lithological Symbol	Facies	Color	Desription	Sample G.W.L
200		silt – silty vf.s	olive gray		202.24
210		alternation of silt and vf.s	olive gray – grayidh olive, gray		210.33
220		clayey silt – silt	olive gary	221.85–212.35 alternation of silt and vf.s 212.74–217.00 clayey silt (with thin vf.s layer)	220.00
		alternation (silt/vf.s)	olive gray, gray		224.00
230		alternation of silt and vf.s	olive gray gray	silt rich	232.00
		alternation of silt and vf.s	olive gray gray		239.00
240 250		alternation of silt and vf.s	olive gary gray	silt rich	255.52
260 270		silt	olive gray	with thin vf.s layer 260.53–.56 clayey silt 261.67–.75 vf.s 262.60–263.07, 264.80–265.10, 266.00–.15, 269.27–.41, 271.54–.59 clayey silt 268.70–.75 vf.s	274.86
280		alternation of silt and vf.s	olive gray gray	silt rich	286.62
290 300		alternation of silt and vf.s	olive gray gray	292.27–.29 trace fossil	

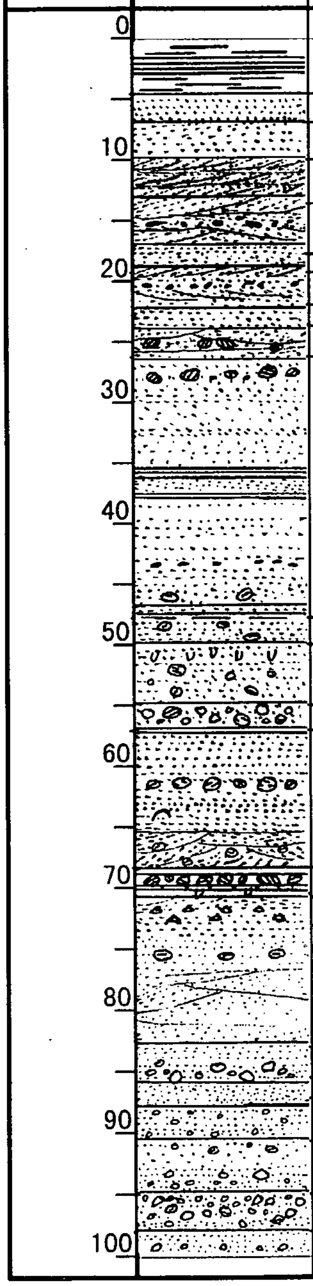
Figure 5.6.3(3) Geological columnar section

No. 1

Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS
FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Jhenaidah	Drilling No.	GeHJ-1
Union	Pourashava	Depth	0 m ~ 100 m
Mouza	Arappur Chandpara		
Location	Near Bagmara Bridge	Recorder	Suenaga



Facies	Color	Desription	Bottom of Layer (GL-m)
Silt (Clay)	Dark grayicial yellow, Graycial olive, Olive black	0.00-0.35 Artificial Surface Soil, 1.08-1.30 Alternation of VF.S and Silt, 2.15-3.60 Clay - Silty Clay	4.62
VF.S	Gray	4.75-5.00 F.S	7.00
F.S	Gray		10.00
VF - F.S	Gray	Cross Laminee	13.30
F - M.S	Gray Graycial Olive	Mica Rich, Cross Laminee 16.55-.65 Charcoal wood fragments (max 1* 3.5 c.m.)	17.60
M.S	Graycial Olive	Mica Rich	19.00
F - M.S	Gray	Mica Rich, Cross Laminee, 20.25-.70 Charcoal wood fragments	22.00
VF - F.S	Gray	Mica Rich	23.35
M.S	Grayish Olive, Gray	Mica Rich, Cross Laminee 24.82-25.00 M - C.S	26.20
F.S	Gray	Mica Rich 27.25-.36 Clay Block (max 5 c.m.) 27.33-.38 Peaty Silt Block (max 4*1.5 c.m.) 36.00 -.32 Silty Clay 37.93 -.38.10 Silty Clay 47.41-.59 Silt	48.00
F - M.S	Gray	Mica Rich	50.00
M.S	Gray	Mica Rich, 50.50-.65 Trace Fossil 51.00-.50 F - M.S	55.00
C.S	Gray	with Pebble (Orthoquartzite, max 3cm), Clay, Silt Block	57.00
F - M.S	Gray	Mica Rich, Cross Laminee, Parallel Laminee 57.00-.09 Silty Clay, 61.50-.55 Silt Block (max 3.5cm) 63.94-.96 Oxidize Shell Fragment (2*4 c.m.)	68.70
Alternation (M.S/Silty Clay)	Gray Olive Yellow	Clay Block, Trace Fossil	70.50
F - M.S	Gray	Mica Rich 182.75 -183.05 with Pebble (O.Q, 1-3.5 c.m.) 187.50-188.00 M-C.S	82.86
M - C.S	Gray	Mica Rich, with Pebble (O.Q, 0.5-4 c.m.)	85.90
VF - M.S	Gray	Mica Rich	87.30
M - C.S	Gray	Mica Rich, with Pebble (O.Q, 0.5-2 c.m.)	91.00
M.S	Gray	Mica Rich, with Pebble (O.Q, 0.5-2.5 c.m.)	95.00
M - C.S	Gray	Mica Rich, with Pebble (mainly O.Q, 0.5-3 cm), Silt Block	98.00
F - M.S	Gray	Mica Rich	

Figure 5.6.4(1) Geological columnar section

No. 2

Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS
FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Jhenaidah	Drilling No.	GeHJ-1
Union	Pourashava	Depth	100 m ~ 200 m
Mouza	Arappur Chandpara		
Location	Near Bagmara Bridge	Recorder	Suenaga

Depth (m)	Lithological Symbol	Facies	Color	Desription	Bottom of Layer (GL-m)
100					
		F - M.S	Gray	100.55-.67 Silty Clay, 102.00-103.68 Clay Silt Block	103.68
		VF - F.S	Olive Gray		105.35
110		M - C.S	Gray	with Gravel (O.Q. 0.4-7 c.m.)	115.00
120		F - M.S	Gray	with Pebble (O.Q, 0.5-5 c.m.) 117.70-118.00 C-VC. S with Pebble	120.00
		F - M.S	Gray	Mica Rich	123.40
		M - C.S	Gray	with Pebble (O.Q, 0.5-4 c.m.)	129.00
130		F - M.S	Gray	with Pebble (a little O.Q, 0.4-3 c.m.)	133.73
		M - C.S	Gray	with Pebble (O.Q, 0.5-4 c.m.), Clay, Peaty Clay Block (1-5cm)	136.46
140		F - M.S	Gray	with Pebble (O.Q, 0.5-6 c.m.) 139.80-140.00 VF - F.S	142.65
		F - M.S	Gray	with Pebble (a little O.Q, 1-4.5 c.m.) 143.28-.85 VF - F.S, 145.00-.60 Silty F - M.S	149.00
150		M - C.S	Gray	with Pebble (O.Q, 0.5-5 c.m.)	157.00
160		F - M.S	Gray	with Pebble (O.Q, 0.5-6 c.m.)	163.00
		M.S	Gray	with Pebble (a little O.Q, 1-5 c.m.)	165.00
170		F - M.S	Gray	Mica Rich with Pebble (O.Q, 0.5-5 c.m.)	171.65
		M - C.S	Gray,Grayish Olive	with Pebble (O.Q, 0.5-4 c.m.)	174.00
		F - M.S	Gray	Mica Rich	177.00
180		Pebble	Gray	O.Q 1-6 c.m. Matrix C - VC., S	180.00
		M.S	Gray	with Pebble (O.Q, 0.5-3 c.m.) 181.60-.80 Alt.	182.45
		F .S	Gray	Mica Rich, 182.75 -183.05 with Pebble (O.Q, 1-3.5cm) 187.50-188.00 M-C.S	188.00
190		Pebble	Grayish Olive	O.Q 1-4.5 c.m. Matrix M-C.S	189.87
		F - M.S	Gray	Mica Rich, with Pebble (a little O.Q, 0.5-3 c.m.) 189.87-.92 Sandy Silt, 189.92 -190.25 VF.S	194.60
200		Alternation (Silt and F.S), F.S	Greenish Gray, Olive Gray	Sand rich	200.00

Figure 5.6.4(2) Geological columnar section

No. 3

Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS
FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Jhenaidah	Drilling No.	GeHJ-1
Union	Pourashava	Depth	200 m ~ 300 m
Mouza	Arappur Chandpara		
Location	Near Bagmara Bridge	Recorder	Suenaga

Depth (m)	Lithological Symbol	Facies	Color	Desription	Bottom of Layer (GL-m)
200		Alt			200.15
		F - M.S	Olive Gray	Mica Rich, 202.46-.50 Sandy Silt	202.50
		F.S Alt (Silt and F.S)	Olive Gray Greenish Gray	Sand rich, Mica Rich	207.00
210		F - M.S	Grayish Olive	Mica Rich, 207.70-.85 Alt(Sandy Silt and F.S)	209.00
		M - C.S	Grayish Olive	with Pebble (O.Q, 0.5-2.5 c.m.)	210.75
		Sandy Silt and F - M.S	Olive Gray Gray	Sand rich	217.80
220		Alternation of Sandy Silt and F - M.S	Greenish Gray Gray	220.00-.26 Bioturbution	224.50
230		F - M.S and Alternation (Silt and F.S)	Gray Greenish Gray	Sand rich 226.20-.27 Bioturbation	233.00
		VF - F.S	Gray	233.63 - .66 Silt, 216.14 and .41 -.42 Sandy Silt	237.00
240		F - M.S	Gray		242.00
		F.S and Alt (Silt , F.S)	Gray, Greenish Gray, Olive Gray	Sand rich 243 - 244 Mica Rich	247.00
250		F - M.S	Gray	248.15 -.17 Charcoal wooden Fragment, 248.55 -.58 Silt Block	250.00
		F.S	Gray	Mica rich, 250.00-.50 and 254.00-.30 Alt(sandy silt/f.s) 253.29-.48 sandy silt, 253.95-.96 heavy mineral densly	255.00
260		F - M.S	Gray	Mica rich 258.65 - 259.00 and 260.07 - .30 Alt (sandy silt / f.s)	261.60
		Alternation of silt and M.s	Greenish Gray Gray	Silt and M.S block (irregular)	266.40
270		F - M.S	Gray	Mica rich 268.00 - .82 dark reddish gray laminae (with heavy mineral) 270.33-.38, 270.42-.50, 272.83-273.00, 273.10-.30 Silty V.F.S	276.32
280		F - M.S	Greenish Gray Olive Gray	Mica rich, 280.72 - .77 Silt Block	281.11
		VF - F.S	Olive Gray	Mica rich, 285.00 - .36 M - C.S	285.36
290		Alt (sandy silt / f - m.s)	Greenish Gray Olive Gray		290.00
		F - M.S	Olive Gray		292.30
300		Silty F - M.S	Olive Gray, Light Greenish Gray	Mica rich	

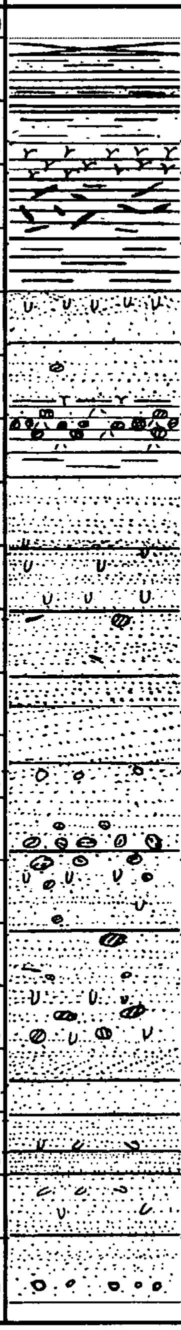
Figure 5.6.4(3) Geological columnar section

No. 1

Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Jessore	Drilling No.	GeJJ-1
Union	Pourashava	Depth	0 m ~ 100 m
Mouza	Khorki		
Location		Recorder	Suenaga



Depth (m)	Lithological Symbol	Facies	Color	Desription	Bottom of Layer (GL-m)
0		Sandy Silt and Clay	Dark GrayishYellow Olive Gray	2.36 Shell Fragment (0.3 c.m., White)	8.40
10		Peat, Peaty Clay	Black		10.90
		Clay	Olive Gray	with wooden Fragment (max 5*20 c.m.)	16.30
20		Clayey Silt Silty Clay	Olive Gray- Dark Olive Gray	with Shell Fragment (max 2*3 c.m.)	20.00
		VF. S	Gray	Mica Rich, 20.50-21.20 Trace Fossil and bioturbation, 22.25-22.70 Sandy Silt	24.00
30		F. S	Gray	Mica Rich, 24.69-.70 Shell Fragment (2m.m.), 29.00 -.48 VF-F.S, 29.48-29.58 Peaty Silt	29.58
		Tuffaceous Sandy Clay	Olive Gray - Gray	29.58-31.00 Silty Clay Block (0.5-2 c.m.)	32.85
		Silt	Brown		34.00
40		F. S	Yellowish Brown - Grayish Olive	Mica Rich, 34.00-35.00 Silty VF-F.S, 40.49-.50 Trace Fossil	40.60
		F - M.S	Yellowish Brown	Mica Rich, 40.74-.75 Trace Fossil 42.09-.13 and 45.08 -.23Trace Fossil	46.00
50		M.S	Yellowish Brown - Grayish Olive	Mica Rich, 46.30-.80 M-C.S, 46.52-.55 Clay Block (2.5*4cm), 46.22-.27 and 49.71-.72 Charcoal wooden Fragment, 48.40-49.14 and 49.85-50.00 F - M.S	51.00
		F - M.S	Yellowish Brown - Grayish Olive	Mica Rich	53.00
		M.S	Grayish Olive	Mica Rich	58.00
60		M - C.S	Grayish Olive	Mica Rich 58.70 - .90 with Pebble (O.Q, 3 c.m.)	65.00
70		M.S	Grayish Olive	Mica Rich with Silt Block, Trace Fossil	71.00
80		F - M.S	Grayish Olive - Gray	Mica Rich 71.51 -.55, 77.67 -.78 and 79.00 - .50 Clay block (max 4*5cm)	82.71
		M.S	Grayish Olive	Mica Rich	85.40
		F - M.S		Mica Rich, 88.08 - .24 Trace Fossil	88.24
90		VF - F.S		Mica Rich	90.00
		F.S	Grayish Olive- Gray	91.35 .40 and 93.00 -.10 Trace Fossil Mica Rich	95.00
100		M.S		Mica Rich 98.68 - .70 Pebble (Sand Silt 1*2.5 c.m.)	100.00

Figure 5.6.5(1) Geological columnar section

Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Jessore	Drilling No.	GeJJ-1
Union	Pourashava	Depth	100 m ~ 200 m
Mouza	Khorki		
Location		Recorder	Suenaga

Depth (m)	Lithological Symbol	Facies	Color	Desription	Bottom of Layer (GL-m)
100					
		F - M.S	Gray	Mica Rich, 101.66-.70 and 102.53-.65 and 103.04-.83 reddish gray laminae (with heavy mineral)	105.00
		M.S	Gray	Mica Rich with Pebble (O.Q. 0.5 -5 c.m.)	109.00
110		F - M.S	Gray	Mica Rich, 109.20 -110.80 Trace Fossil 109.00- 113.30 Silt Clay Block (0.5 -5 c.m.) with Pebble (Silt O.Q. 0.4 -5 c.m.)	118.46
120		M.S	Gray	with Pebble (O.Q. 0.5 -4 c.m.) 120.80-.95 Trace Fossil	122.00
130		F - M.S	Gray	with Pebble (O.Q 0.5 - 4.5 c.m.)	135.00
		VF - F.S	Gray	135.50- 137.10 with Pebble (O.Q 0.5 - 2.5 c.m.) 137.20 - .70 Trace Fossil	138.00
140		Clayee Silt	Greenish Gray	138.07 - .20 F.S	138.75
		F - M.S	Gray	with Pebble (O.Q. 0.5 -3 c.m.)	145.00
150		M.S	Gray	with Pebble (O.Q. 0.5 -3 c.m.) 146.84 - .86 Organic Matter	150.00
		F - M.S	Gray	with Pebble (a little O.Q. 1.5 -3.5 c.m.) 150-153 Mica Rich	154.30
		M - C.S	Gray	with Pebble (O.Q 0.5 - 4 c.m.), 155.06 - .12 Clayee Silt	159.00
160		Silty Clay	Brownish Black		159.65
		F.S	Gray	Cross Laminae	163.00
		M.S	Gray	with Pebble (O.Q 0.5 - 3 c.m.)	165.00
170		F - M.S	Grayish Olive	with Pebble (O.Q. 0.5 -3.5 c.m.)	170.00
		M.S	Gray	with Pebble (a little O.Q. 0.5 -2 c.m.)	175.65
		F - M.S	Gray- Grayish Olive	with Pebble (O.Q 0.5 - 3 c.m.)	178.00
180		M.S	Grayish Olive	with Pebble (O.Q 0.5 - 2.5 c.m.)	180.00
		M - C.S	Gray	with Pebble (O.Q. 0.5 -4 c.m.) 181.80 - 182.00 Organic Matter	186.00
190		F - M.S	Gray	186.00 -187.70 with Pebble (O.Q. 0.6 -3.5 c.m.) 189.25 - 189.75 Trace Fossil	192.00
		F.S	Gray	Mica Rich	194.40
200		M.S	Grayish Olive - Gray	with Pebble (O.Q. 0.4 -3.5 c.m.)	200.00

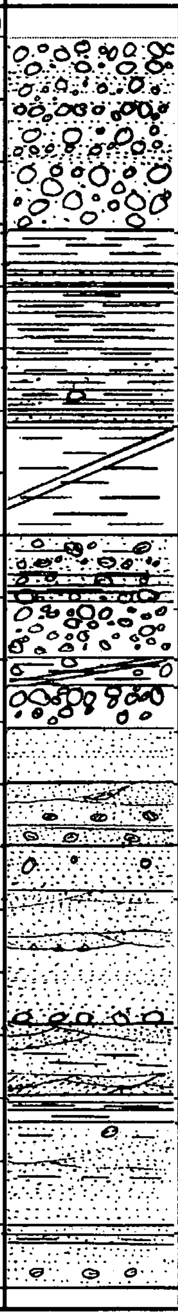
Figure 5.6.5(2) Geological columnar section

No. 3

Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Jessore	Drilling No.	GeJJ-1
Union	Pourashava	Depth	200 m ~ 300 m
Mouza	Khorki		
Location		Recorder	Suenaga



Depth (m)	Lithological Symbol	Facies	Color	Desription	Bottom of Layer (GL-m)
200					
210		F - M.S	Grayish Olive	with Pebble (a little O.Q. 0.5 - 6 c.m.) 150-153 Mica Rich	216.00
		M.S	Dark Olive Gray		218.50
220		Alt of Silt, VF.S	Gray	silt rich	220.24
		Silty Clay Clayee Silt	Dark Olive Gray		226.55
230		Alternation of Silt and VF.S	Gray	silt rich, 227.15 - 228.00 Sandy Silt 229.62 - .65 Pebble (Sand, 5 c.m.)	231.22
240		Clayee Silt	Dark Olive Gray - Gray		240.00
		M - C.S	Gray	with Pebble (O.Q. 0.5 -6 c.m.) with Silt block (1 - 5 c.m.)	246.00
250		Gravel		with Pebble (O.Q. 0.5 - 4 c.m.) matrix M - C.S	250.00
		Clayee Silt	Olive Gray	with Pebble (O.Q. 1- 5 c.m.)	252.22
		Gravel		with Pebble (O.Q. 1- 5 c.m.)	256.00
260		Silty F - M.S	Gray		260.00
		F - M.S	Gray	Mica Rich, Silt, Clay Block (1- 3 c.m.)	265.00
270		M.S	Gray	with Pebble (O.Q. 3 c.m.)	269.00
280		F - M.S	Gray	Mica Rich 279.40 - .50 with Pebble (O.Q. 1.5 - 3.5 c.m.)	279.50
		F.S	Gray	Mica Rich 281.59 -.61 and .67 -.69 Sandy Silt (1 c.m.)	285.00
		Clay Silt	Greenish Gray Olive Gray	Clay Silt Block	287.00
290		F.S	Greenish Gray	287.58 - .59 and 291.61 Silt (1 c.m. and 0.4 c.m.) 290 - 296 Mica Rich	296.00
300		F - M.S	Greenish Gray	Mica Rich, 296.30 - .50 Alternation of Silt and M.S	300.00

Figure 5.6.5(3) Geological columnar section

No. 1

Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Keshabpur	Drilling No.	GeJK-1
Union	Panjia	Depth	0 m ~ 100 m
Mouza	Rajnagar Bankabarsi		
Location		Recorder	Suenaga

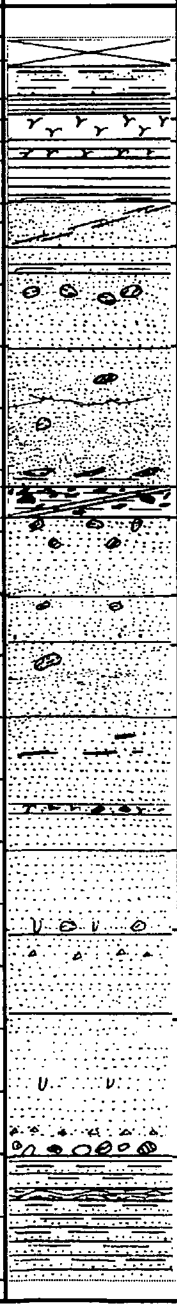
Depth (m)	Lithological Symbol	Facies	Color	Desription	Bottom of Layer (GL-m)
0		Surface Soil		Silt	2.00
		Silt, VF.S	Yellowish Brown		5.00
		Clay	Olive Gray		6.37
		Peat	Black		8.21
10		Clay	Olive Gray	8.21–9.05 with Wooden Fragment 9.00 – 9.40 Peaty Clay, 12.50 – 13.00 Silty Clay	13.00
		Silt, VF.S	Gray	15.50 – 16.00 Bioturbution	17.00
20		VF.S	Gray	Mica Rich 18.62 – .80 Sandy Silt – Silty VF.S 20.00 – .80 Silt Block (1 – 6 c.m., Gray)-	25.00
30		VF – F.S	Gray	Mica Rich 27.80 Clay Block (2 c.m., Gray) 31.50 – 35.00 Bioturbution 36.10 – .35 Silt Lense	37.00
		Clayey Silt	Dark Olive Gray	Charcoal Wooden Fragment	39.05
40		F.S	Gray	Mica Rich 39.05 – 40.53 Silty VF.S Clay Block (2 – 3 c.m.) 43.60 – .90 Bioturbution	45.00
		VF – F.S	Gray	Mica Rich, 45.59 – .61 Silty VF.S Block (1 c.m.) 47.70 – .75 Bioturbution	49.00
50		F.S	Gray	Mica Rich, 50.12 – .15 Silty VF.S, Clay Block (2–3cm) 51.00–.50 F – M.S	55.00
60		F – M.S	Gray	Mica Rich 57.11–.12 and 58.66–.67 Charcoal Wooden Fragment (0.5–1.5cm) 61.80–62.00 Peaty VF.S (with Charcoal Wooden Fragment 1–3cm)	66.00
70		M – C.S	Gray	Mica Rich 69.50 – 70.00 F – M.S, 71.24 – .25 Trace Fossil 71.15 – .35 Silt Block (1–2 c.m.)	72.00
80		F – M.S	Gray	Mica Rich 74.30 –75.00 with Spoted matter (Reddish, Brown, heavy Mineral), 77.00 – .25 M.S	79.00
90		F.S	Gray	Mica Rich 84.17 – .22 Trace Fossil 89.45 – .46 Reddish Laminae (Heavy Mineral) 89.90 – 90.30 Silt, Clay Block (1–4cm) with Pebble (Silt, Hard, 1–1.5 cm), shell fragment (0.1 – 0.2cm)	90.30
100		Alternation of Clayey, Silt and VF – F.S	Dark olive gray Gray		100.00

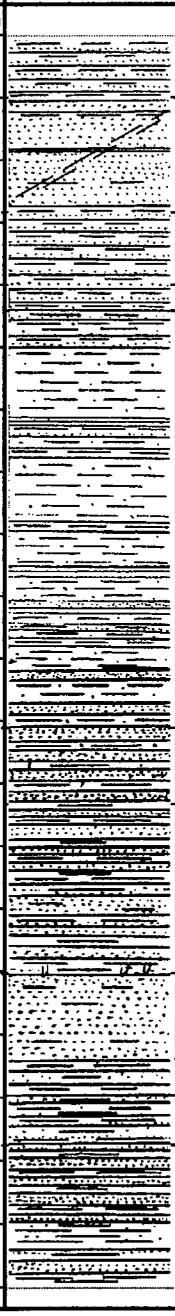
Figure 5.6.6(1) Geological columnar section

No. 2

Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Keshabpur	Drilling No.	GeJK-1
Union	Panjia	Depth	100 m ~ 200 m
Mouza	Rajnagar Bankabarsi		
Location		Recorder	Suenaga



Depth (m)	Lithological Symbol	Facies	Color	Desription	Bottom of Layer (GL-m)
100		Alternation of Clayey, Silt and VF - F.S	Dark Olive Gray, Gray		105.00
110		Silty VF. S	Dark Olive Gray ~ Olive Gray	105.50 - 106.00 Alternation of Silt and VF.S 108.50 - -.52 and .58 - .62 Clay 112.28 - .31 Silt	113.50
120		Alternation of Clayey Silt, VF - F.,S	Dark Olive Gray - Olive Gray		120.00
		Alt Silt VF.S	Olive Gray - Gray	121.00 - .50 Sandy Silt	122.00
130 140 150		Sandy Silt	Olive Gray	123.00 - 124.00 Alternation of Silt and VF.S 131.08 - .45 Clayey Silt 131.45 - 132.00 Alternation of Silt and VF - F.,S 132.55 - .85 Silt 139.30 - .63 Silt 142.50 - .70 Silty Clay 145.30 - .52 Silty VF.S 145.52 - .82 Clayey Silt 146.90 - 147.55 Alternation of Silt and VF.S 148.00 -40 Silt 150.70 - 151.60 Silty VF.S 153.80 - 154.40 Silty VF.S	155.30
160		Silty VF. S	Olive Gray	156.55-.70 Sandy Silt 158.00 -.25 Sandy Silt 159.80 - 160.60 Sandy Silt	161.30
170		Alternation of Silt - Sandy Silt and Silty VF.S - VF.S	Olive Gray Gray	168.40 - 169.00 Thin Layer Alternation 170.35 - 172.25 Thin Layer Alternation 173.30 - 175.00 Thin Layer Alternation 174.65 - .68 Trace Fossil	175.00
180		Sandy Silt	Olive Gray Dark Olive Gray	with Thin VF.S Layer	182.00
		Alt. Clayey Silt Sandy Silty	Dark Olive Gray		185.00
		Sandy Silt	Dark Olive Gray	with Thin VF.S Layer	188.75
190 200		Alternation of Silt - Sandy Silt and Silty VF.S - VF.S	Dark Olive Gray Gray		200.00

Figure 5.6.6(2) Geological columnar section

No. 3

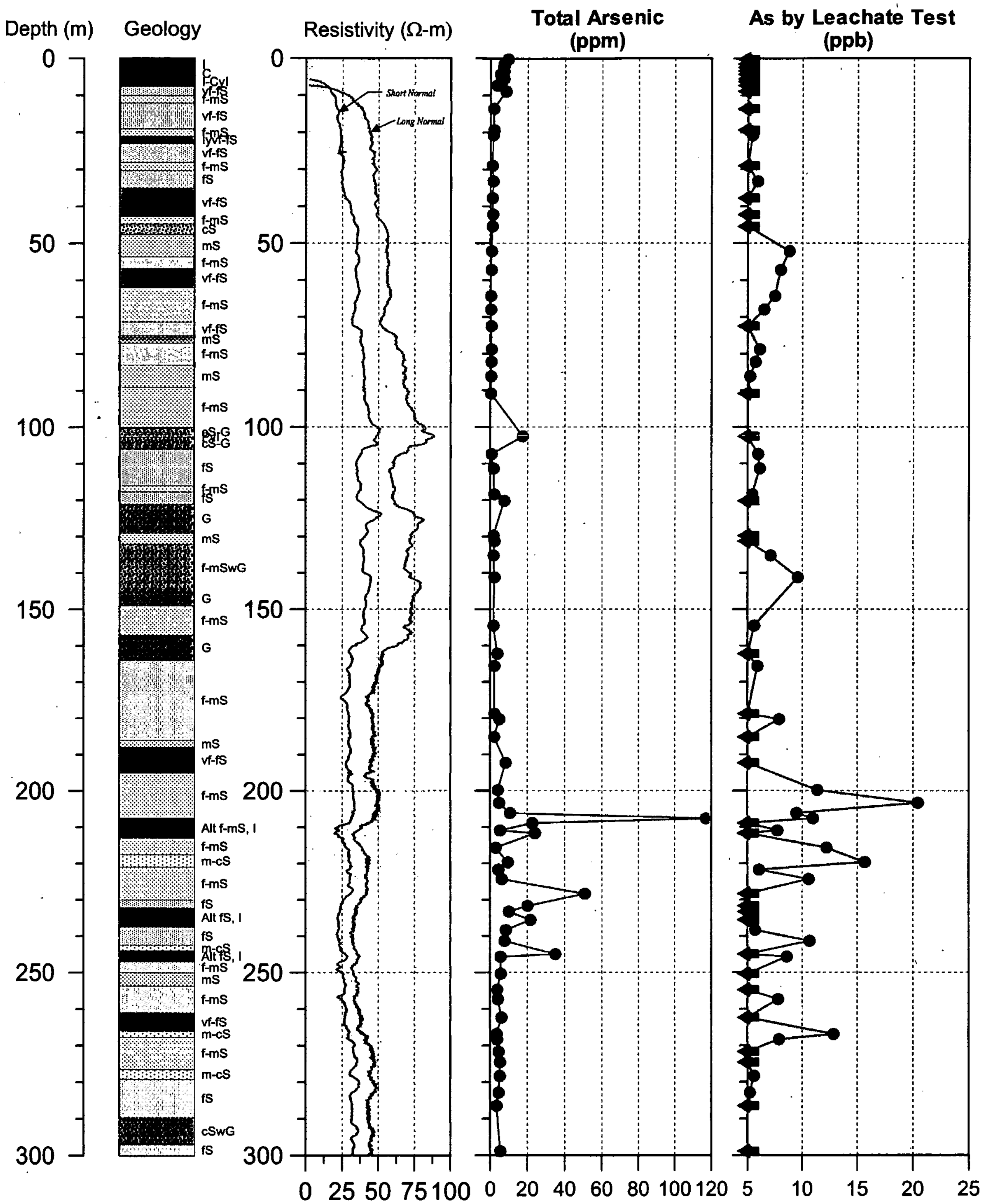
Geological Log Sheet *(JICA Study Team)*

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS
FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

Thana	Keshabpur	Drilling No.	GeJK-1
Union	Panjia	Depth	200 m ~ 300 m
Mouza	Rajnagar Bankabarsi		
Location		Recorder	Suenaga

Depth (m)	Lithological Symbol	Facies	Color	Desription	Bottom of Layer (GL−m)
200–210		Alteration of Silt VF.S	Gracial Olive Gray		208.00
210		Silt − Sandy Silt	Olive Gray	213.05 −214.00 Clayey Silt − Silt	214.00
		VF.S	Gray		217.50
220		Alt(Silt/Silty VF.S)	Olive Gray		219.00
		VF − F.,S	Gray	with Silt Block 220.30 − .90 Trace Fossil	224.00
		Silt / VF.S	Gray		227.60
230		Alternation of Silt and Sand	Gray	With Silt Block and Pebble, 227.60−229.00 Alt of Silt and VF−F.S, 228.30−.90 shell fragment(0.2−1.8cm), 229.00−230.00 Alt(Silt/F−M.s), 230.00−232.00 Alt(Silt/M−C.S)	232.00
		Silty VF.S	Gray	234.77 − .78 Silt Block	235.22
240–250		Alternation of Silt − Sandy Silt and Silty VF.S − VF.S	Olive Gray Gray	239.17 − 243.44 Silt Rich 247.00 − 251.00 with Silt, Sand Block, irregular Lamination	251.74
		F − M.S	Gray	WithPebble, Silt Block	253.56
		Silt	Olive Gray	With thin VF.S Layer	256.00
260–290		Clayee Silt	Olive Gray − Dark Olive Gray	With thin VF.S Layer 250.00 − .50 Silt, 259.00 260.00 Clayey Silt − Silt 262.04 − .07 Peaty (Dark Bluish Gray) 265.00 − .50 Clayey Silt − Silt, 265.50 − .60 Silty Clay 267.34 − .60 Clay, 269.88 − 270.20 Silt 271.20 − 272.16 Silt 273.50 − .55 Silty Clay 279.00 − .45 Silt 282.00 − .50 Clayey Silt − Silt, 282.50 − .60 Silty Clay 284.16 − .26 Silty Clay, 284.26 − .45 Silt	288.50
290–300		Silt	Olive Gray	With thin VF.S Layer 289.54 − 290.00 Clay 293.32 − .79 Clay 293.79 − 294.00 Clayee Silt	

Figure 5.6.6(3) Geological columnar section

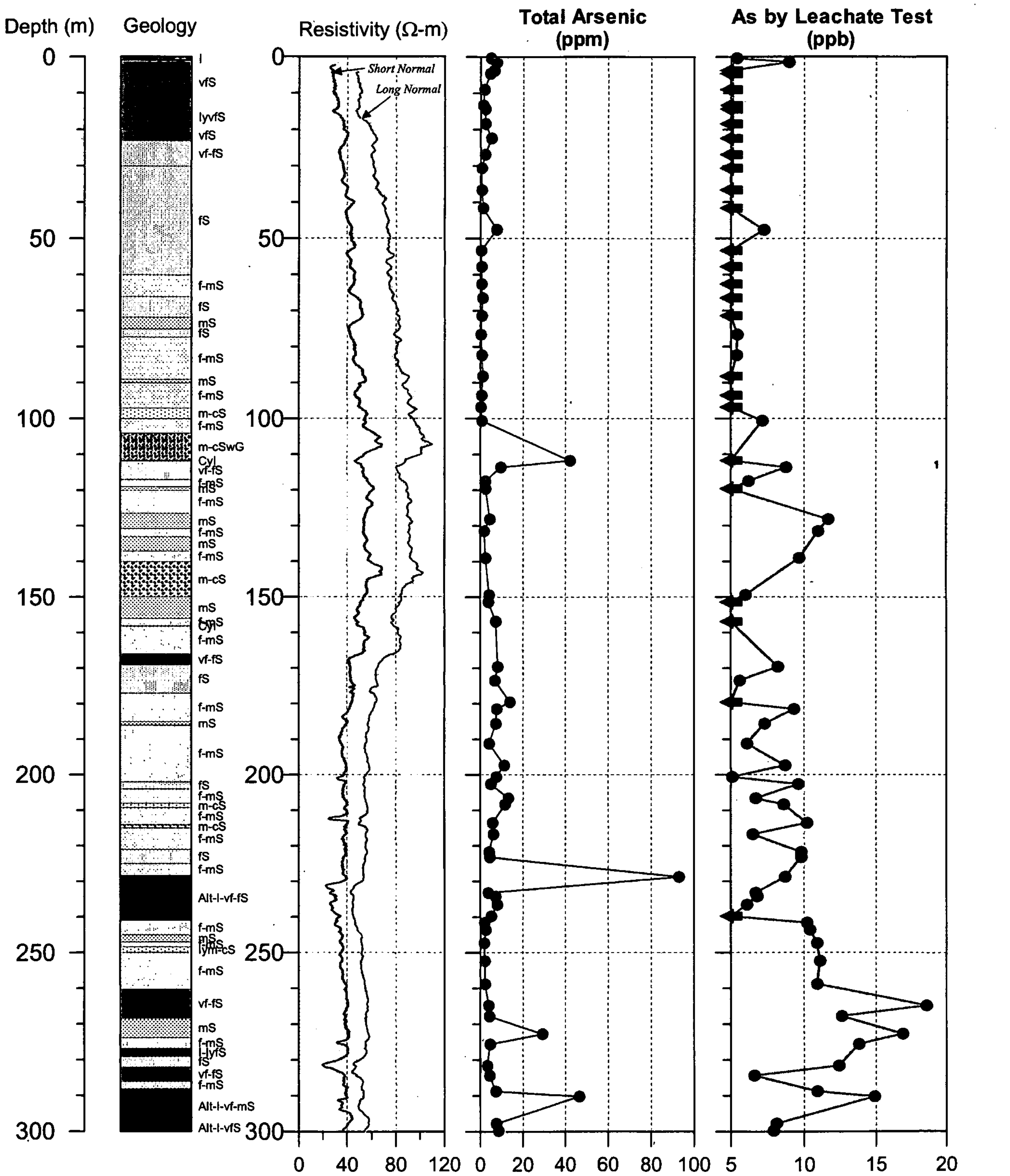


C: Clay	Cy: Clayey
I: Silt	Iy: Silty
S: Sand	Sy: Sandy
G: Gravel	w: with
v: very	-: to
f: fine	Alt: Alternation
m: medium	P: Peat
c: coarse	TS: Top Soil

Figure 5.6.7 Results of Arsenic Content Test and Leachate Test at CH-2 Site [Girls College, Chuadanga Pourashava]

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)



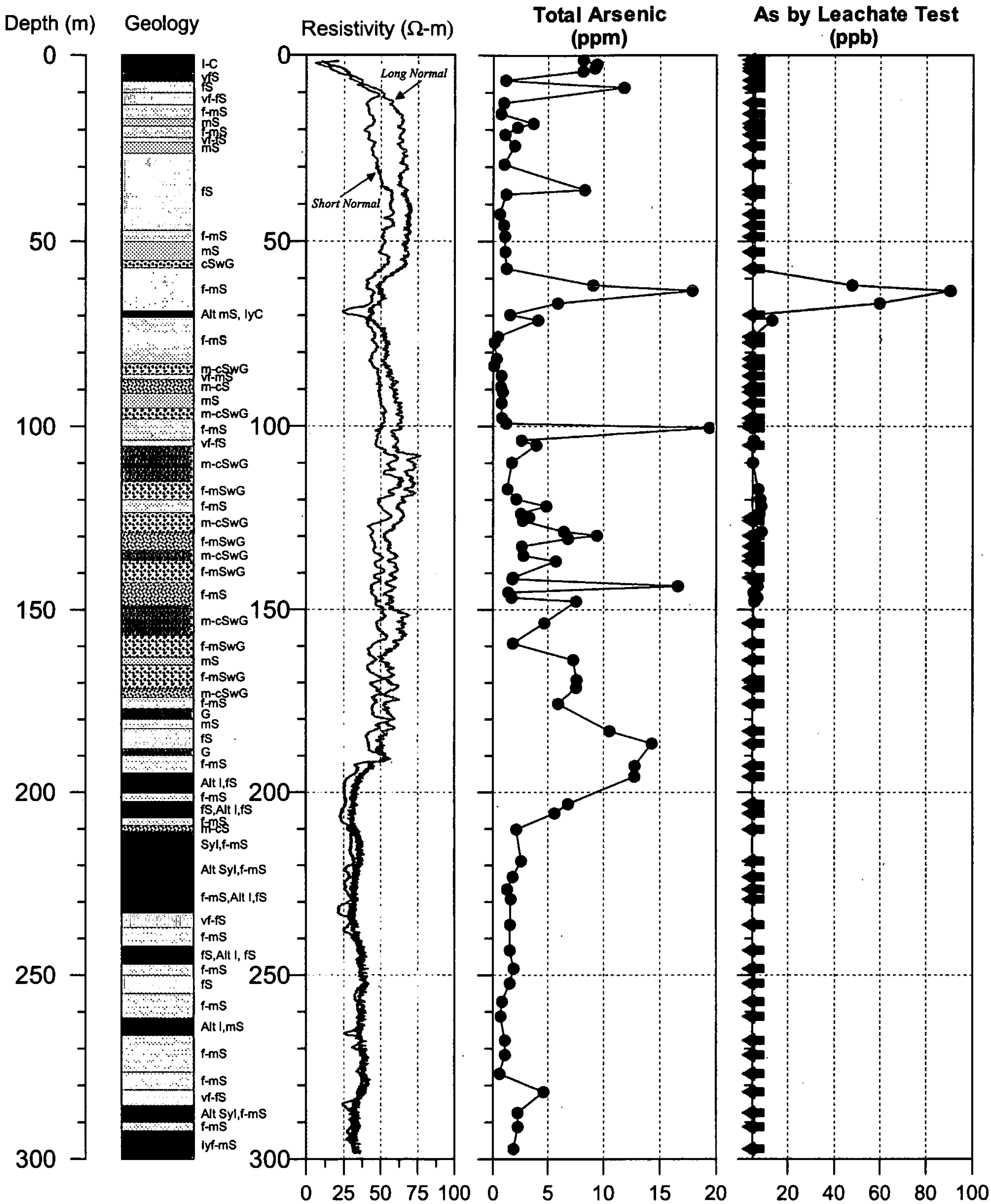
C: Clay
I: Silt
S: Sand
G: Gravel
v: very
f: fine
m: medium
c: coarse

Cy: Clayey
ly: Silty
Sy: Sandy
w: with
-: to
Alt: Alternation
P: Peat
TS: Top Soil

Figure 5.6.8	Results of Arsenic Content Test and Leachate Test at CH-BD Site [Bara Dudpatila, Damurhuda]

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)



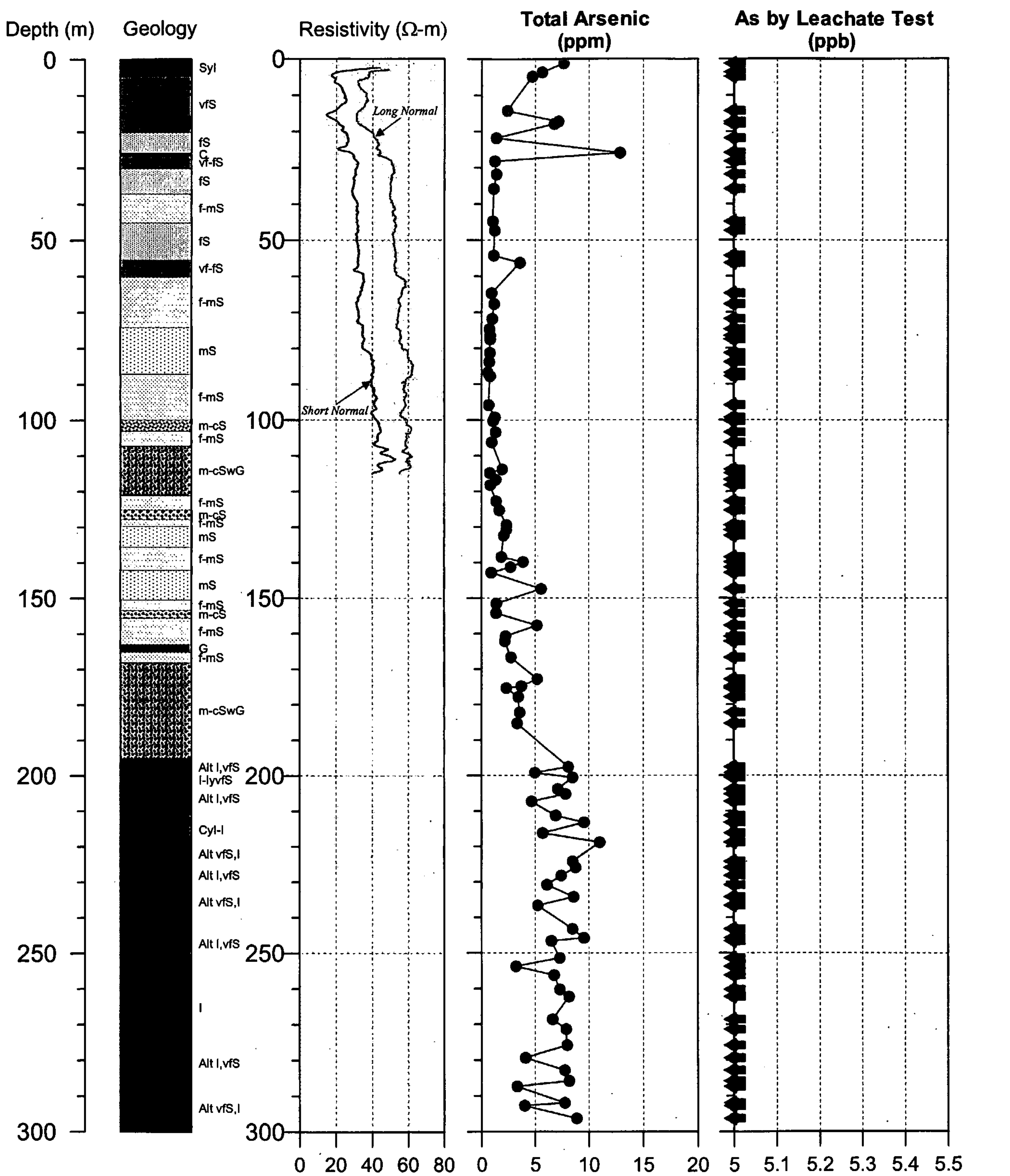
C: Clay
l: Silt
S: Sand
G: Gravel
v: very
f: fine
m: medium
c: coarse

Cy: Clayey
ly: Silty
Sy: Sandy
w: with
-: to
Alt: Alternation
P: Peat
TS: Top Soil

Figure 5.6.9 Results of Arsenic Content Test and Leachate Test at JH-1 Site [Arabpur, Jhenaidah Pourashava]

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)



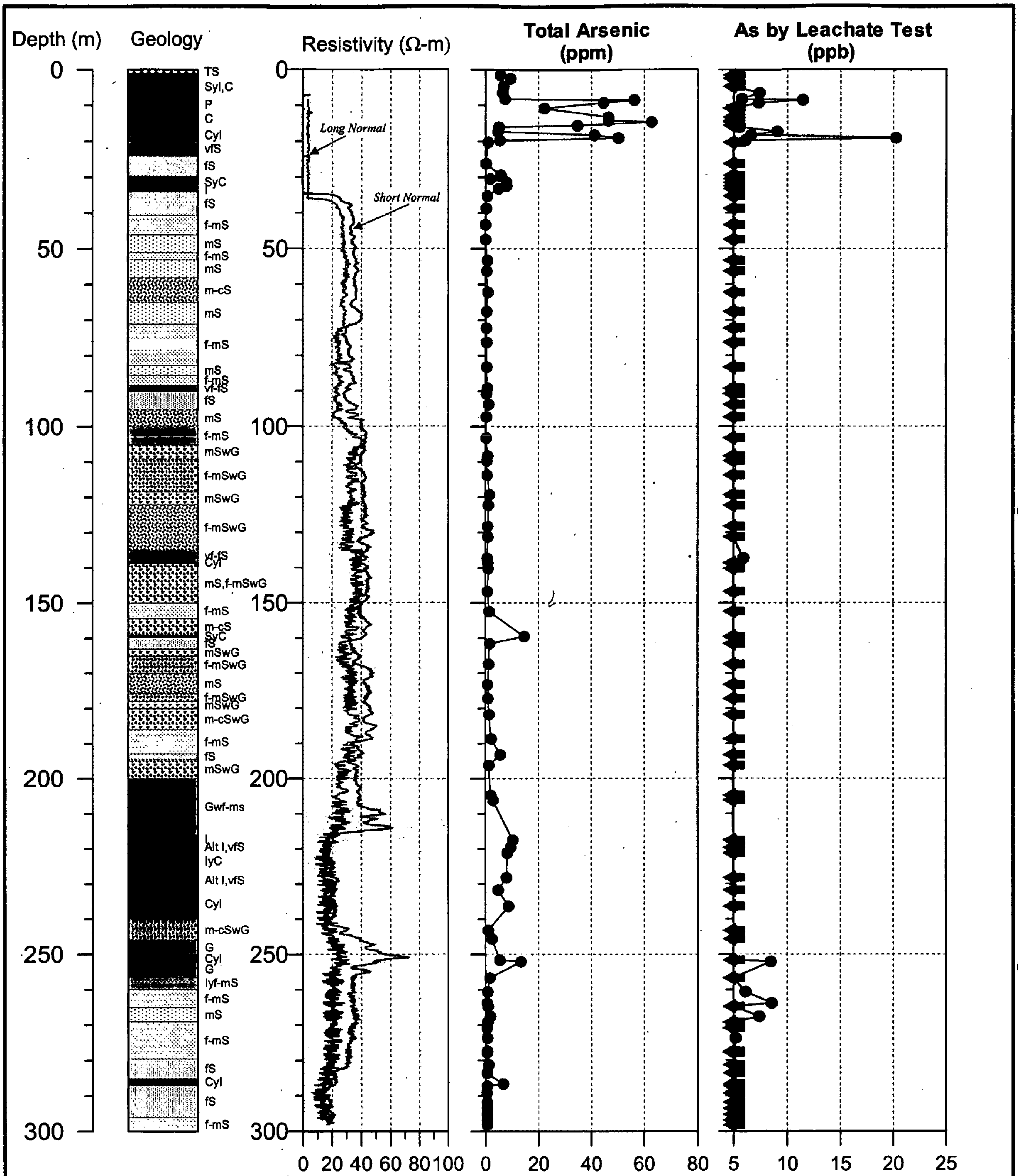
C: Clay
l: Silt
S: Sand
G: Gravel
v: very
f: fine
m: medium
c: coarse

Cy: Clayey
ly: Silty
Sy: Sandy
w: with
-: to
Alt: Alternation
P: Peat
TS: Top Soil

Figure 5.6.10	**Results of Arsenic Content Test and Leachate Test at JH-KC Site [Krishna Chandrapur, Moheshpur]**

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)



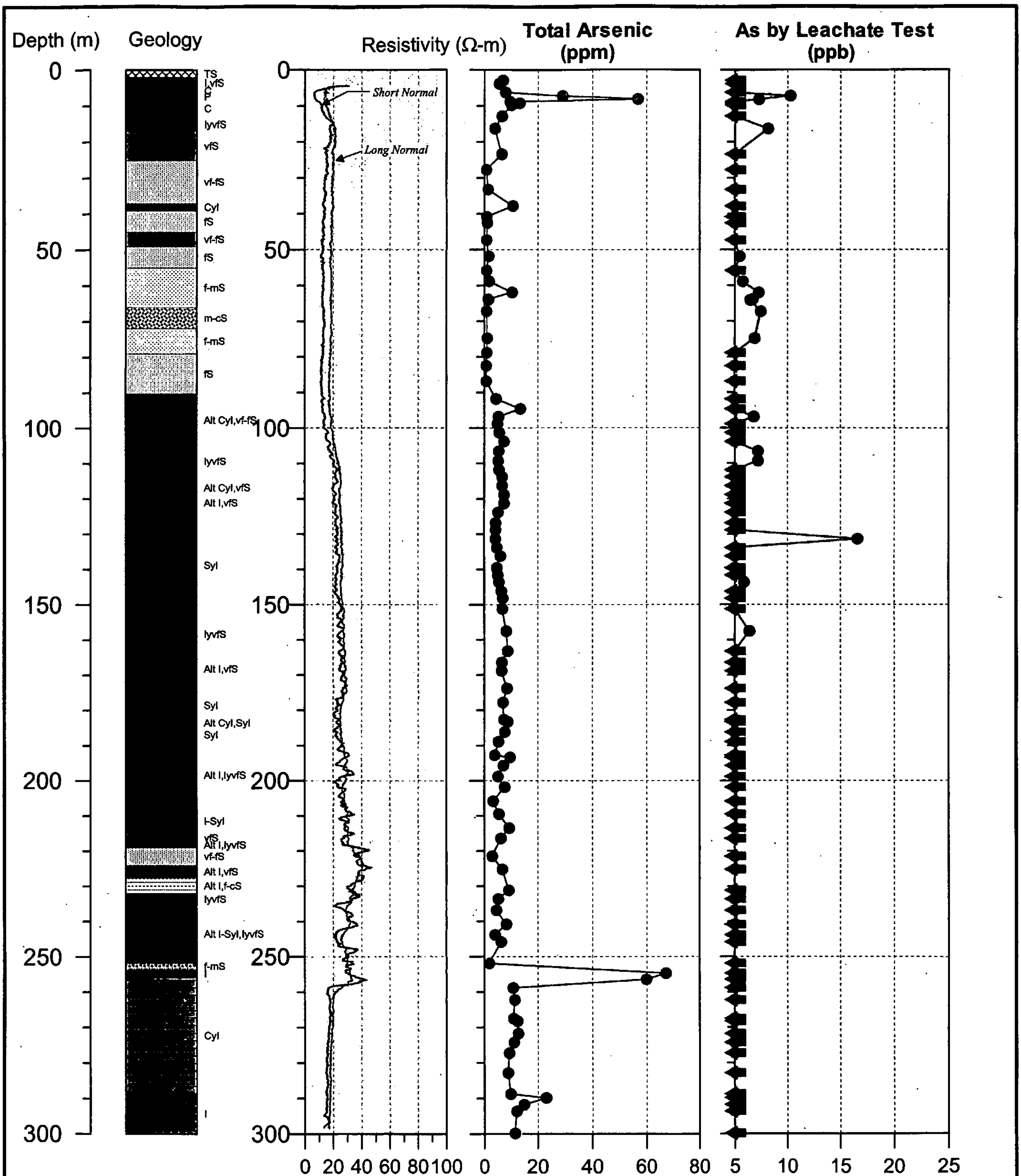
C: Clay
I: Silt
S: Sand
G: Gravel
v: very
f: fine
m: medium
c: coarse

Cy: Clayey
ly: Silty
Sy: Sandy
w: with
-: to
Alt: Alternation
P: Peat
TS: Top Soil

Figure 5.6.11	Results of Arsenic Content Test and Leachate Test at JS-2 Site [Kharki, Jessore Pourashava]

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)



C: Clay
I: Silt
S: Sand
G: Gravel
v: very
f: fine
m: medium
c: coarse

Cy: Clayey
ly: Silty
Sy: Sandy
w: with
-: to
Alt: Alternation
P: Peat
TS: Top Soil

Figure 5.6.12	Results of Arsenic Content Test and Leachate Test at JS-RB Site [Rajnagar Bankabarsi, Keshabpur]

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

5.7 Evaluation of Deep Aquifers

5.7.1 Quantitative Evaluation

Aquifer productivities are evaluated based on the result of the pumping test carried out at the observation wells/holes in the study area,.

1) Specific Capacity

a. Observation Wells

Figure 5.7.1 shows the distribution of specific capacity (*Sc*) values by the drilling site. In the observation deep wells, which can be converted to production wells in future, Ch-1 well in Chuadanga Pourashava has the greatest value of 257.1m^2/day. The second greatest value was found at Js-1 well in Jessore Pourashava, having 85.4m^2/day. On the other hand, the smallest *Sc* value of 2.5m^2/day was found at Jh-1 well, while the second smallest value of 6.5m^2/day was also found in Jhenaidah Pourashava at Jh-2 well. The *Sc* values of Ch-2 well and Js-2 well show 10.5 and 9.1m^2/day, respectively.

Compared with *Sc* values of the observation holes, the *Sc* value of the observation wells was only higher than that of the observation holes at CH-1 site in Chuadanga Pourashava. At the rest of the sites, the *Sc* value of the observation wells was the smallest or the second smallest among the observation well/holes.

The *Sc* values of the observation wells were also lower than that of existing Pourashava production wells, which are shown in Figure 4.1.5. The *Sc* values of the production wells range from 200 to 2,000m^2/day and the logarithmic average value is 1,086m^2/day.

It is, therefore evaluated that the aquifer productivity of deep aquifers below 200m in depth in the study area is smaller than that of the main aquifer used by the existing Pourashava production wells in terms of specific capacity.

b. Observation Holes

The distribution of specific capacity values obtained from the observation holes are also shown in Figure 5.7.1. Because the specific capacity is controlled not only by the aquifer productivity but also by the well loss or well performance, the *Sc* values in different aquifers were compared using the observation holes' data. The *Sc* values of deep aquifers below 200m deep obtained from the observation holes range from 13 to 104m^2/day. Except JS-2 site in Jessore Pourashava, the *Sc* value of the deepest observation hole shows to be the smallest at each site.

From the *Sc* values of observation holes, it is evaluated that the aquifer productivity of deep aquifers below 200m in depth is smaller than that of shallow aquifers within 200m in depth.

2) Transmissivity

The value of transmissivity (*T*) is usually obtained through a pumping test. In the study, a pumping test was carried out at each observation well/hole. However, the values of transmissivity and storage coefficient were not obtained in some wells/holes due to the irregular fluctuations of groundwater level, that were caused by the pumpage of exiting wells nearby. It is also observed that the *T* values obtained by the continuous pumping test were greatly different from the values obtained by the recovery test. There are also some differences in *T* values between the analyses using the drawdown data in pumped wells and using the drawdown data in observation holes.

Figure 5.7.2 shows the vertical distribution of *T* values by district. In Chuadanga, the *T* values in the shallow aquifers within 162m in depth range from 300 to 830m^2/day based on the continuous pumping test. In the deep aquifer, Ch-1 well has a very high *T* value of about 16,000m^2/day based on the continuous pumping test and recovery test. However, the *T* values in Ch-2 well and Ch-2-4 hole shows 80 to 740m^2/day. The results of the recovery test also show that the *T* value of the deep aquifer is smaller than that of shallow aquifers except for Ch-1 well.

In Jhenaidah district, the observation holes in the 100m depth zone have higher values of *T* ranging from 2,000 to 3,400m^2/day. The observation holes in the150m zone also show higher values ranging from 400 to 1,850m^2/day. The shallowest holes in the 50m zone show 115 to 290m^2/day. However, Jh-1and Jh-2 observation wells have very small *T* values below 2m^2/day. At the observation holes, *T* values show to be about 350m^2/day by the continuous pumping test. The results of the recovery test also show that *T* values of the deep aquifer are smaller than that of shallow aquifers. It is, therefore, evaluated that the aquifer productivity of the deep aquifer in terms of transmissivity is smaller than that of shallow aquifers.

In Jessore district, the *T* values in the 150 m zone observation holes are smaller, ranging from 2 to 300m^2/day. The *T* values of observation holes in the 50 and 100m zones show 200 to 3,500m^2/day, indicating that the aquifer productivity at 50m and 100m in depth is higher than at 150m in depth. In the deep wells/holes, although Js-2 well shows *T* values of 2,200 to 6,600m^2/day, the rest mainly shows *T* values ranging from 30 to 80m^2/day.

As a result, it is evaluated that the transmissivity values in the deep aquifer are generally smaller than that of the shallow aquifers. However, the *T* values have a wide range of variation by place and by well/hole. The *T* values at Ch-1 well and Js-1 well indicate that the aquifer productivity is enough to supply water for a piped water system. However, the *T* values in Jhenaidah Pourashava are too small.

3) Apparent Hydraulic Conductivity

As per the definition of transmissivity, the value becomes greater when the thickness of aquifer is larger. To compare the permeability of aquifer materials, apparent hydraulic conductivity (k_{ap}) was computed by the following equation:

$$K_{ap} = \text{(Transmissivity) / (total length of screen pipes)} \qquad (5.7.1)$$

Figure 5.7.3 shows the vertical distribution of apparent hydraulic conductivity by district. In Chuadanga district, the K_{ap} values in the shallow aquifers within 160m in depth range from 30 to 70m/day, showing an increasing trend with depth. In the deep aquifer, however, the K_{ap} values in Ch-2 well and Ch-2-4 hole show 4 to 38m/day. The Ch-1 well has K_{ap} values from 740 to 910m/day based on the continuous pumping test and recovery test.

In Jhenaidah district, the observation holes in the 50m zone, 100m zone, and 150m zone show 15 to 32m/day, 36 to 283m/day, and 18 to 154m/day in K_{ap} values. However, the Kap values in the deep aquifer below 200m in depth generally range from 6 to 70m/day. At Jh-1 and Jh-2 wells, the k_{ap} values are very small, ranging from 0.02 to 0.1m/day.

In Jessore district, although the number of available data is limited, the shallow aquifers in the 50m zone and 100m zone have K_{ap} values of 20 to 400m/day and 15 to 50m/day, respectively. The aquifer in th 150m zone has a wide range of K_{ap} values from 0.1 to 30m/day. In the deep aquifer, the k_{ap} values at Js-1 well are high, ranging from 170 to 510m/day. However, the k_{ap} values generally range from 2 to 5m/day.

As a result, it can be said that the apparent hydraulic conductivity of the deep aquifers has a wide range of variation from smaller values to higher values compared with that of shallow aquifers. The k_{ap} values are greater than the shallow aquifers in some places; however, the k_{ap} values of deep aquifers are generally smaller than those of shallow aquifers.

5.7.2 Qualitative Evaluation

1) As Concentration and Groundwater Quality

a. CH-1 Site [Poshu Hat, Chuadanga Pourashava]

Figure 5.7.4 shows the vertical distribution of arsenic concentration and groundwater quality by stiff diagram at CH-1 site. At the site, the arsenic concentrations generally ranged from 0.03 to 0.06mg/l in holes Ch-1-1 to Ch-1-3 for a period from February to October 2001. However, the As concentrations in the deep groundwater measured in Ch-1 well and Ch-1-4 hole ranged from 0.002 to 0.04mg/l, showing lower concentrations than the shallow aquifers.

As for the sizes of the stiff diagrams, the diagrams for holes Ch-1-1 to Ch-1-4 are comparatively small. On the other hand, the size is larger for the deep groundwater, indicating that the chemical characteristics of the deep groundwater are different from the shallow ones.

Considering the existence of fine sediments such as very fine to fine sand layers at depths from 174 to 212m, it can be said that the deep aquifer is separated from the shallow aquifers to a certain degree. However, as there is no thick clay layer between the shallow aquifers and deep aquifer, it may be possible that groundwater can move vertically when the difference in hydraulic heads between the two aquifers is greater.

b. CH-2 Site [Girls College, Chuadanga Pourashava]

A similar situation is more clearly observed at CH-2 site in Chuadanga Pourashava as shown in Figure 5.7.5. At the site, the arsenic concentration in groundwater clearly decreases with depth from 0.12 to 0.23mg/l in Ch-2-1 to below 0.01mg/l in Ch-2 and Ch-2-4.

The stiff diagrams of the deep groundwater at Ch-2 and Ch-2-4 are larger than those of the shallow groundwater.

From the geologic columnar section prepared by the core sample observation, it is understood that several silty layers occurred at depths from 200 to 250m. Although those silty layers are not so thick, the layers can separate the deep aquifer from the shallow aquifers. It is, therefore, evaluated that the groundwater in the deep aquifer below 250m in depth is different from the groundwater in the shallow aquifers at this time.

c. JH-1 Site [Arabpur, Jhenaidah Pourashava]

Figure 5.7.6 shows the vertical distribution of the arsenic concentration and groundwater quality by stiff diagram at JH-1 site. At the site, As concentrations are higher only in Jh-1-1 hole. The As concentration of holes Jh-1-2 and Jh-1-3 ranges from 0.01 to 0.03mg/l. In the deep groundwater, the As concentrations also ranged from lower levels from 0.005 to 0.03mg/l.

The stiff diagram of the Jh-1-1 hole is the smallest. The size of the diagrams in Jh-1-2 and Jh-1-3 holes is slightly larger than that of Jh-1-1 hole. Further, it is clear that the size of the diagrams of Jh-1 well and Jh-1-4 hole is larger than that of the shallow ones. At the site, it is possible to identify three (3) aquifers from hydrogeological and hydrochemical points of view. The shallow aquifer, which is separated from the underlying middle aquifers by alternating layers of medium sand and silty clay, has groundwater moderately contaminated by arsenic with a smaller sized stiff diagram. The middle aquifer having less contaminated groundwater with slightly larger sized stiff diagrams occurs at a depth from 80 to 190m. The deep aquifer, which occurs below the thick alternating layers of sandy silt and fine sand from 190 to 235m, have groundwater less contaminated by arsenic with larger sized stiff diagrams.

Although there is no pure and thick clay layer between the shallower aquifers and the deep aquifer, the hydrogeological and hydrochemical conditions suggest that the deep aquifer is separated at the present time from the shallow ones by the finer sediments at depths from 190 to 235m.

d. JH-2 Site [Hamdah, Jhenaidah Pourashava]

Figure 5.7.7 shows the vertical distribution of arsenic concentration and groundwater quality by stiff diagram at JH-2 site, Jhenaidah Pourashava. At the site, As concentrations gradually decrease with depth, from 0.07 to 0.09mg/l in Jh-2-1 hole to 0.005 to 0.02mg/l in Jh-2 well.

The size of the stiff diagrams is smaller for holes Jh-2-1 to Jh-2-3. In the deep aquifer, Jh-2 well has a large sized diagram like the JH-1 site; however, Jh-2-4 hole, which has almost the same screen position as Jh-2 well, shows a rather small sized stiff diagram. The reason is presumed that during the drilling work for Jh-2-4 hole, the borehole collapsed several times due to the looseness of the gravel layers occurring at a depth from 150 to 200m so that the seepage of shallow groundwater through the borehole may have occurred due to the enlarged borehole even though an effort was made to seal it sufficiently.

From the result, it is evaluated that the deep groundwater has a different chemical composition from the shallow ones, indicating that the deep aquifer is separated from the shallow aquifers by fine sediments that are overlain by the main aquifer up to a depth of 200m.

e. JS-1 Site [Ghop, Jessore Pourashava]

Figure 5.7.8 shows the vertical distribution of arsenic concentration and groundwater quality by stiff diagram at JS-1 site, Jessore Pourashava. At the site, it is noted that the arsenic concentration in Js-1-2 hole, from which the 100m zone aquifer is monitored, is the highest among the observation well/holes even though the arsenic levels range from 0.001 to 0.035mg/l.

The stiff diagrams show that the groundwater quality of shallow aquifers measured in holes Js-1-1 to Js-1-3 shows to be Ca - HCO_3 type, whereas the deep groundwater measured at Js-1 well and Js-1-4 hole shows to have a different type of chemical composition, characterized by the (Na+K) - HCO_3 type.

According to the geological columnar section, there are fine-grained layers including very fine sand and sandy silt at depths from 200 to 260m. It is, therefore, regarded that the deep aquifer is separated from the shallow aquifers by the fine sediments.

f. JS-2 Site [Kharki, Jessore Pourashava]

Figure 5.7.9 shows the vertical distribution of arsenic concentration and groundwater quality by stiff diagram at JS-2 site, Jessore Pourashava. The arsenic concentration in groundwater is high in Js-2-2 hole tapped at the 100m zone aquifer. The concentrations range from 0.05 to 0.1mg/l. On the other hand, the As concentrations in Js-2-1 hole are below 0.01mg/l. The concentrations in Js-2-3 and Js-2-4 holes and Js-2 well show below the Bangladeshi standard value, ranging from 0.002 to 0.03mg/l in Js-2-3 hole and from 0.0005 to 0.005mg/l in Js-2-4 hole and Js-2 well, respectively.

According to the stiff diagrams, the shallow groundwater in Js-2-1 to Js-2-3 holes shows Ca - HCO_3 type. On the other hand, the deep groundwater obtained from Js-2 well and Js-2-4 hole shows (Na+K) - (HCO_3) type.

At the site, it is confirmed by the core sample analysis that there are clayey layers at depths from 215 to 240m. Therefore, it is concluded that the deep aquifer at a depth below 240m is clearly separated from the shallow aquifers by the clayey sediments.

2) Arsenic in Soil and Groundwater

Arsenic in soil and groundwater was compared at three (3) drilling sites in Pourashava areas where core boring and depth-wise distribution of arsenic monitoring were carried out.

a. CH-2 Site [Girls College, Chuadanga Pourashava]

Figure 5.7.10 shows the vertical distribution of total arsenic content, arsenic by leachate test, and arsenic concentration in groundwater at CH-2 site. The total arsenic content in the core samples at depths shallower than 200m is not high, showing less than 10ppm. The result of the leachate test also shows the released arsenic by the test was very small in the portion, particularly the amount was almost below 5ppb at depths from 0 to 50m. However, the arsenic concentration at Ch-2-1 hole, which has screen at depths from 44.5 to 53.5m, shows groundwater highly contaminated by arsenic ranging from 0.12 to 0.23mg/l. The reason may be that although the source of arsenic does not exist at the drilling point itself, the source should be located near the drilling point at a shallow depth so that the plume of contaminated water has reached the drilling point by advection and dispersion. The decreasing of arsenic concentration in groundwater with depth, which is observed in the holes from Ch-2-1 to Ch-2-3, also suggests that the source of arsenic is located in the shallow portion within 50m in depth near the drilling site. The vertical distribution of arsenic concentrations in groundwater also indicates the downward movement of contaminated groundwater.

In the deeper portion below 200m in depth, although the highest total arsenic content of 117.3ppm was found in a silty clay sample at a depth from 207.50 to 207.72m and values from 20 to 50ppm were also found at depths from 210 to 250m, the arsenic concentrations in groundwater measured in Ch-2 well and Ch-2-4 hole were very small, showing below 0.002mg/l. To explain the reason of the phenomenon, the following three (3) hypotheses can be proposed:

(a) The arsenic in the deep soil is not released into groundwater, remaining in the soil.

(b) Some of the arsenic is leached into groundwater, but has not reached the deep aquifer due to slow groundwater flow velocity.

(c) The arsenic is released in the groundwater, but the contaminated groundwater moves upward for the depression of piezometric head in the upper aquifers.

At the site, there is no crucial data to identify the reason. Further research and monitoring of groundwater conditions are required.

b. JH-1 Site [Arabpur, Jhenaidah Pourashava]

Figure 5.7.11 shows the vertical distribution of total arsenic content, arsenic by leachate test, and arsenic concentration in groundwater at JH-1 site. Since the total arsenic content at the site from 0 to 300m in depth is below 20ppm, a clear source of arsenic cannot be identified from the profile. However, the groundwater in Jh-1-1 hole, which has screen at depths from 48 to 57m, has slightly elevated arsenic concentrations ranging from 0.043 to 0.055mg/l. There are two (2) possibilities to explain the slightly elevated As concentrations in the hole: (a) there is a source in the shallow portion but not at the drilling point, and the contaminated groundwater reached to the hole by advection and dispersion, (b) the source is the fine to medium sand layer occurring at depths from 57 to 69m, having slightly higher values of arsenic content as well as some amount of leached arsenic. In Jhenaidah Pourashava, there are several production wells for the Pourashava water supply that pump up groundwater from the aquifer at depths from 100 to 150m. If there is some influence by this pumpage, depressions of piezometric heads would be generated and the groundwater flow direction in the shallow portion should be downward. In this case, possibility (b) cannot explain the actual situations monitored at the site.

The total arsenic content in the core samples below 210m in depth is less than 5 ppm, but it is noted that the arsenic concentrations range from 0.01 to 0.03mg/l in Jh-1-4 hole. Similarly, the arsenic concentrations in Jh-1-3 hole also show to be 0.015 to 0.03mg/l. However, the concentrations in Jh-1-2 hole are the lowest among the observation holes, ranging from 0.01 to 0.025mg/l. To explain this, there is a possibility that the background value of arsenic contamination in deep groundwater is slightly higher. The slightly elevated background value is also related to the traveling time and flow path of deep groundwater as well as the mechanism of arsenic contamination in deep layers. Further study and research are, therefore, necessary particularly from the viewpoint of paleo-groundwater flow systems.

c. JS-2 Site [Kharki, Jessore Pourashava]

Figure 5.7.12 shows the vertical distribution of total arsenic content, arsenic by leachate test, and arsenic concentration in groundwater at JS-2 site. At the site, the results of the arsenic content test show that the source of arsenic contamination is the shallow clayey sediments particularly peat, which has an arsenic content of 40 to 65ppm. Below 20m in depth, there is no arsenic source up to 300m. However, the results of groundwater monitoring show that the highest As concentrations ranging from 0.05 to 0.1mg/l were found in Js-2-2 hole, which has screen pipes at depth from 99 to 111m. On the other hand, the groundwater in Js-1-1 hole, in which screen is located at about 30m below the peaty layers, does not show arsenic contamination in groundwater.

From the vertical profile of arsenic in the soil and groundwater, it can be said that the arsenic found in the groundwater of Js-1-2 hole is not derived straight from the shallow peaty layers by the vertical movement of groundwater, because the As concentration in Js-1-1 hole is clearly lower than that in Js-1-2. Therefore, one possibility can be that the arsenic in the groundwater of Js-1-2 hole originates from the shallow peaty layer not at the drilling site but other areas nearby the drilling site. In other words, the plume of contaminated water that has reached the screen portion of Js-1-2 hole comes from the shallow portion in another area. The shape of the plume may be controlled by the hydrogeologic structures and the gradient of the hydraulic head of groundwater.

At the drilling site, there is a clayey layer at depths from 29 to 33m, which can prevent the vertical movement of shallow contaminated groundwater. The contaminated groundwater above the clayey layer cannot pass the clayey layer and will move in a lateral direction along the groundwater flow. If there is a discontinuity of the clayey layers and if the piezometric head of lower layers are lower than that of the upper layers, the contaminated groundwater can move down through the “hole”. The hypothesis to explain the vertical distribution of arsenic at the site can be confirmed if some more vertical arsenic profiles are made near the site.

In the deep aquifers below 240m in depth, there is no source of arsenic contamination. It is, therefore, evaluated that the deep aquifer at the site has no potential of future arsenic contamination by the arsenic originating from the deep layers.

3) Potential of Arsenic Contamination in Deep Aquifer

From the investigation results mentioned above, it can be said that there are two (2) possibilities for the contamination of groundwater in deep aquifers. One is the seepage or leakage from shallow contaminated water, which reaches the deep aquifers. The possibility of such contamination originating from the shallow portion is high if there is no significant aquitard or aquiclude between the two aquifers. If the shallow aquifer and the deep aquifer are directly connected, the shallow groundwater can move downward easily when the piezometric head in the deep aquifer is lower than that of shallow aquifer.

Another possibility of deep aquifer contamination is by arsenic occuring in the deep layers. From the results of core sample analysis, CH-2 and CH-BD sites in Chuadanga district and JS-RB site in Jessore district have potential of such contamination. However, so far any significant arsenic contamination in groundwater has not been detected. Although the potential of deep contamination exists at the sites, the possibility of deep contamination from arsenic in the deep layers cannot be evaluated at present.

To evaluate the deep contamination, it is necessary to carry out further monitoring and detailed research on the deep groundwater conditions as well as the nature and environment of deep aquifers including the detailed form and occurrence of arsenic in the deep layers.

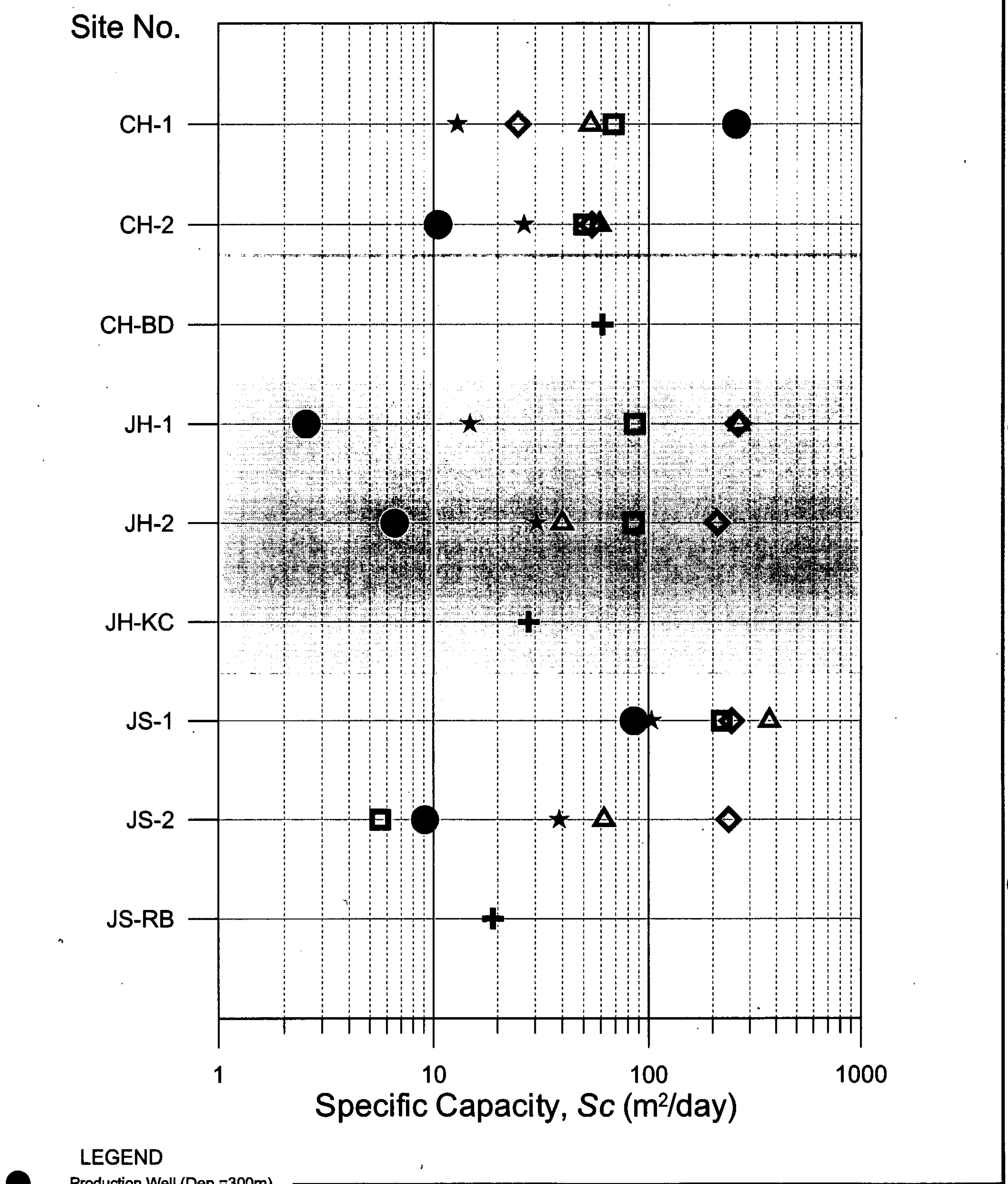
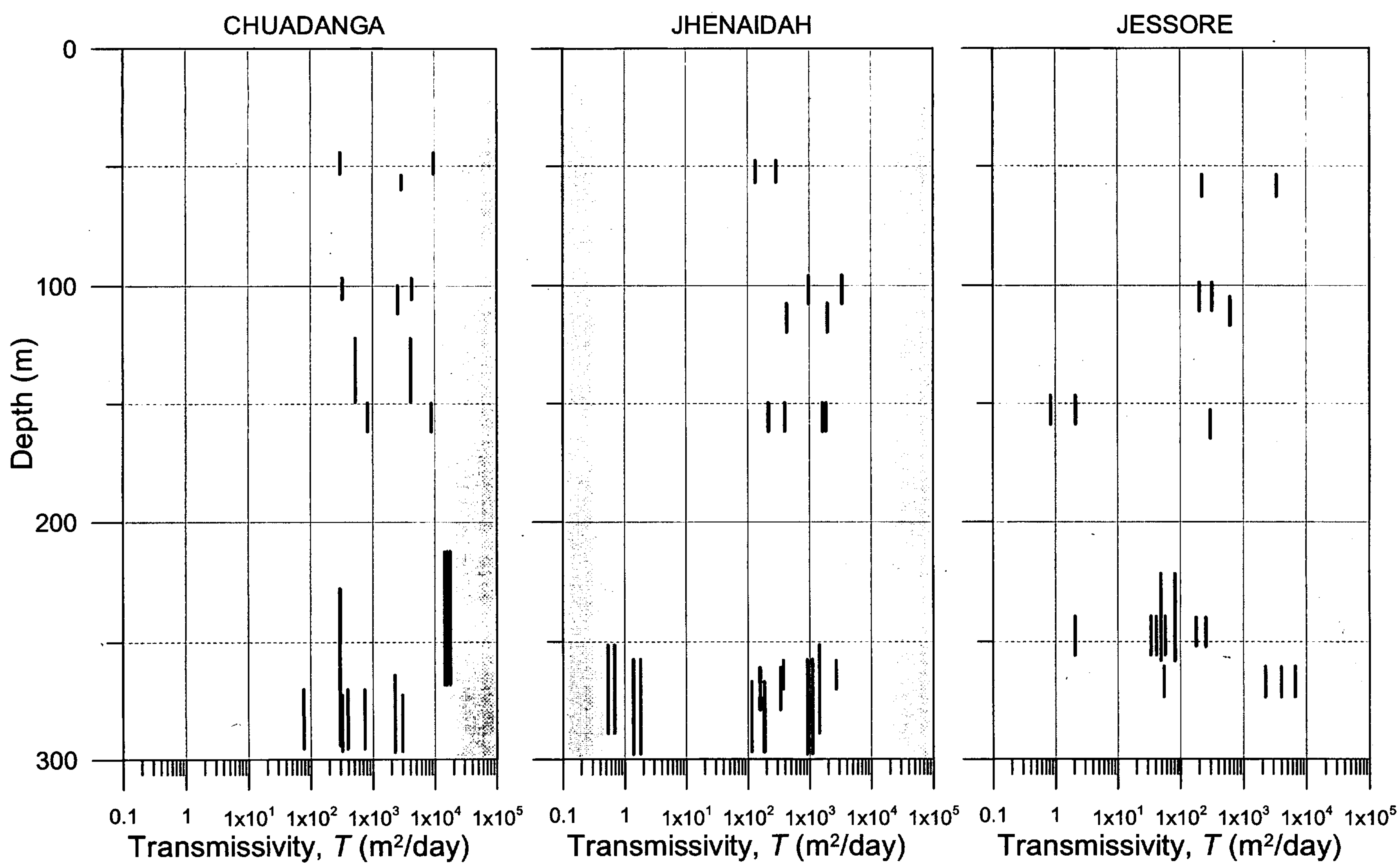


Figure 5.7.1	Distribution of Specific Capacity at JICA Drilling Sites
THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH	
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	



T by Continuous Pumping Test Using Pumped Well Data

T by Recovery Test Using Pumped Well Data

T by Continuous Pumping Test Using Obs. Hole Data

T by Recovery Test Using Obs. Hole Data

Figure 5.7.2 **Depth-wise Distribution of Transmissivity by District**

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

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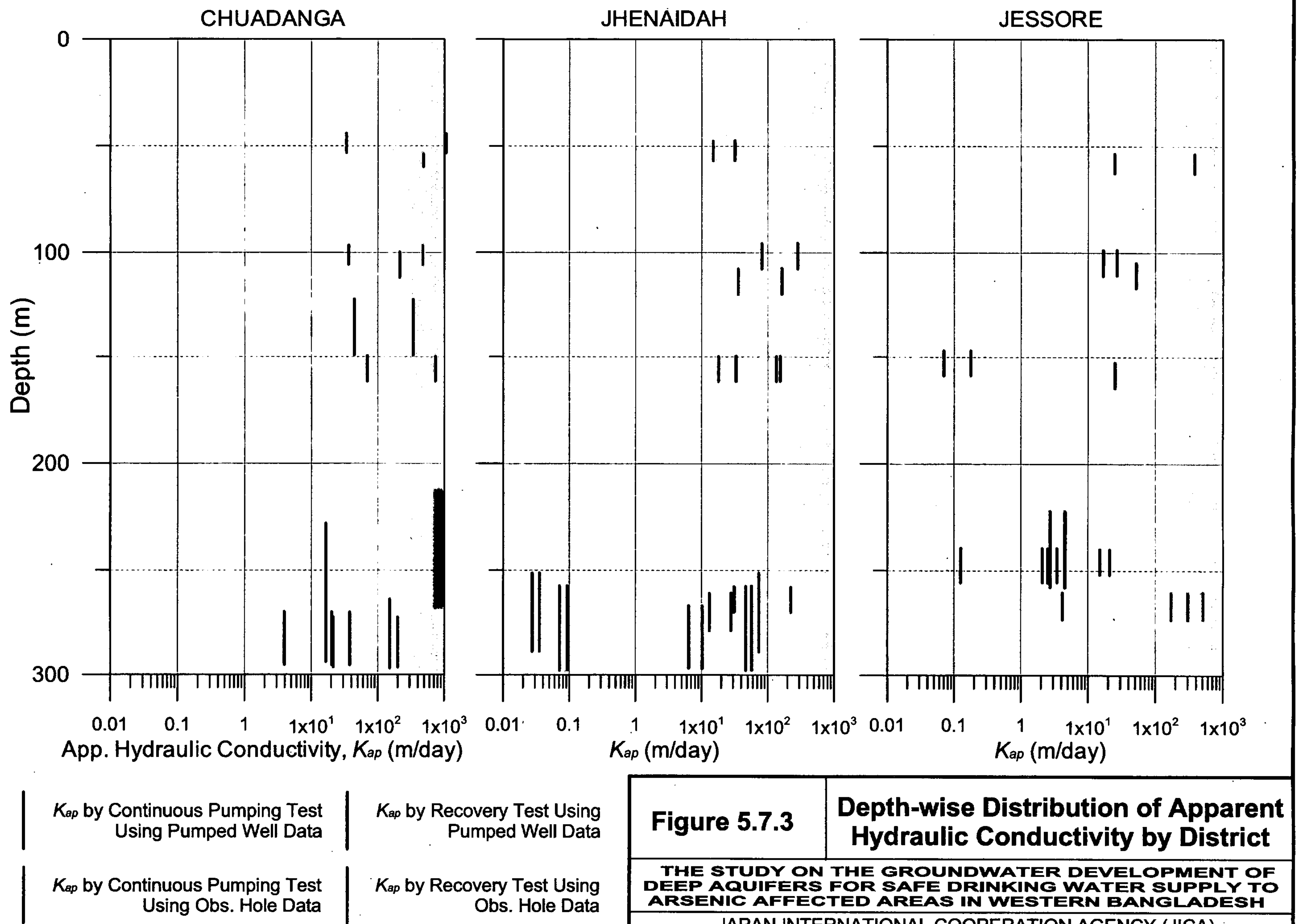

Figure 5.7.3 Depth-wise Distribution of Apparent Hydraulic Conductivity by District

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

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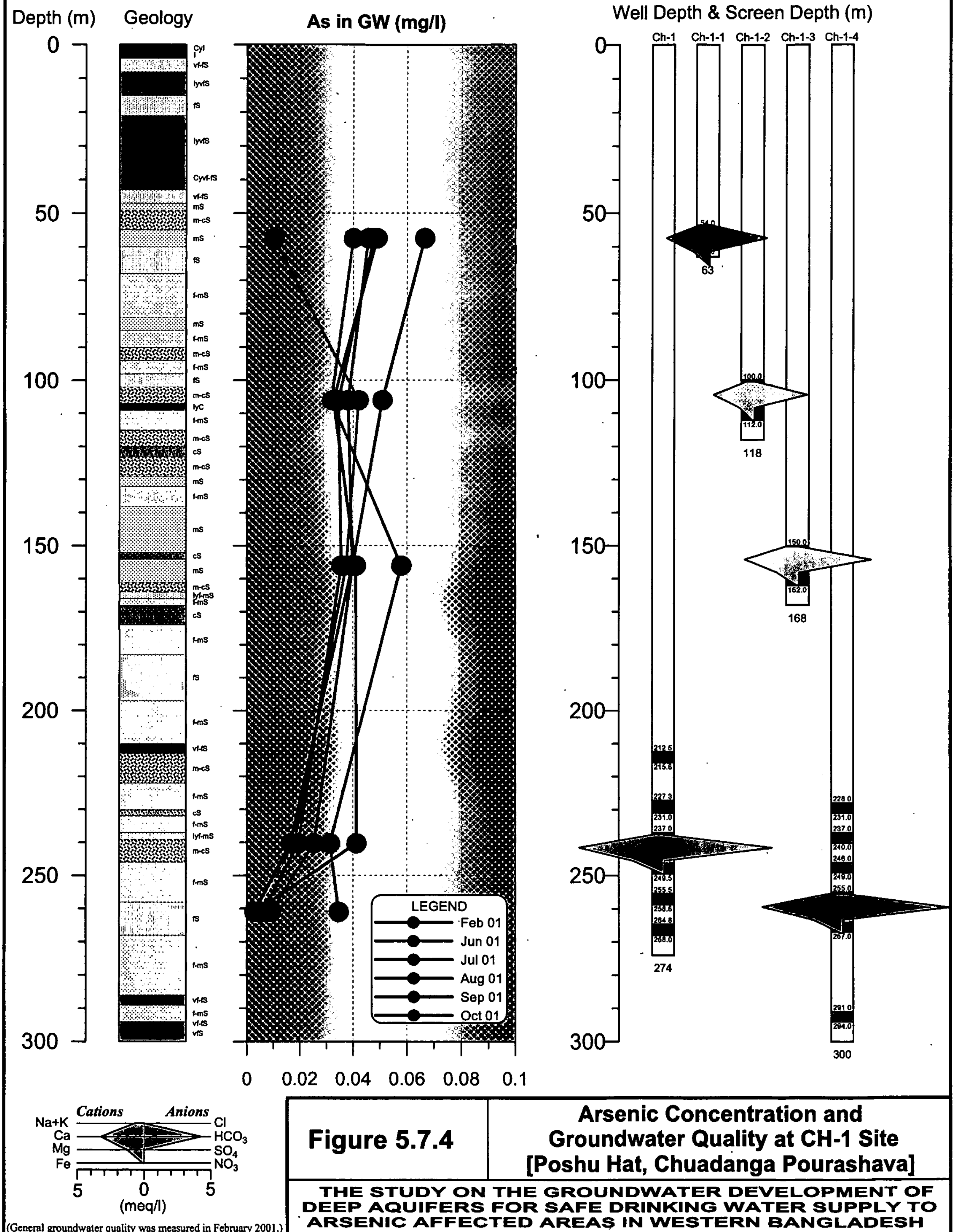
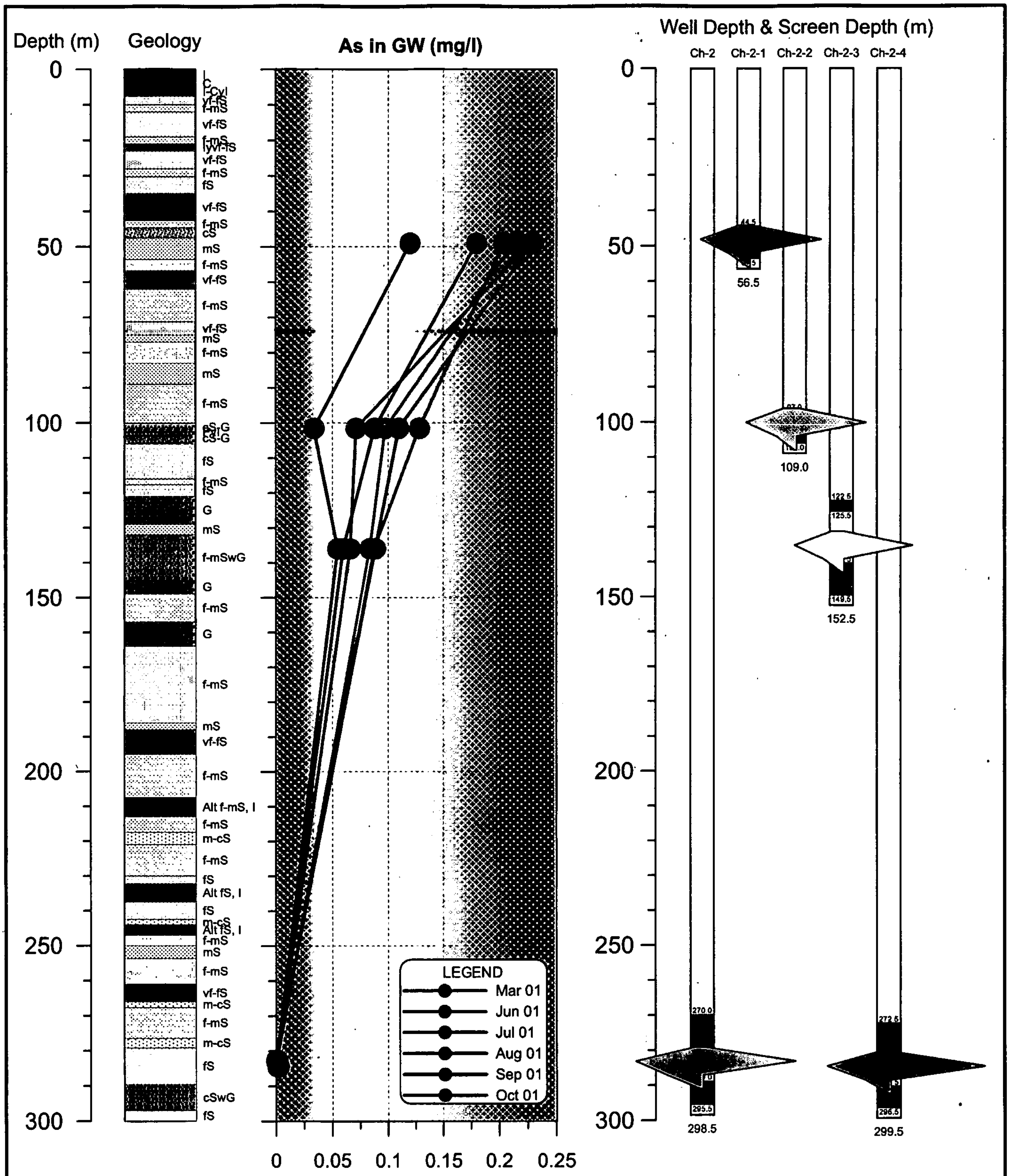
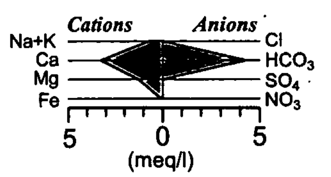


Figure 5.7.4	Arsenic Concentration and Groundwater Quality at CH-1 Site [Poshu Hat, Chuadanga Pourashava]

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)





(General groundwater quality was measured in March 2001.)

Figure 5.7.5	Arsenic Concentration and Groundwater Quality at CH-2 Site [Girls College, Chuadanga Pourashava]

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

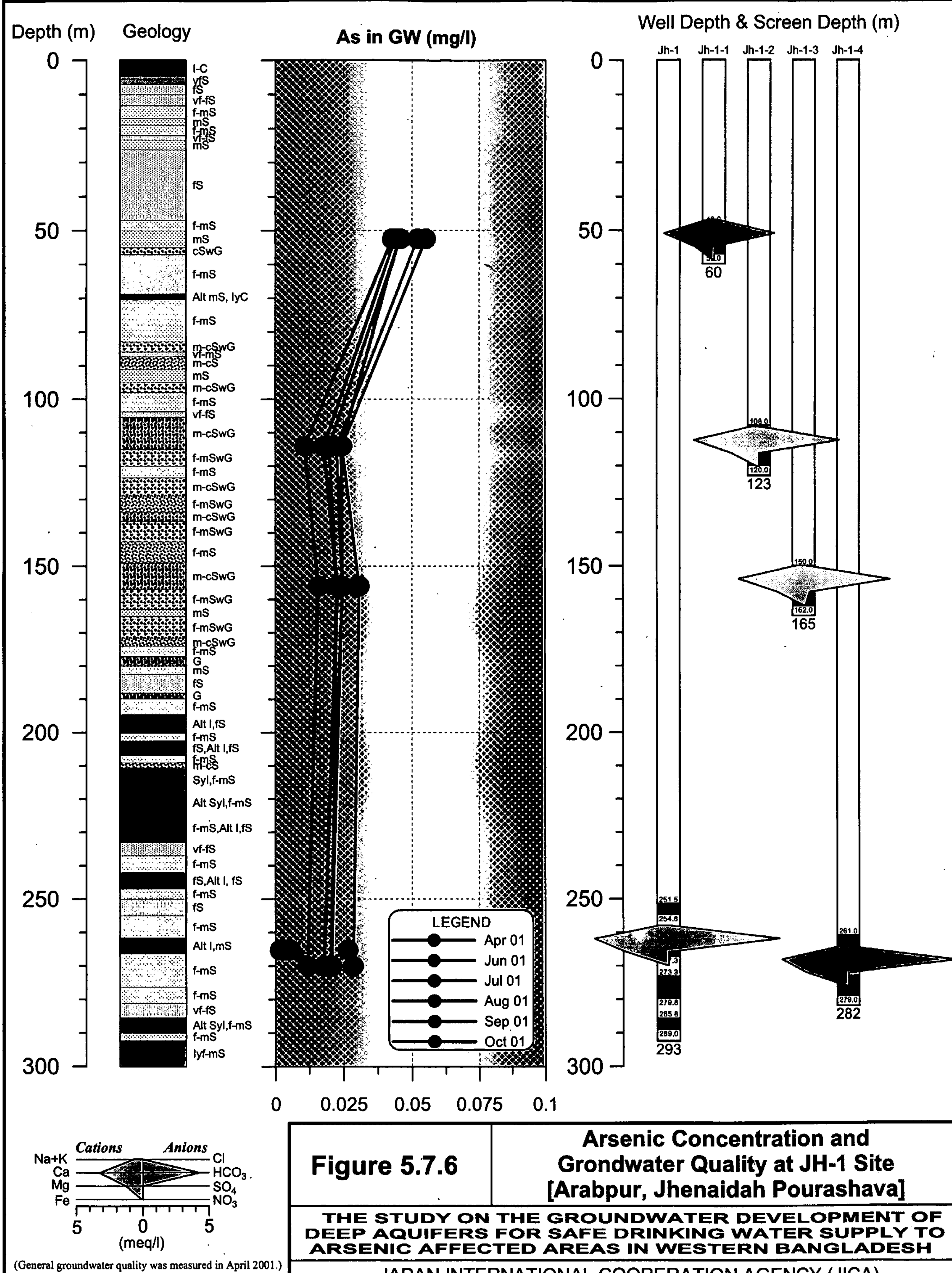


Figure 5.7.6 Arsenic Concentration and Grondwater Quality at JH-1 Site [Arabpur, Jhenaidah Pourashava]

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

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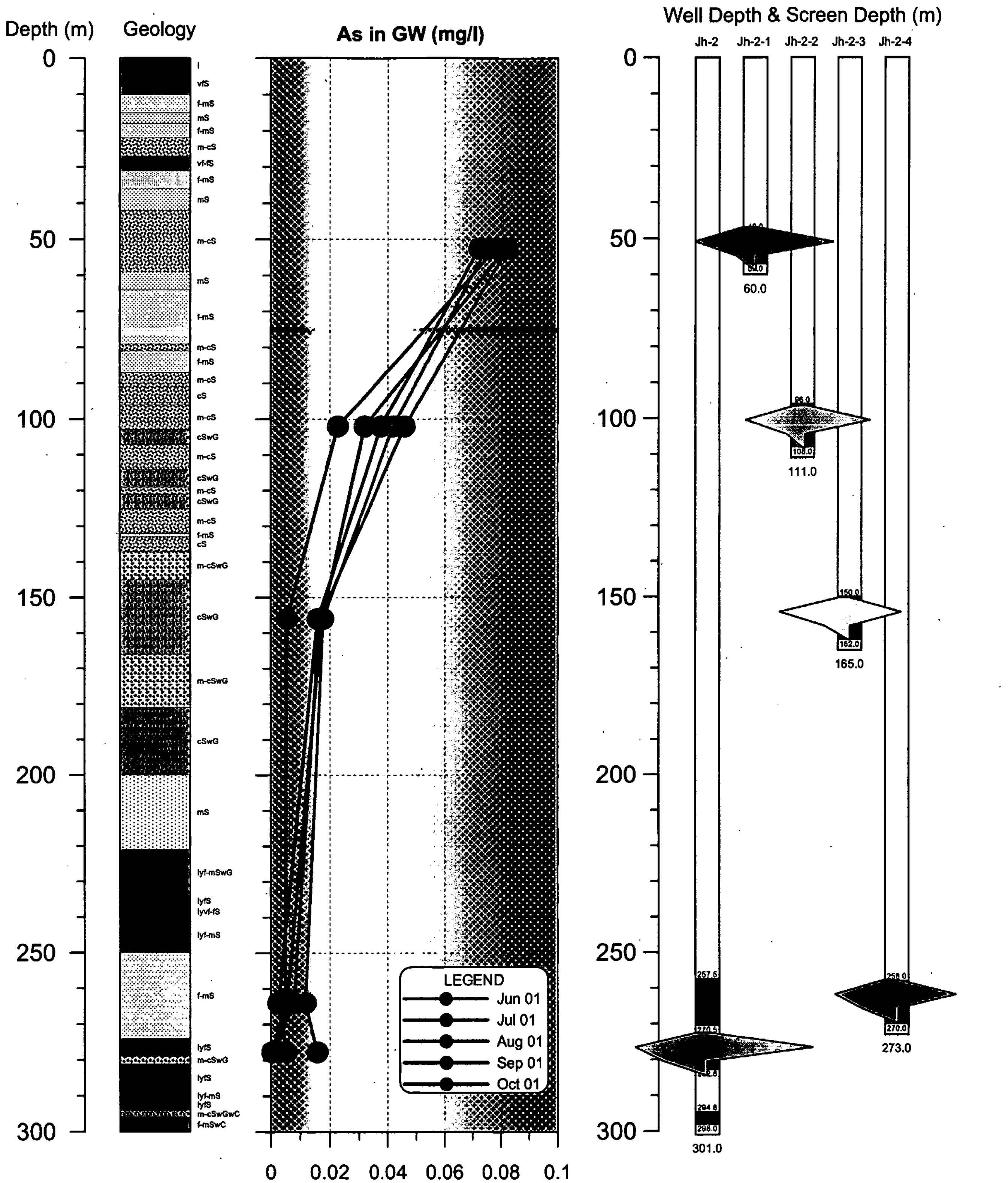

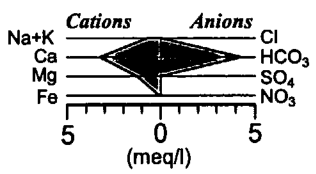

(General groundwater quality was measured in June 2001.)

Figure 5.7.7	Arsenic Concentration and Groundwater Quality at JH-2 Site [Hamdah, Jhenaidah Pourashava]

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

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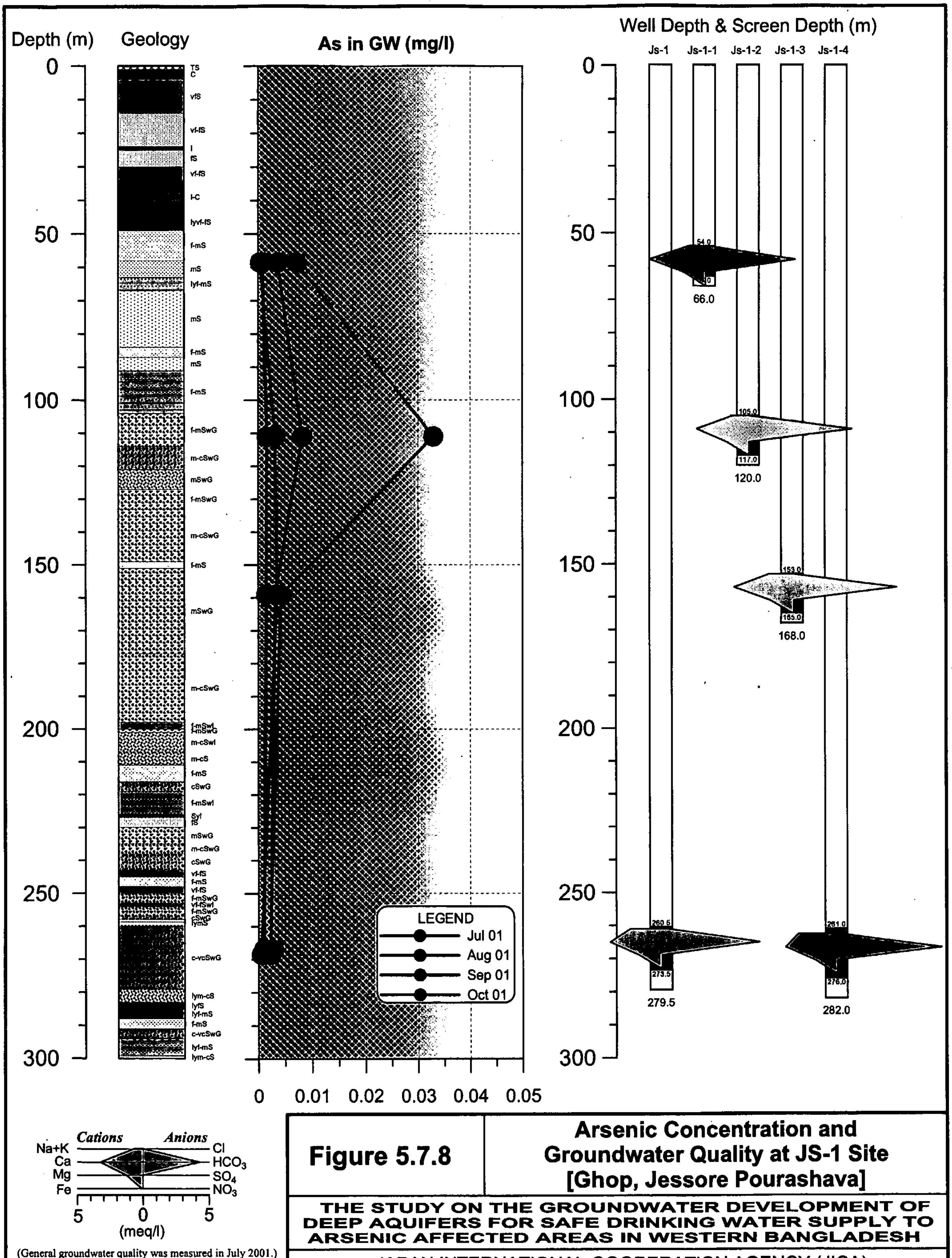

Figure 5.7.8 Arsenic Concentration and Groundwater Quality at JS-1 Site [Ghop, Jessore Pourashava]

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

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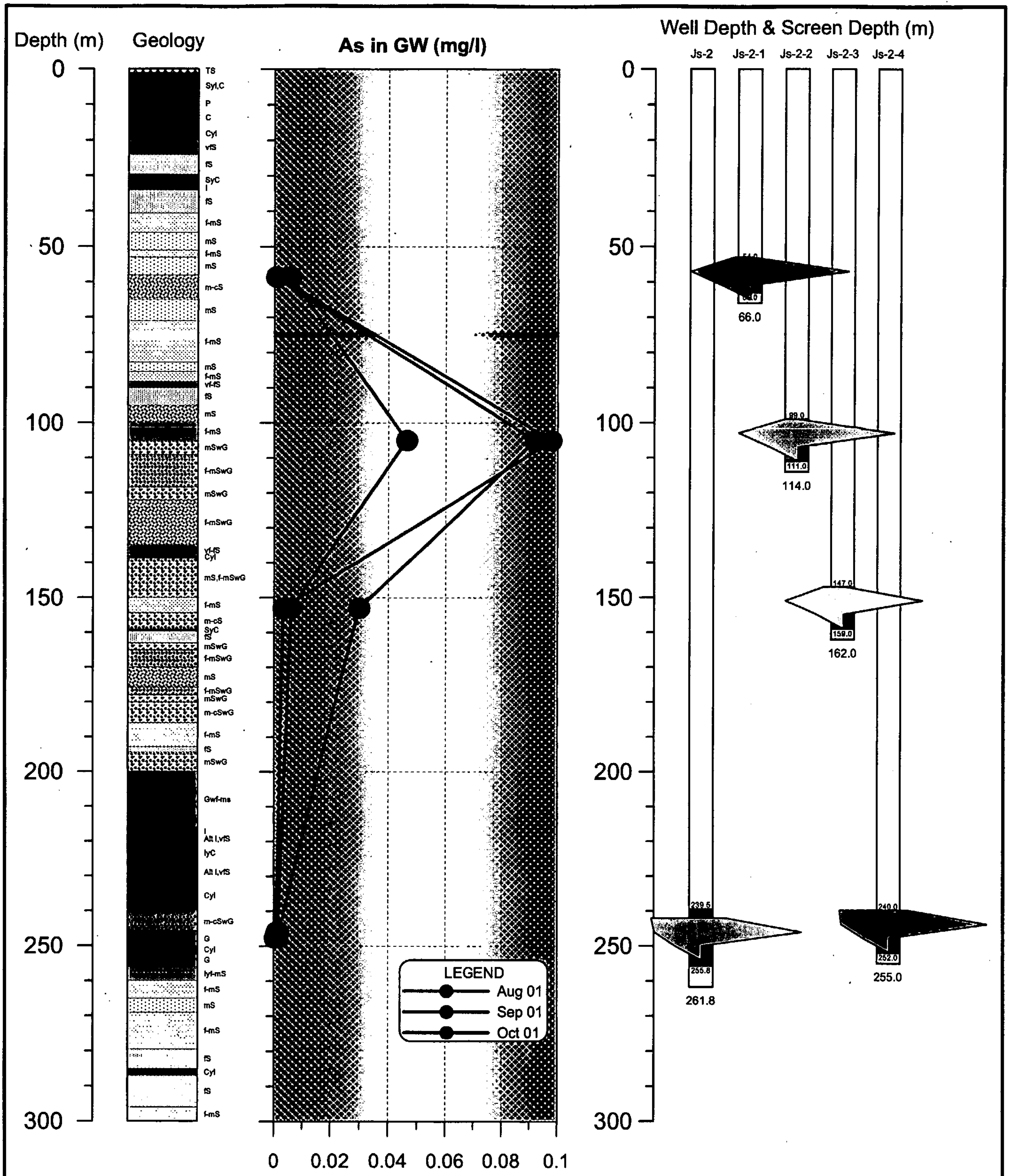

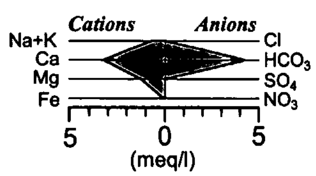

(General groundwater quality was measured in August 2001.)

Figure 5.7.9	Arsenic Concentration and Groundwater Quality at JS-2 Site [Kharki, Jessore Pourashava]

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

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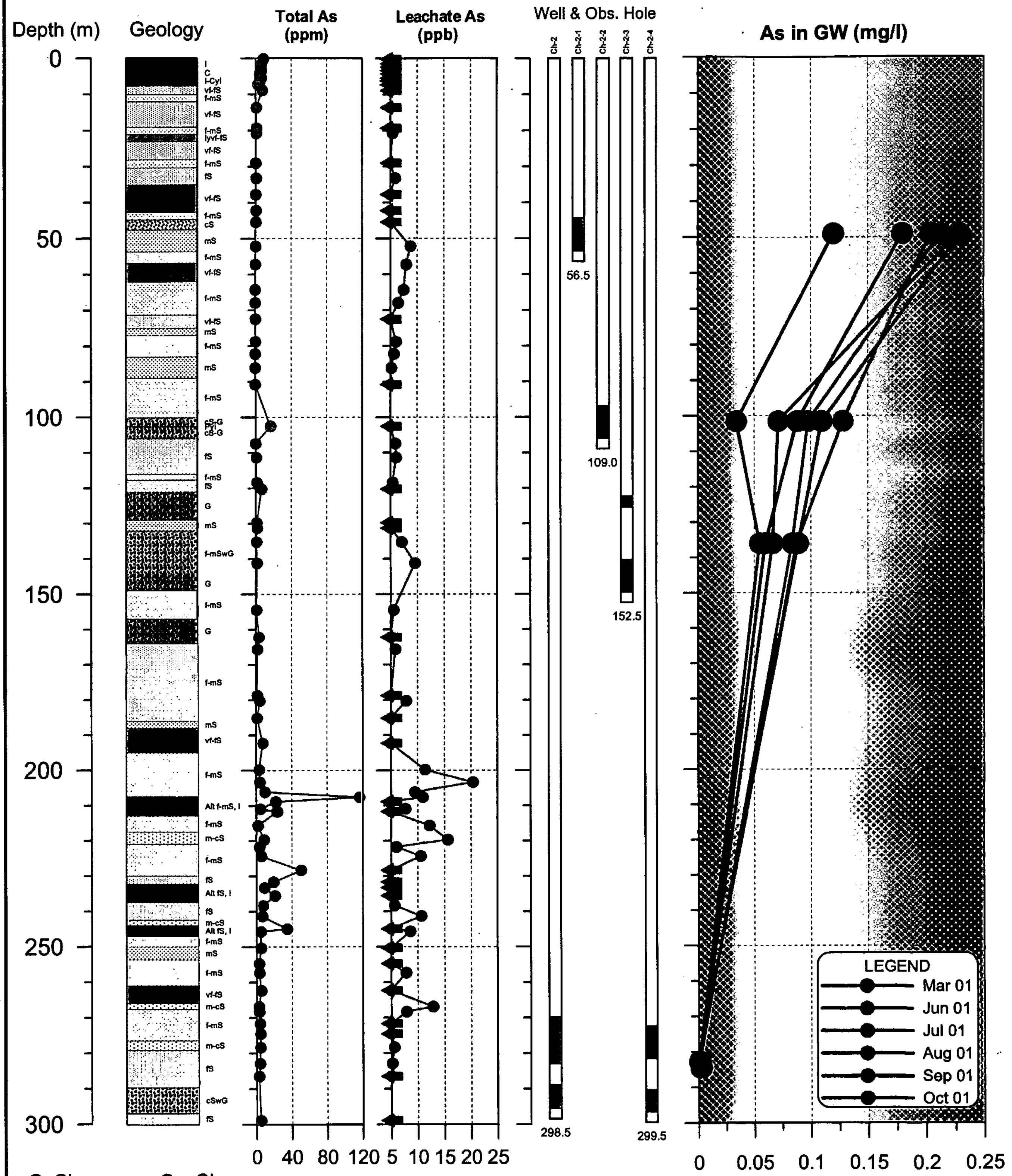

C: Clay
I: Silt
S: Sand
G: Gravel
v: very
f: fine
m: medium
c: coarse

Cy: Clayey
ly: Silty
Sy: Sandy
w: with
-: to
Alt: Alternation
P: Peat
TS: Top Soil

Figure 5.7.10 Arsenic in Soil and Groundwater at CH-2 Site [Girls College, Chuadanga Pourashava]

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

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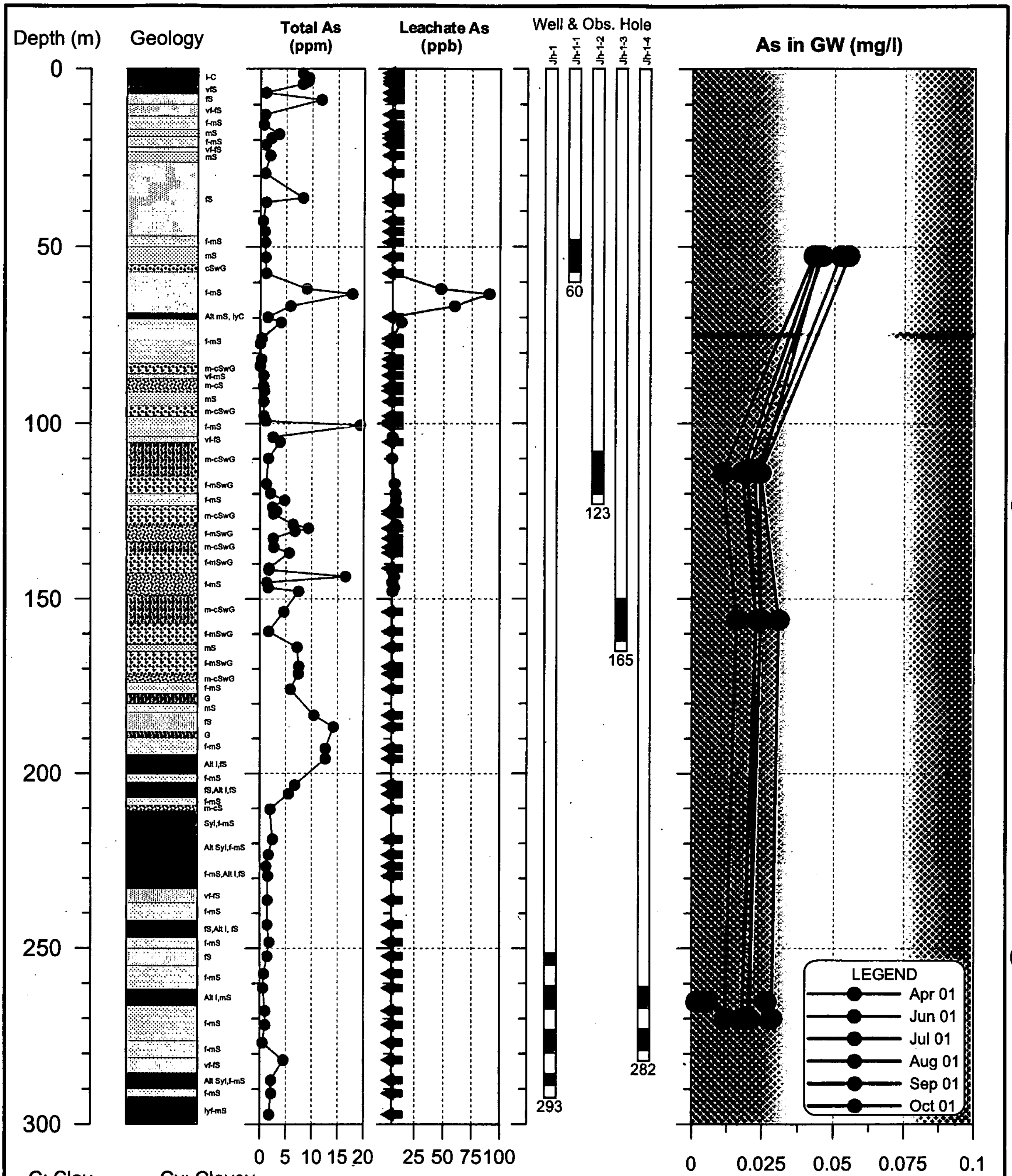

Figure 5.7.11 Arsenic in Soil and Groundwater at JH-1 Site [Arabpur, Jhenaidah Pourashava]

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

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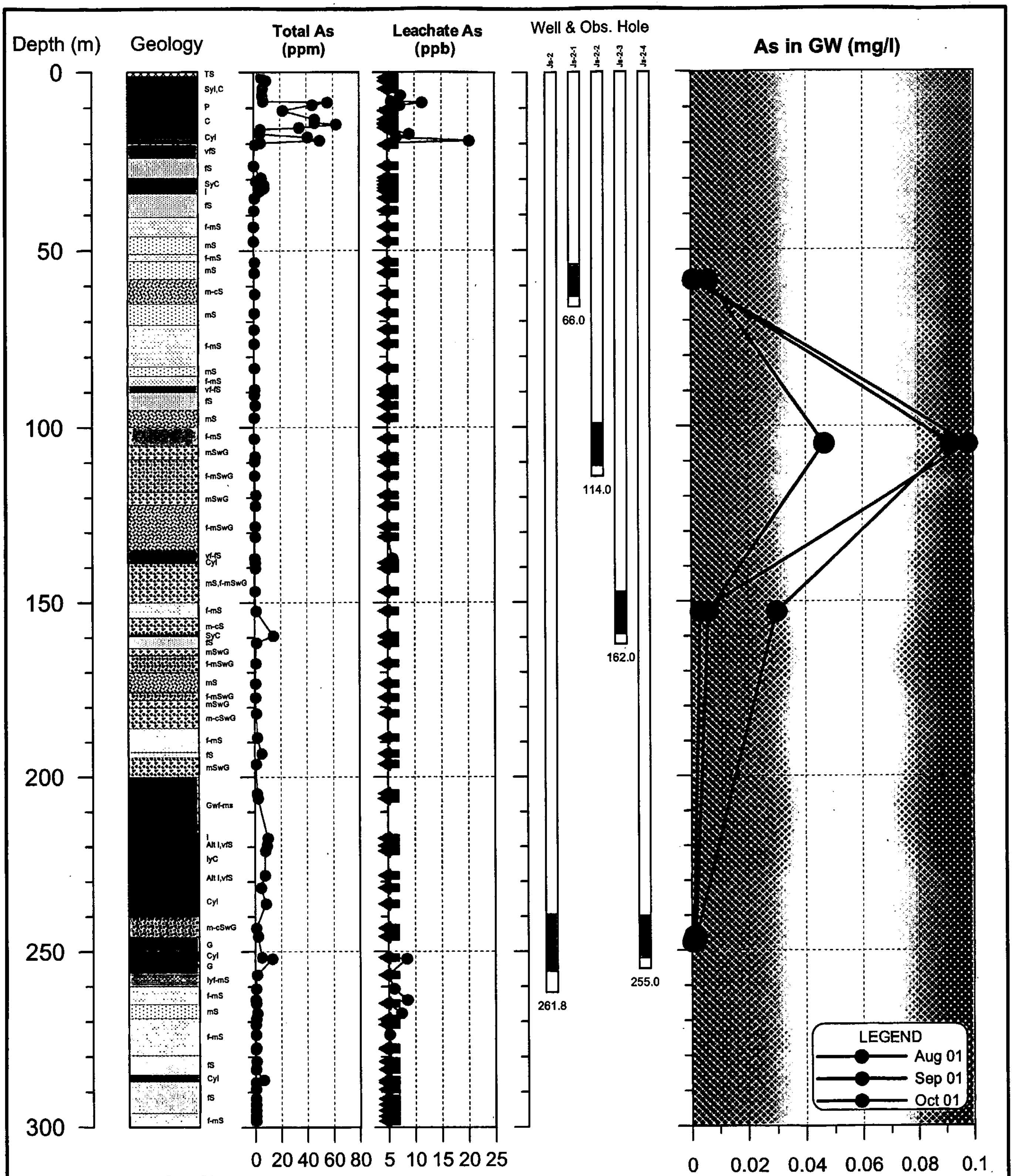

C: Clay
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Figure 5.7.12	Arsenic in Soil and Groundwater at JS-2 Site [Kharki, Jessore Pourashava]

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

5.8 Regional Hydrogeologic Structures

5.8.1 Geological Profiles

The geologic layers in the study area can be classified into five (5) formations (A to E formation) according to the sedimentary facies, which are based on the results of core boring and shown in Table 5.1.1. After the establishment of basic subsurface stratigraphy in the study area, the stratigraphy was extended to the observation well/holes in the drilling sites without core boring and to the improved deep wells drilled in the model rural areas. Then the established subsurface geologic successions were further extended to the whole study area based on the existing drilling records collected from DPHE and BADC considering the results of the geophysical survey done in the study.

Figure 5.8.1 shows the existing well locations collected from DPHE and BADC, together with the location of six (6) core borings carried out in the study. The figure also shows the location of geological profile lines, which are almost the same as the profile lines of the geophysical prospecting, which are mentioned in Chapter 2 in the Supporting Report. A total of 7 geological profiles in N-S directions and W-E were prepared. For identifying the geologic units at each existing drilling record, the geologic description and drilling record were carefully examined one by one comparing them with the neighboring existing well records and the resistivity profiles nearby.

The geological profiles along A - A’ line to G - G’ line are presented in Figures 5.8.2 to 5.8.8. The layer of these formations has a general tendency to become coarser toward the north. A, B and E formations lie flatly in study area. C and D formations slightly dip toward the southeast in the study area. E formation lies flatly in study area. The upper part of E formation is unconformably overlain by D formation with angular unconformity.

D formation declines from the northwestern area (Chuadanga thana) toward the southeastern area (Abhaynagar thana). The depths to the bottom of the formation vary in a wide range from about GL- 190 to 300m+.

C formation is declines from the northwestern area (Chuadanga thana) toward the southeastern area (Abhaynagar thana) as with D formation. The depths to the bottom are distributed in a wide range from about GL- 160 to 270m+.

The base of B formation shows to be comparatively flat in the study area. The depths to the bottom are deep in the northeastern area (Sailkupa thana) while the depths are shallow in the southern area (Kesahbpur thana).

The thickness of A formation varies from 25 to 50m. The bottom of A formation is not flat. The depths to the bottom tend to decrease (GL-25m) in the northwestern area (Sailkupa thana), and to increase (about GL-50m) in the southern area (Kesahbpur thana).

1) Geological Profile along A – A' Line (Figure 5.8.2)

The profile line is located in the western part of the study area from north to south. Along the profile line, there are three (3) core boring sites. The boundaries of geologic formations decline toward the south. The grain size of the sediments generally becomes smaller in the southern part. In C formation, several thick gravelly layers occur in Chuadanga and Jhenaidah districts, but the layers disappear in the area between Moheshpur in Jhenaidah district and Chougacha in Jessore district. From Jhikargacha in Jessore, thick clayey layers occur in C formation, but that cannot be seen well in Sharsha.

2) Geological Profile along B – B' Line (Figure 5.8.3)

The profile line is located in the eastern part of the study area from north to south. Along the profile line, there are three (3) core boring sites. The boundaries between E and D formations and D and C formation decline toward the south, however, the depth of other formation boundaries vary from place to place. It can be seen from the profile that a thick gravel layer occurs in C formation from Chuadanga district to the south of Jessore town through Jhenaidah district. However, the gravel layer is not distributed in Moniranpur in Jessore district. Instead, a clayey layer occurs in C formation from the south of Jessore town to Keshabpur. The thickness of the clayey layer suddenly increases from Moniranpur to Keshabpur. The thickness of the clayey layer becomes about 100 m in the southern part of Keshabpur Upazila.

3) Geological Profile along C – C' Line (Figure 5.8.4)

The profile line is located in the northern part of the study area from west to east. Along the profile line, there is one (1) core boring site in Chuadanga Pourashava. In the profile, there are some changes in facies of B and C formation. In western Chuadanga district, the facies of C formation consists of alternating layers of gravel layers and fine to medium sand layers. On the other hand, the facies in eastern Chuadanga district consists of medium to coarse sand in the upper part and gravelly layers in the lower part. The difference of facies can also be found in B formation. In the west, B formation mainly consists of medium to coarse sand in the upper part and fine to medium sand in the lower part. In the west, B formation mainly consists of medium to coarse sand.

4) Geological Profile along D – D' Line (Figure 5.8.5)

The profile line is located in Jhenaidah district from southwest to northeast. Along the profile line, there are two (2) core boring sites. According to the profile, the boundary between D and E formations slightly dips toward northeast. The facies of E formation is finer with clayey layers in the southwest and coarser with fine to medium sand layers in the northeast. Similar facies change can also be seen in D formation. C formation in mainly consists of gravelly layers, however, there are some fine to medium sand layers in the southwest. The facies of B formation becomes coarser from Kaliganj to Jhenaidah Sadar Upazila.

5) Geological Profile along E – E' Line (Figure 5.8.6)

Although there are few exiting wells along the E - E' line, which is located from southwestern Jhenaidah district to northeastern Jessore district with west to east orientation, the geologic profile was made based on the information of other geologic profiles across the E - E' line. It is estimated that the facies of D and C formations becomes finer in the east, but the facies of E and B formation becomes coarser in the east.

6) Geological Profile along F – F' Line (Figure 5.8.7)

The profile line is located in Jessore district from west to east. Along the profile line, there is one (1) core boring site in Jessore Pourashava. According to the profile, the thickness of A formation increases toward the east. Complicated facies changes can be seen in each formation. The facies of E and D formation is clayey in the west, but it becomes coarser in the east. A gravel layer occurs at the bottom of D formation from Jessore distict to the east. There is no thick clayey layers in C formation, however, there are some very fine to sand layers in Jhikargacha. On the other hand, thick gravel layers are developed from Jessore Pourashava to Moniranpur and Abhaynagar. The facies of B formation also shows to be finer in the west and coarser in the east. In A formation, very fine to fine sand layers are dominant from Jhikargacha to Jessore Pourashava, but clayey sediments are dominant from Moniranpur to Abhaynagar.

7) Geological Profile along G – G' Line (Figure 5.8.8)

The profile line is located in southern Jessore district from west to east. Along the profile line, there is one (1) core boring site in Keshabpur Upazila. The formation boundaries are almost all located from Sharsha to Keshabpur, but they become deeper from Keshabpur to southern Abhaynagar. The profile shows that the clayey facies is dominant from E to C formations. In E and D formations, clayey sediments occur from Sharsha to Keshabpur. In C formation, thick clayey layers occur from Jhikargacha to Keshabpur. However, the facies is drastically changed in Sharsha and Abhaynagar. In Sharsha Upazila, the upper part of C formation mainly consists of fine to medium sand, whereas the lower part mainly consists of clayey layer particularly in the west. There is a medium to coarse sand layer that occurs from Sharsha to Jhikargacha. In the area from Keshabpur to Abhaynagar, fine to medium sand and medium to coarse sand layers occur in the middle to lower parts of the formation. B formation is mainly composed of fine to medium sand along the profile line. In the eastern part of Keshabpur Upazila, medium and coarse sand layers occur. A formation consists of clayey layers in the upper part and very fine to fine sand layers in the lower part.

5.8.2 Isopach Map of Clayey Layers

From the geological profiles in the study area, it is understood that the distribution and thickness of clayey layers in C formation are very important to control groundwater flow in the study area. It clearly divides the shallow aquifer and the deep aquifer, and the concentration of arsenic and other groundwater quality parameters are also different above the clayey layers and below the clayey layers. The arsenic concentration and groundwater quality in the deep aquifer overlain by the clayey layers clearly shows much better conditions than those in the shallow aquifer.

Figure 5.8.9 shows the isopach map of the clayey layers in C formation, indicating the thickness and area of the distribution of the clay. The isopach map was prepared based on the results of core boring and drilling of observation wells/holes, results of the geophysical prospecting by TEM method, and data of exiting well records. The clayey layers are distributed in the southern to western part of Jessore district. The clay is not distributed in Jhenaidah and Chuadanga districts. In Jessore district, the thickness more than 80m is found in Keshabpur and Jhilkargacha. In Abhaynagar, the thickness increased more than 80m in the southeastern part toward Khulna. The areas having more than 50m in thickness are distributed in the whole of Keshabpur, the central to southeastern part of Abhaynagar, central to southern Monirampur, central to northern Jhikargacha, and the northeastern part of Sharsha. On the other hand, the clayey layers are not distributed in the western part of Sharsha upazila, northern Jessore Sadar Upazila, and northwestern Bagarpara Upazila.

The isopach map will provide very important information on the hydrogeological characteristics of the study area as well as the strategy of deep groundwater development for a safe drinking water supply.

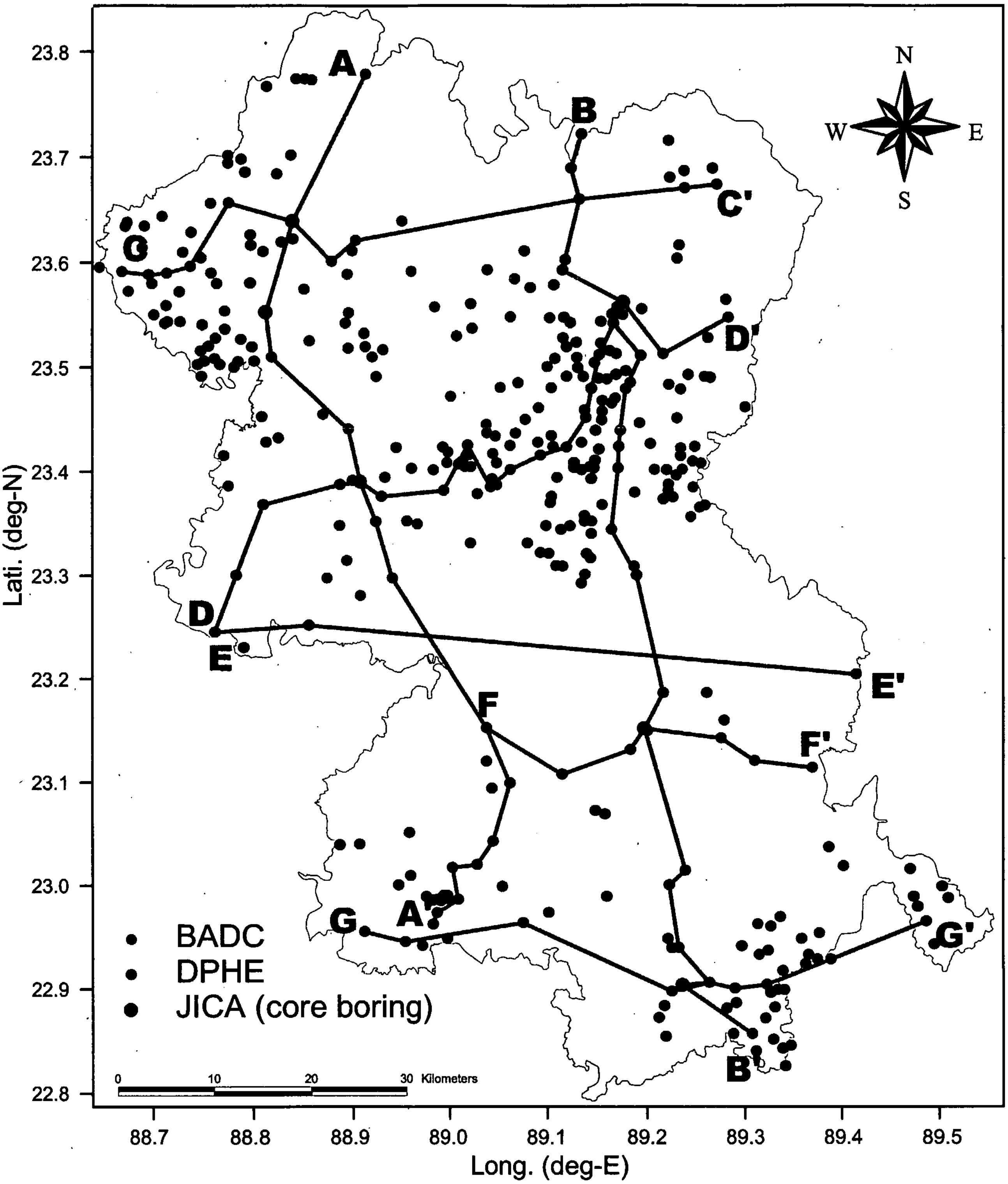

Figure 5.8.1	**Location Map of Geological Profile and Geological Log.**
THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH	
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	

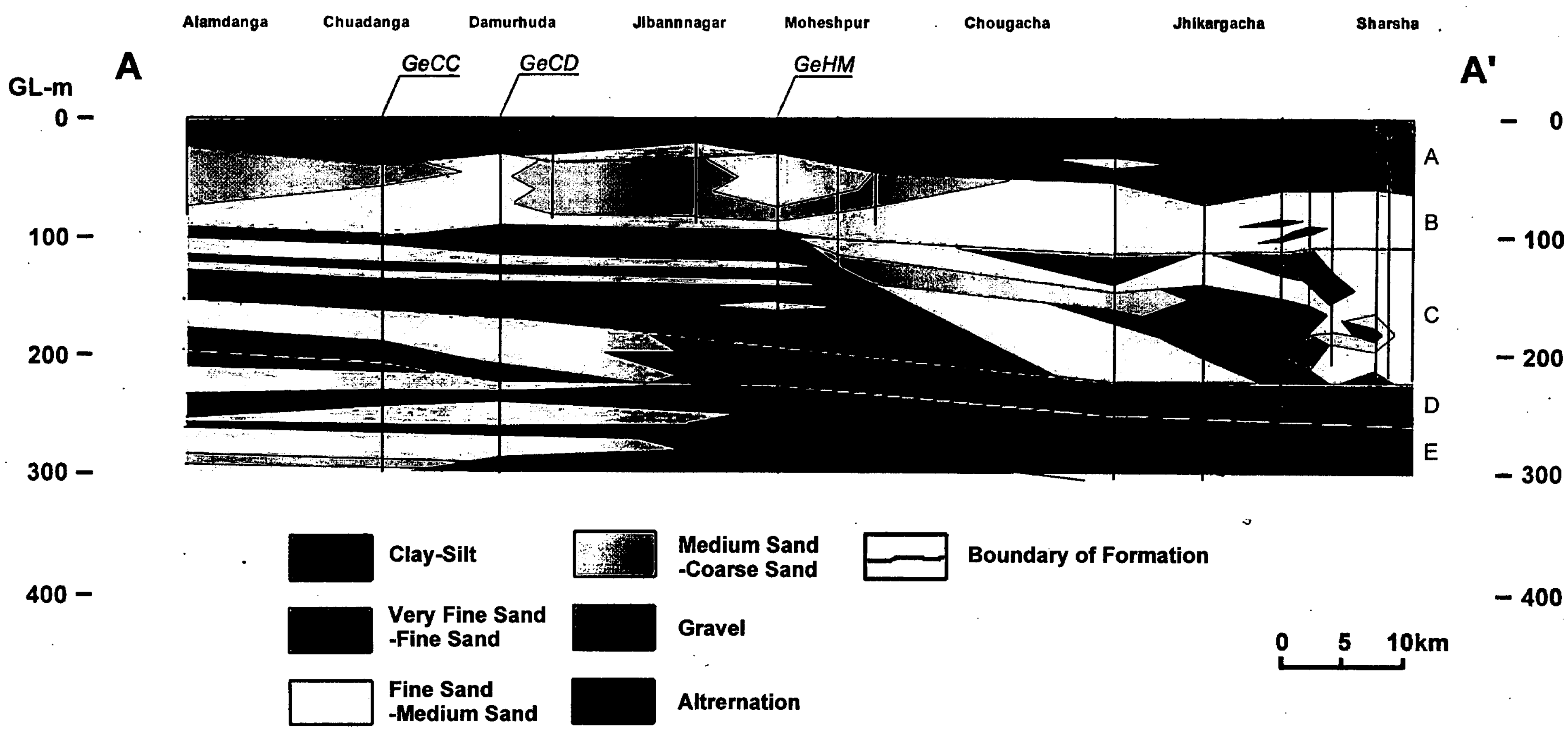

Figure 5.8.2	Geological Profile (A-A')

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

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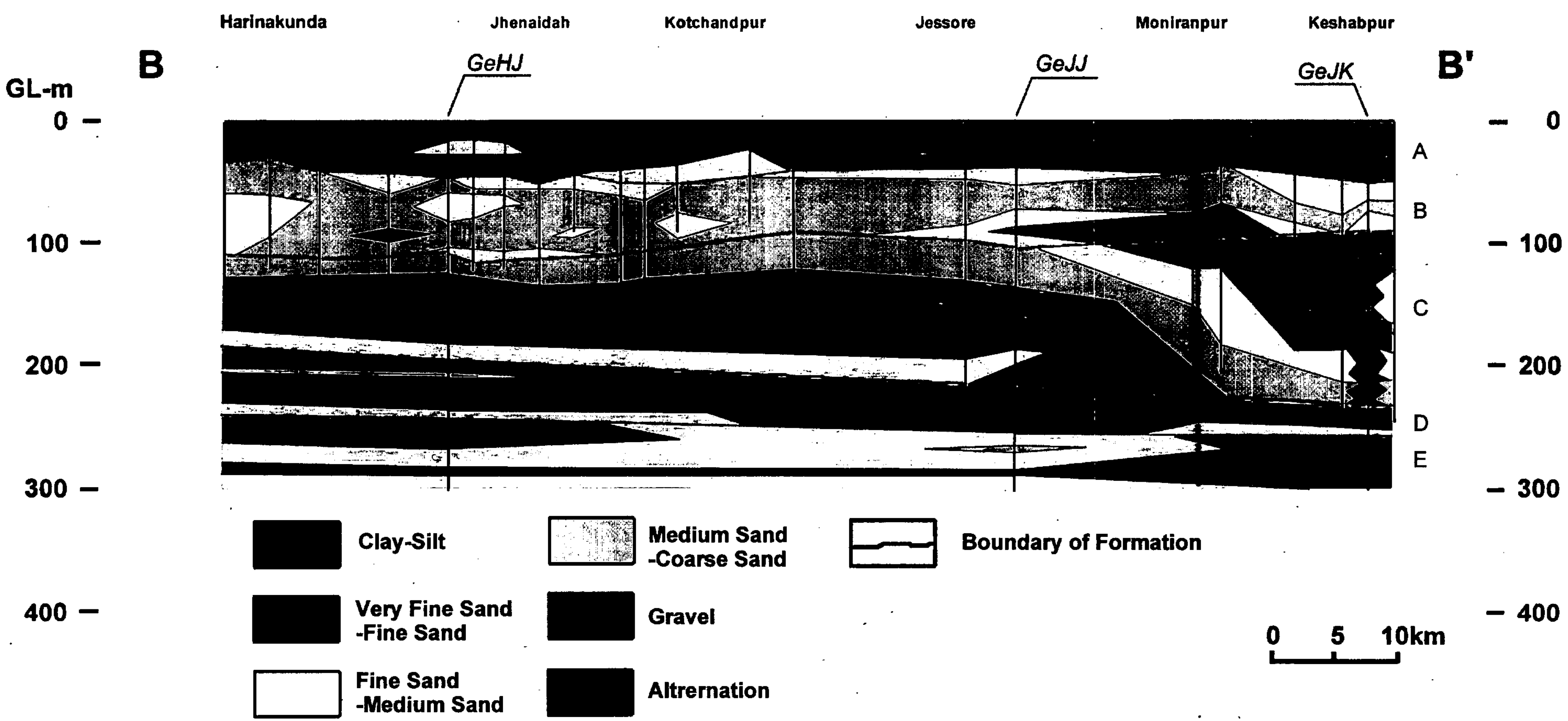


Figure 5.8.3	Geological Profile (B-B')

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

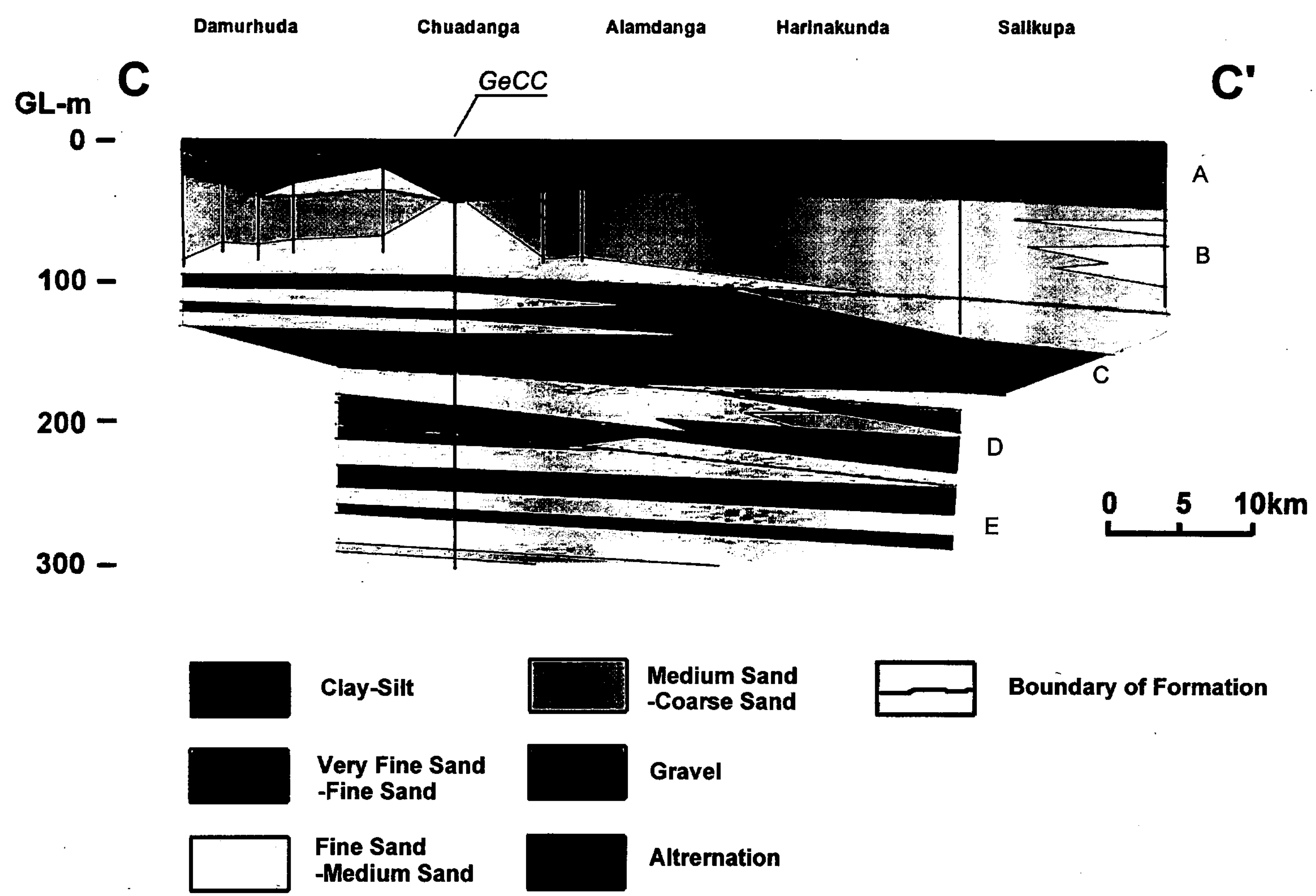


Figure 5.8.4	Geological Profile (C-C')

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

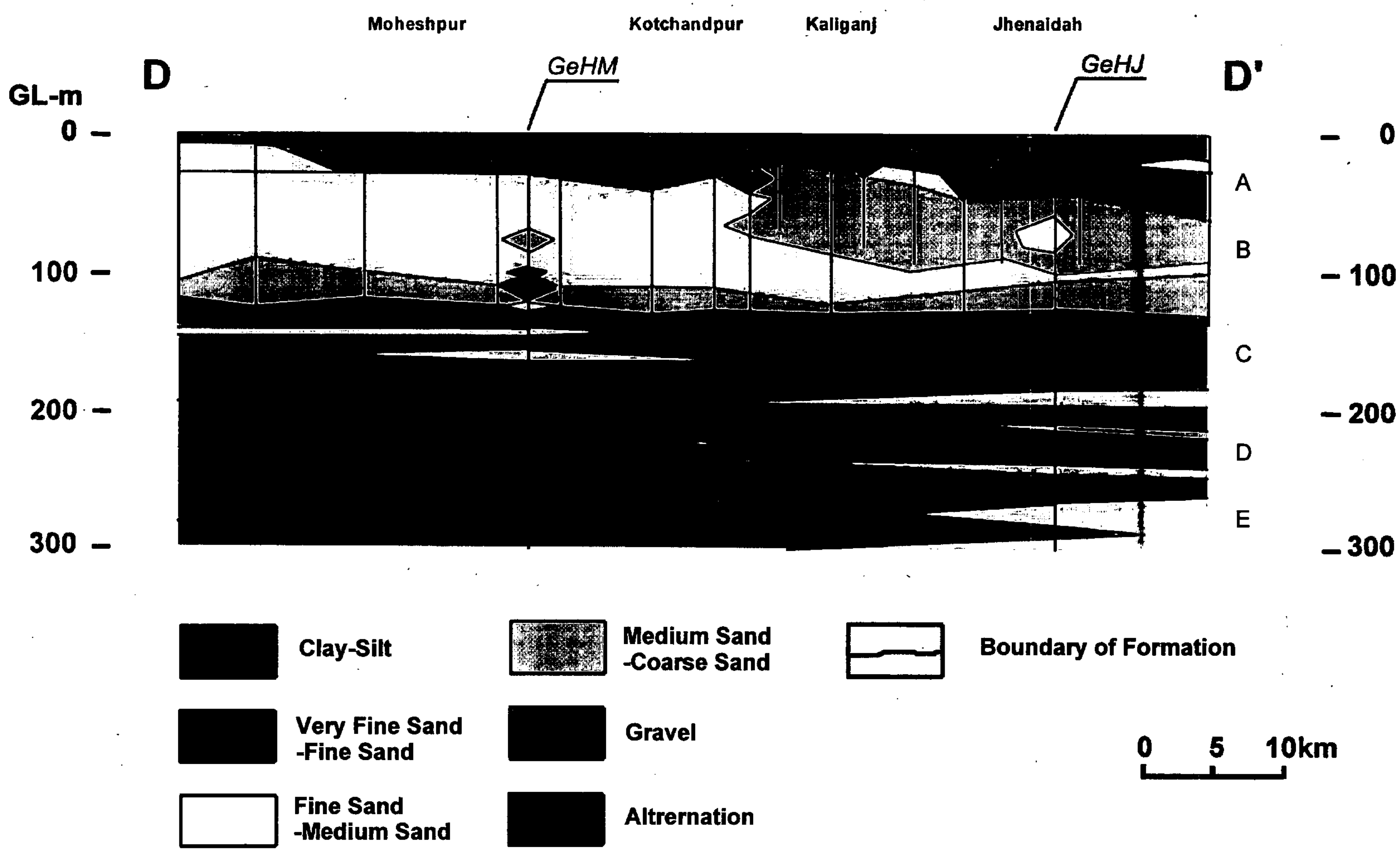


Figure 5.8.5	Geological Profile (D-D')

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

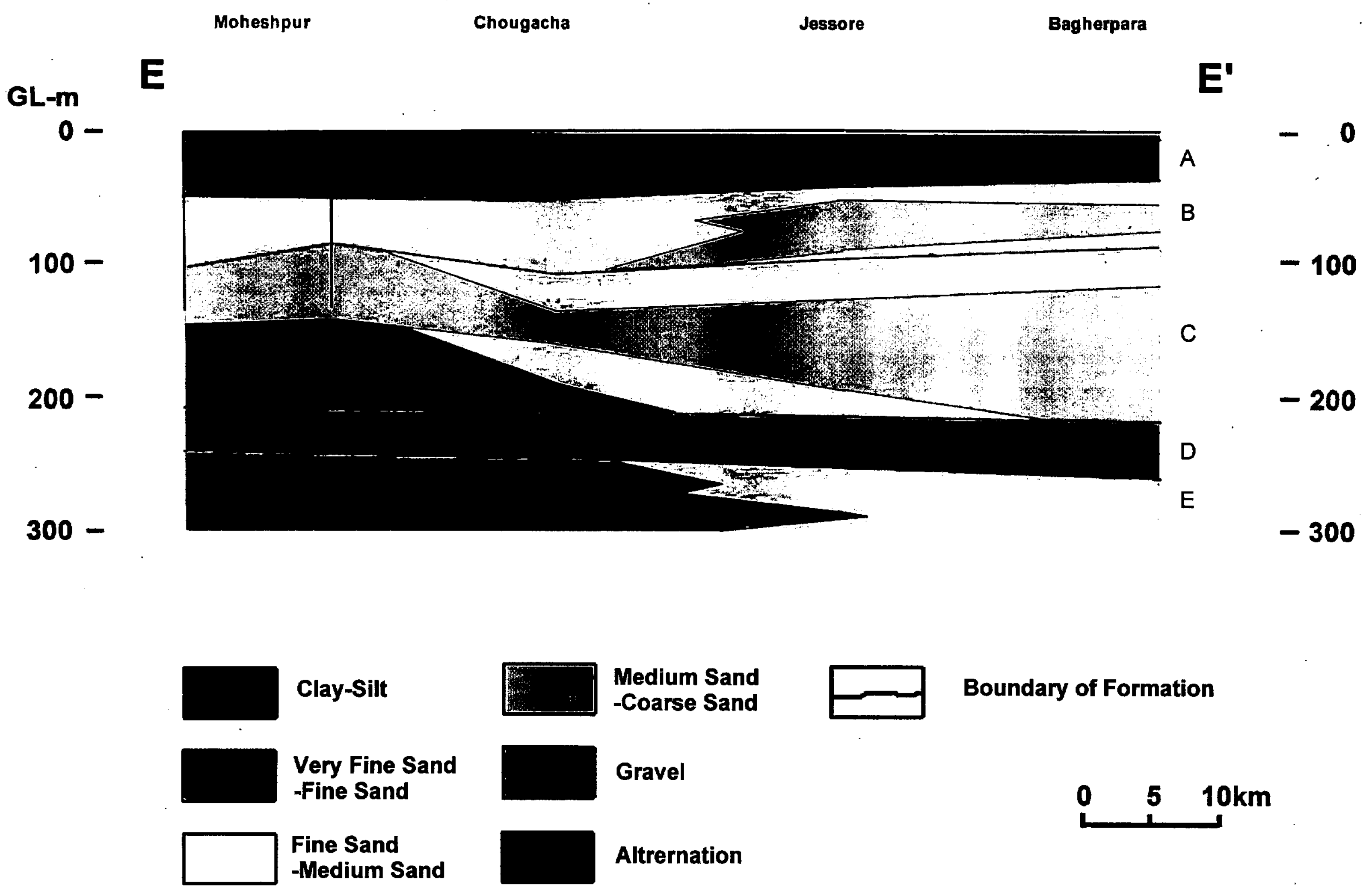


Figure 5.8.6	Geological Profile (E-E')

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

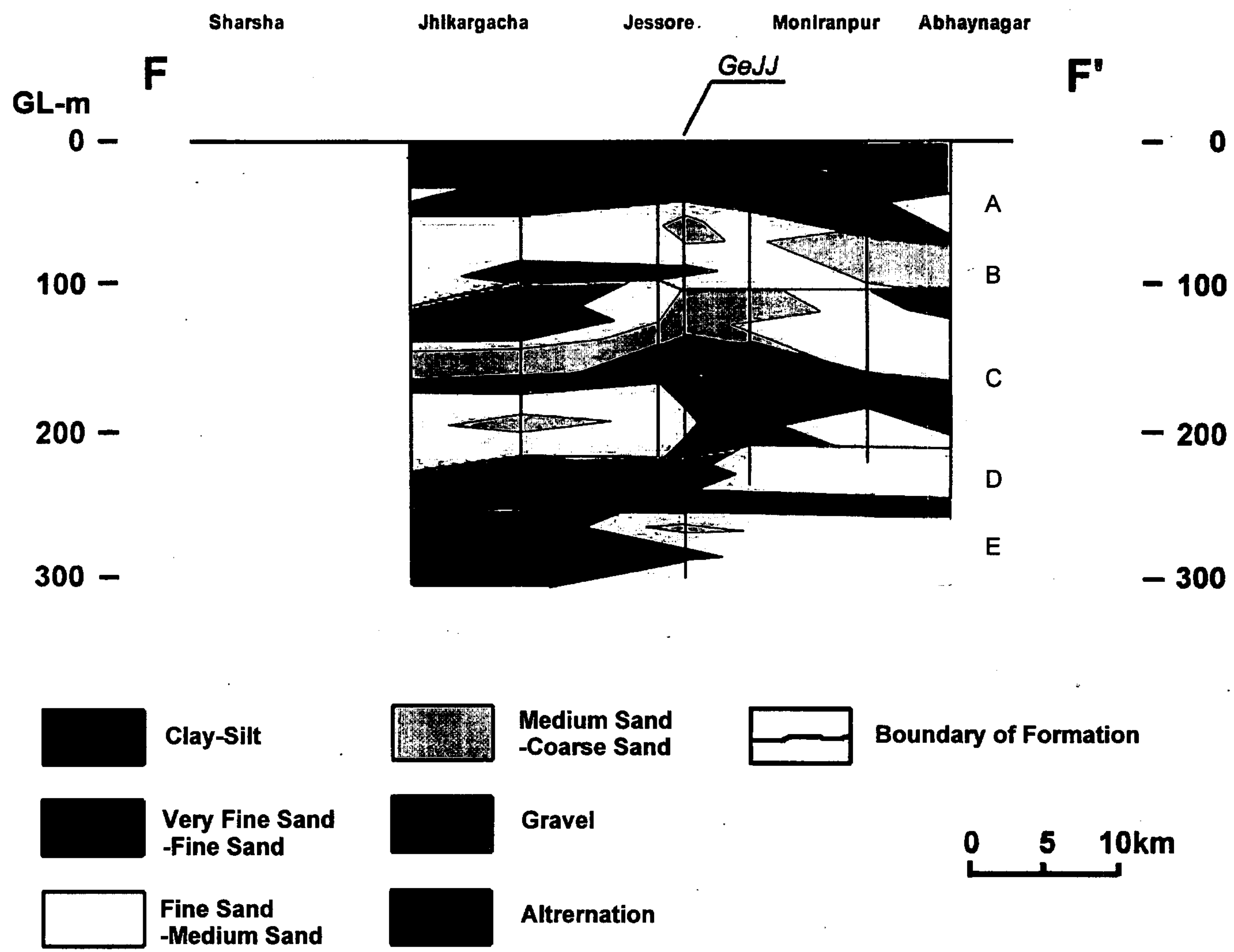


Figure 5.8.7 Geological Profile (F-F')

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

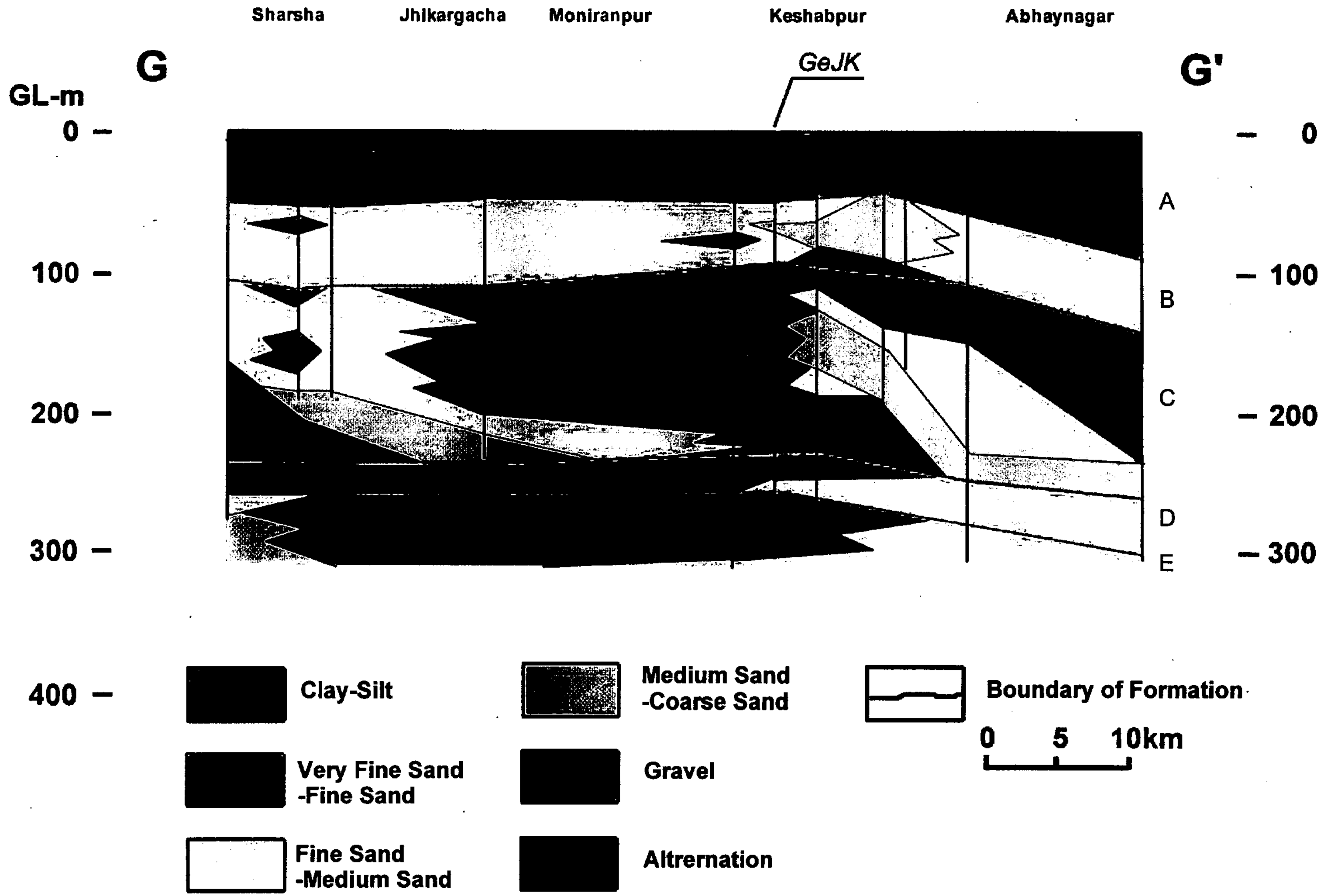
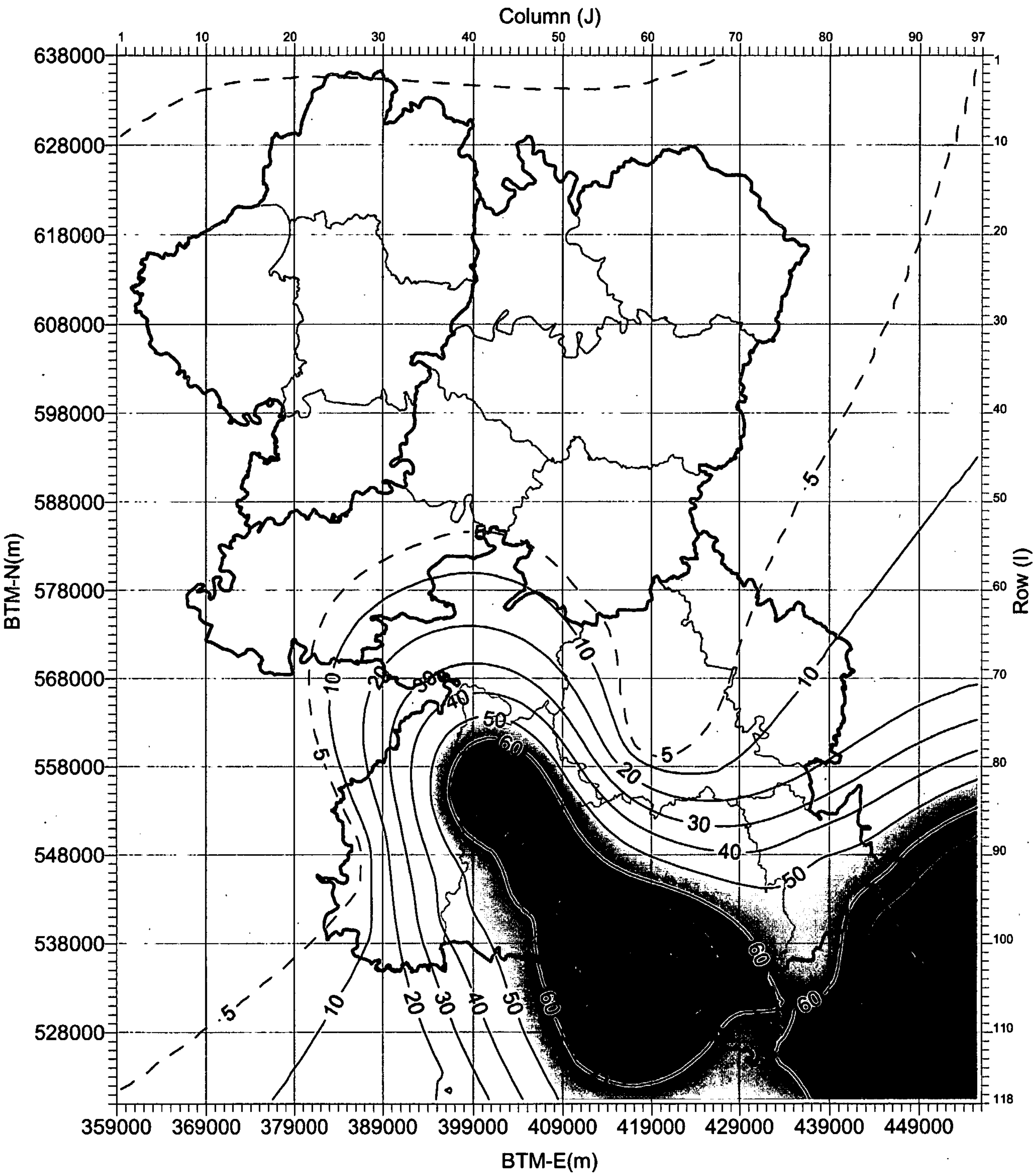


Figure 5.8.8	Geological Profile (G-G')

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)



Equal Line of Clay Thickness (m)

Figure 5.8.9	Isopach Map of Clayey Layers in C Formation

THE STUDY ON THE GROUNDWATER DEVELOPMENT OF DEEP AQUIFERS FOR SAFE DRINKING WATER SUPPLY TO ARSENIC AFFECTED AREAS IN WESTERN BANGLADESH

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