Guideline for Collection of Design Data & Data for rate vetting of De-watering, Closure & Dredging

Design Circle -II
Bangladesh Water development Board
72 Green Road, Dhaka

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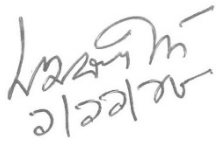
Preface

Design Data is a key element for Design. Relevant and correct Design Data is very important for design. Incomplete or irrelevant Design Data causes waste of lot of time, working hour and paper of Design Office as well Field Office. Incomplete or irrelevant Design Data causes delay in preparation of design, which in turn delays tendering process and as well as implementation. Design prepared on the basis of incorrect Design Data causes difficulties during implementation, which may cause delay of work, increase in quantities of work and sometimes non-tender item are arises.

It is to be mentioned here that Design Data shall be submitted to Design Office through the Superintending Engineer of concern Field Circle. It indicates the importance of Design Data. Normally Design Data is prepared by Sub - Assistant Engineer of field office. It is expected that Sub-Divisional Engineer and Executive Engineer have personally checked the Design Data in the field, before submitting it to field Circle Office. Superintending Engineer shall also check the Design Data before sending it to Design Office.

Another important aspect is data required for vetting rate of Sub-Surface De-watering, Closure & Dredging, which was included in this Guideline. Rate of Sub-Surface De-watering, Closure & Dredging shall be vetted from Design Circle-2.

This Guideline for Collection of Design Data will assist the Design Office for quick checking of Design Data, send from field office. It will also help field engineers for preparing the Design Data and vetting rate of Sub-Surface De-watering, Closure & Dredging. This Guideline is the first step. It may be reviewed and update time to time as per requirement.



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Superintending Engineer
Design Circle - 2
BWDB, Dhaka

Note : Design Data shall be submitted to Design Office through the Superintending Engineer of concern Field Circle.

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7. Water Level Data
8. Soil Investigation Report
9. Long Section
10. Cross Section etc.

B. Description of Different Components of Design Data

1. Technical Report shall include the following information
   a) Name of Project
   b) Location of Project
   c) Location of Work with GPS.
   d) Quantity of work (i,e Length, number etc.)
   e) Source of fund : ADP or NDR
   f) ADP allocation
   g) Whether or not this work is included in DPP
   h) Whether this drawing is needed for implementation (working drawing) or DPP or Technical Committee or Feasibility Study report.
   i) Necessity & justification of work
   j) Possible socio-economic & environmental effects etc.
   k) Any other information, if field office feels necessary.

2. Topographic Map or Basin Map
   a) It must be clear. Illegible or Unreadable map shall not be sent.
   b) Topography of the Project Area including topographic information with contour line.
   c) All project features such as embankment, drainage channel, irrigation Canal, bridge, culvert, regulator etc. shall be shown.
   d) Water bodies (pond, beel, haor), roads, homesteads, outfall river, hydrological Stations, BM pillar etc. shall be shown.
   e) Topographic Map may be prepared from satellite images collected from SOB, SPARSO, CEGIS, FINMAP(IWTA) etc.

3. Index Map
   a) It must be clear. Illegible or Unreadable map shall not be sent.
   b) It must be in scale.
   c) Project Boundary shall be demarcated.
   d) All project features such as embankment, drainage channel, irrigation Canal, bridge, culvert, regulator etc. shall be shown.
   e) Kilometer must be shown along the alignment of embankment & khal.
   f) Location of structure shall be shown with GPS.
   g) Index Map may be prepared from satellite images collected from SOB, SPARSO, CEGIS, FINMAP(IWTA), Google etc.

4. Site Plan
   a) It must be clear. Illegible or Unreadable map shall not be sent.
   b) It must be in scale.
   c) It must be Site specific for a specific structure
   d) Area may be from 300m x 300m to 1000m x 1000m or more depending on the size & importance of structure. For a Hydraulic Structure, “Site Plan” shall be prepared in such a way that alignment of Diversion Channel and Approach Embankment can be shown including the following :
      - Location of existing structure, if any.
      - Alignment & Centre Line of proposed structure.
      - Original Channel & Diversion Channel.

- Alignment of Approach embankment & Closure.
- Location of Soil Bore Hole with GPS.
- Reference BM pillar with GPS.
- Spot level with 5m interval.

e) For embankment **&** Irrigation canal alignment should preferably be shown in mouza map

5. Rainfall Data
   a) Maximum available Data.
   b) At least last 50 year Rainfall Data.
   c) Location and distance of Rainfall Station.

6. Discharge Data
   a) Maximum available Data.
   b) At least last 50 year Discharge Data.
   c) Maximum Discharge and Minimum Discharge.
   d) Location and distance of Guage Station.
   e) If data is not available, then take bank to bank cross-section, measure the velocity, and find the discharge.

7. Water Level Data
   a) Maximum available Data.
   b) At least last 50 year Water Level Data.
   c) At least nearest 2 gauge stations. One in upstream & one in downstream.
   d) Location of Guage Station i,e Riverine distance of the gauge station from work location.
   e) Yearly High Water Level & Yearly Low Water Level or specified by design office.
   f) For Submergible embankment, daily HWL & LWL from January to May 15.
   g) If data is not available, ask the local people, search whether there is any mark of HWL in that locality.

8. Soil Investigation Report

a) Ground Level must be mentioned in Soil Boring Report.

b) Bore Hole location shall be shown in the Site Plan.

c) Bore Hole location with reference to permanent objective & dimension and GPS location must be shown on the Map of Soil Investigation Report.

d) Depth of boring may be 30m or specified by design office.

e) Assistance may be taken from concerned design office to determine the Number & Location of bore hole for Structure, Embankment or Protective Work.

f) Soil Report shall contain at least Grain Size Distribution, Liquid Limit (LL), Plastic Limit (PL), Plasticity Index (PI), Unit Weight (γ), Cohesion (c), Angle of Internal Friction (φ), Initial Void Ratio (e_0), Compression Index (Cc) etc.

g) The location map of bore hole enclosed in the Soil Report must be same as of Design Data Report.

9. Long Section

a) Mainly for Embankment, Khal and Connecting khal of Regulator or Sluice etc.

b) Long Section shall be taken along the proposed alignment with GPS.

c) Existing Crest level, C/S Toe Level, R/S Toe Level shall be shown at least at an interval of 100m for Embankment.

d) Existing bed level, Left bank Level, Right bank Level shall be shown at least at an interval of 100m for Khal.

e) For Drainage Channel, Long section shall be drawn from downstream, with zero (0.00) at outfall river.

f) For Irrigation Canal, Long section shall be drawn from upstream, with zero (0.00) at offtake river.

g) Location of all physical features such as khal, embankment, road, bridge, regulator etc. shall be marked on Long Section.

h) Name & Location of "starting point" & "end point" must be mentioned.

i) Span, Invert Level, Deck Level, Soffit Level etc. of Bridge shall be mentioned.

j) Invert Level, Vent size, Vent no., etc. of Regulator or Sluice shall be mentioned.

10. Cross Section
    a) For Embankment, Khal, Protective Work, Flood Wall, Drain etc.
    b) Cross Section perpendicular to the alignment shall be taken at least at an interval of 100m.
    c) The width of Cross Section shall be at least 70m for sea dyke and 50m for other embankment or as per actual requirement.
    d) Centre Line of Khal & Embankment shall be shown in Cross Section.
    e) Location of Flood Wall shall be shown.
    f) For Embankment & Flood Wall, C/S & R/S shall be marked.
    g) For Khal & Drain, L/B & R/B shall be marked.
    h) Right of Way or extent of acquired land shall be shown.
    i) Cross Section for protective work on large river like Jamuna, Padma, Meghna etc., shall be taken for at least 300m from bank.
    j) Cross Section for protective work on small river, shall be taken up to Lowest Bed Level or at least half of river or khal.
    k) Cross Section shall extend at least 20m on the bank towards C/S.
    l) "Zero Point" of Cross Section shall be marked on ground by a permanent pillar, especially for protective work. All monitoring survey shall be done with this reference point.

C. Design Data requirement for different Infrastructure

1. **Design Data requirement for Embankment** :
    - Technical Committee Report, Feasibility Study Report, DPP etc.
    - Technical Report for Design Data.
    - Clear Index map, Topographic Map.
    - Site Plan showing the proposed alignment of embankment. Better if it is possible in mouza map.
    - Type of embankment i,e submergible, full flood protection, sea dyke etc.,
    - Water Level Data (yearly HWL & LWL) of adjacent river & riverine distance of gauge station.
    - For submergible embankment, daily HWL & LWL from January to May 15.
    - Crest level & width of embankment of adjacent project, if any.
    - Long Section.

- Cross Section at 100m interval (max.).
- Field Office should propose a Crest width & Crest Level of embankment as per field requirement.
- It should be mentioned whether this embankment will be used as a road. In that situation, type of road i,e feeder road, village road etc. and traffic Load etc.
- Wind Speed, Wind Duration, Wave period, Wave Height, Fetch Length etc.
- Soil Investigation Report etc.

2. **Design Data requirement for Excavation or Dredging of Drainage Channel or Irrigation Canal or River**
   - Technical Committee Report, Feasibility Study Report, DPP etc.
   - Technical Report for Design Data.
   - Clear Index map, Topographic Map, Contour Map.
   - Clear Site Plan showing the proposed alignment of Drainage Channel
   - Catchment area for individual reach.
   - Invert level, vent no. & vent size of outfall / offtake regulator.
   - Level and Width of C/S & R/S Apron of outfall / offtake regulator.
   - Rainfall data.
   - Discharge from outside of Catchment area.
   - Water Level Data of outfall river (Drainage period)
   - During survey, Bathymetry should be done if depth of water is more than 4.00m.
   - Long Section.
   - Cross Section at 100m interval (max.).
   - Maximum Retention Level & Minimum Drainage Level.
   - Cross sections (3 nos.) of the outfall river. One at Centre line of Khal, one on 500m U/S and other one on 500m D/S.
   - Data of existing structure along the alignment of the channel.
   - Locations, Span, Sill Levels, Deck Level, Soffit Level & information about foundation of Bridges / Box Culvert / Sluice. Vent Size & number of Box Culvert/sluice.
   - Navigational, fishing, environmental requirement etc.
   - Width, draft, length of boat.

- Location of Dredged Material Dumping Area with dimension and distance from Centre Line of Dredging alignment. Dredged Material shall not be dumped within the river or in the flood plain. A specific proposal for dumping of Dredged Material.
- Evapo-transpiration data from the nearest Station with distance.
- Field Office should propose a Bed width & Bed Level of Drainage Channel as per field requirement.
- Proposed alignment of Irrigation Canal in the Topographic Map and command area.
- Cropping pattern & Duty etc. (**for Irrigation Canal**).
- Water Level Data of offtake river (**for Irrigation Canal**).
- Discharge of offtake river (**for Irrigation Canal**).

3. **Design Data requirement for River Training Work :**
   - Technical Committee Report, Feasibility Study Report, DPP etc.
   - Technical Report for Design Data.
   - Clear Index map showing the river system.
   - Clear Site Plan showing the river morphology.
   - Yearly Maximum Discharge Data.
   - Water Level Data (yearly HWL & LWL) of river & riverine distance of gauge station from work site.
   - D50 of river bed material
   - Cross Section of river.
     - Cross Section should be taken at least up to centerline of River and lowest bed level, in case of Small River.
     - Cross Section should be taken at least 300m from bank, in case of large river.
     - At least 20 to 30m survey should be done on the bank on C/S.
   - Yearly Maximum Velocity of water in River.
   - Wind Speed, Wind Duration, Wave period, Wave Height, Fetch Length etc.
   - Khal crosses the protection work shall be marked in the site plan.
   - Soil Investigation Report etc.

4. **Design Data requirement for Closure:**
   - Technical Committee Report, Feasibility Study Report, DPP etc.
   - Technical Report for Design Data.
   - Clear Index map, Drainage Map.

- Site Plan with Spot levels of proposed site at 5 m interval.
- Yearly Maximum and Minimum Discharge Data.
- Water Level Data (yearly HWL & LWL) of river & riverine distance of gauge station from work site.
- Long Section of river.
- Cross Section of river at 25m interval at closure site.
- Cross sections (3 nos.) of the outfall river. One at Centre line of Khal, one on 500m U/S and other one on 500m D/S.
- Suggested alternative locations, if any.

5. **Design Data requirement for Mechanical works**
   - For Mechanical and Electrical works, design data shall be sent to Design Circle-3.
   - A set of drawing of civil works.
   - Yearly Maximum and Minimum Discharge Data.
   - Water Level Data (yearly HWL & LWL) of river & riverine distance of gauge station from work site.
   - Other data as per requirement of Design Circle-3.

6. **Design Data requirement for Regulator/ Sluice, Barrage, Weir, Siphon, Aqueduct, Check structure, Inlet & outlet, Pump House etc. :**
   - Technical Committee Report, Feasibility Study Report, DPP etc.
   - Technical Report for Design Data.
   - Clear Index map, Topographic Map, Contour Map.
   - Clear Site Plan with spot level at 5m interval.
   - Rainfall data.
   - Water Level Data of outfall river/offtake river & riverine distance of guage station.
   - Cropping pattern.
   - Maximum Retention Level, Minimum Drainage Level.
   - Catchment Area.
   - Type of traffic Load etc.
   - Long Section of khal upto outfall/oftake on R/S. At least 2-3 km Long Section of khal on C/S.
   - Cross Section of khal at least 100m interval.

- Cross sections (3 nos.) of the outfall river/offtake river. One at Centre line of Khal, one on 500m U/S and other one on 500m D/S.
- Soil Investigation Report etc.
- Data should be sent through "Design Data Checklist" (**Annexure - A**).

D. Data requirement for vetting of Sub- Surface Dewatering

Rate of Sub- Surface Dewatering shall be Lump sum. This rate shall be vetted from Design Circle-2. For vetting following data shall send to Design Circle-2.

- Approved Design
- Design of Dewatering System
- Estimate of Dewatering System
- Soil Boring report.
- Ground Water Table Data. Location of Ground Water Table Station.
- Drawing of Foundation Trench.
- Period of De-watering.
- Hydraulic Conductivity of soil.
- Grain Size Analysis.

E. Data requirement for vetting of Closure

Rate of Closure shall be Lump sum. This rate shall be vetted from Design Circle-2. For vetting following data shall send to Design Circle-2.

- Technical Committee Report, Feasibility Study Report, DPP etc.
- Approved Design
- Estimate of Closure

F. Data requirement for vetting of Dredging

Rate of Dredging shall be vetted from Design Circle-2. For vetting following data shall send to Design Circle-2.

- Technical Committee Report, Feasibility Study Report, DPP etc.
- Approved Design.
- Clear Map showing the alignment of Dredging.
- Section of Dredging.
- Location and distance of Dumping Yard of Dredged Material.
- Dimension of Dumping Yard of Dredged Material.
- Section of Dyke of dumping of Dredged Material.

Annexure - A

DATA CHECKLIST FOR THE DESIGN OF DRAINAGE SLUICE/ REGULATOR/ WATER RETENTION STRUCTURE

While submitting proposal for the design of a Sluice, Regulator or Water Control Structure, this Data Checklist shall be filled up and sent to the Design office along with other requisites mentioned herein.

A	Name of the Project :	
B	Name of the Structure :	
C	Project Area	Gross: Net:
D	Catchments Area above the Structure	

1. PURPOSE OF THE STRUCTURE

Identify the purpose(s) that has to be served by the structure and put tick mark accordingly:

1.1 Pre-monsoon drainage

1.2 Monsoon drainage

1.3 Post monsoon drainage

1.4 Prevention of pre-monsoon flood

1.5 Prevention of flood

1.6 Flushing of irrigation water

1.7 Retention of post monsoon water for irrigation

2. MAPS

2.1 Project Index Map :

2.2 Basin Map :

2.3 Site Plan :

3. HYDROLOGICAL DATA

3.1 Rainfall Data :

3.1.1 Is there any rainfall station within the catchments area? If so, specify the name(s) and length of records available :

Yes ☐ No ☐

Station No.	Name of Station	Length of Records available	Remarks

3.1.2 Specify the name and length of records of the rainfall station close to the catchments of the proposed structure :

Station No.	Name of Station	Length of records available	Remarks

3.2 Water Level Data :

3.2.1 Is there any water level station on the outfall river at or near the structure site? If so, mention the name of the station(s):

Yes ☐ No ☐

Station No.	Name of Station	Length of records available	Distance (u/s or d/s) from structure	Remarks

3.2.2 Specify the name of at least one station U/S and one station D/S of the structure site with distance :

U/S station :

U/S distance : km

D/S station :

D/S distance : km

3.2.3 Is there any water level station on the drainage channel corresponding the proposed structure? If so, specify the name.

Yes ☐ No ☐

3.2.4 Mention the highest flood level (H.F.L.) ever experienced in the basin indicating the source of the record

H.F.L. (ever experienced) = m PWD from gauge level at --------- Station / From average public information.

3.3 Discharge Data:

3.3.1 Is there any record of discharge in the drainage channel? If so, enclose the data as available:

Yes ☐ No ☐

Enclose discharge data for the year of ..... at station .....

4. MORPHOLOGICAL DATA

4.1 (a) Are the banks of the outfall river and drainage channel at or near the structure site stable ?

Yes ☐ No ☐

(b) If not, show the movement of the bank in each year in a map.

Enclosed ..... No. of map.

(c) What is the average rate of erosion in each year?
Average rate of erosion - ----------m / year (approx.).

4.2 Cross-section of the drainage channel for at least 1.00 km u/s and 1.00 km d/s of the structure site at an interval of 60m.

Enclosed ----------No (s) of cross section.

4.3 Long section of the drainage channel for at least 3 km u/s from the structure site and up to the outfall river in the d/s

Enclosed ---------- No (s) of long section

4.4 Cross-section of the outfall river for a length of 500m U/S and 500m D/S from the confluence point of drainage channel and the outfall river.

Enclosed ----------No (s) of cross section

5. MISCELLANEOUS DATA

5.1 Data related with Embankment / Road connecting the structure

5.1.1 Existing or proposed road / embankment profile for at least 150m on each side of the proposed structure :

Enclosed ---------- No (s) of sheet

5.1.2 Existing or proposed top elevation, top width and side slopes of embankment / road at the structure site :

i) Top Elevation : PWD

ii) Top Width :

iii) C/S Slope :

iv) R/S Slope :

5.1.3 Type of expected traffic loading on road/embankment.

..... Loading

5.2 Data Related with Drainage Aspects:

5.2.1 Are the existing section and bed slope of the drainage channel adequate for complete or desired level of drainage?

Yes ☐ No ☐

5.2.2 If not, does the scheme include excavation of the drainage channel? If so, the design cross section and long section may be furnished as requirement indicated in Para 4.2 and 4.3.

Yes ☐ No ☐

Enclosed --------- cross sections in 2 Sheet(s) & one long-section of the proposed drainage channel has to be prepared.

5.2.3 (a) Is the complete drainage of the basin necessary?

Yes ☐ No ☐

(b) If not, mention the drainage level required & distance of such level from the proposed structure site.

Drainage Elevation Requirement -------- m PWD

Distance from the structure site: Approx. ---------- km

5.2.4 From the field condition propose the invert level of the structure which can a11ow desired level of drainage from field condition.

(a) **Proposed invert level ----------m PWD**

(b) Invert level nearby existing structure(s) ---------- mPWD
(----------Regulator approx. -------- Km D/S or U/S from proposed regulator and -------- --- is one of the branches khals of --------- Khal, the main khal of the Project).

5.2.5 From the field condition, what is the maximum level of acceptable flooding on the basin during the drainage period?

Acceptable flooding level ----------mPWD

5.2.6 Desired Post Monsoon Drainage Level :
Date: October 31 Level mPWD

5-3 Data Related with irrigation Aspects:

5.3.1 Specify the total cultivable and irrigable area within the project.

Cultivable Area Acres.

Irrigable Area Acres.

5.3.2 Principal crops with acreage in the basin with present and future cropping pattern.

Enclosed in ..... number of sheet(s)

5.3.3 Proposed retention level of water in the u/s of the drainage channel of the structure for irrigation.

Retention Level: ..... m PWD.

5.3-4 For Irrigation by flushing of water, specify the period of such irrigation.

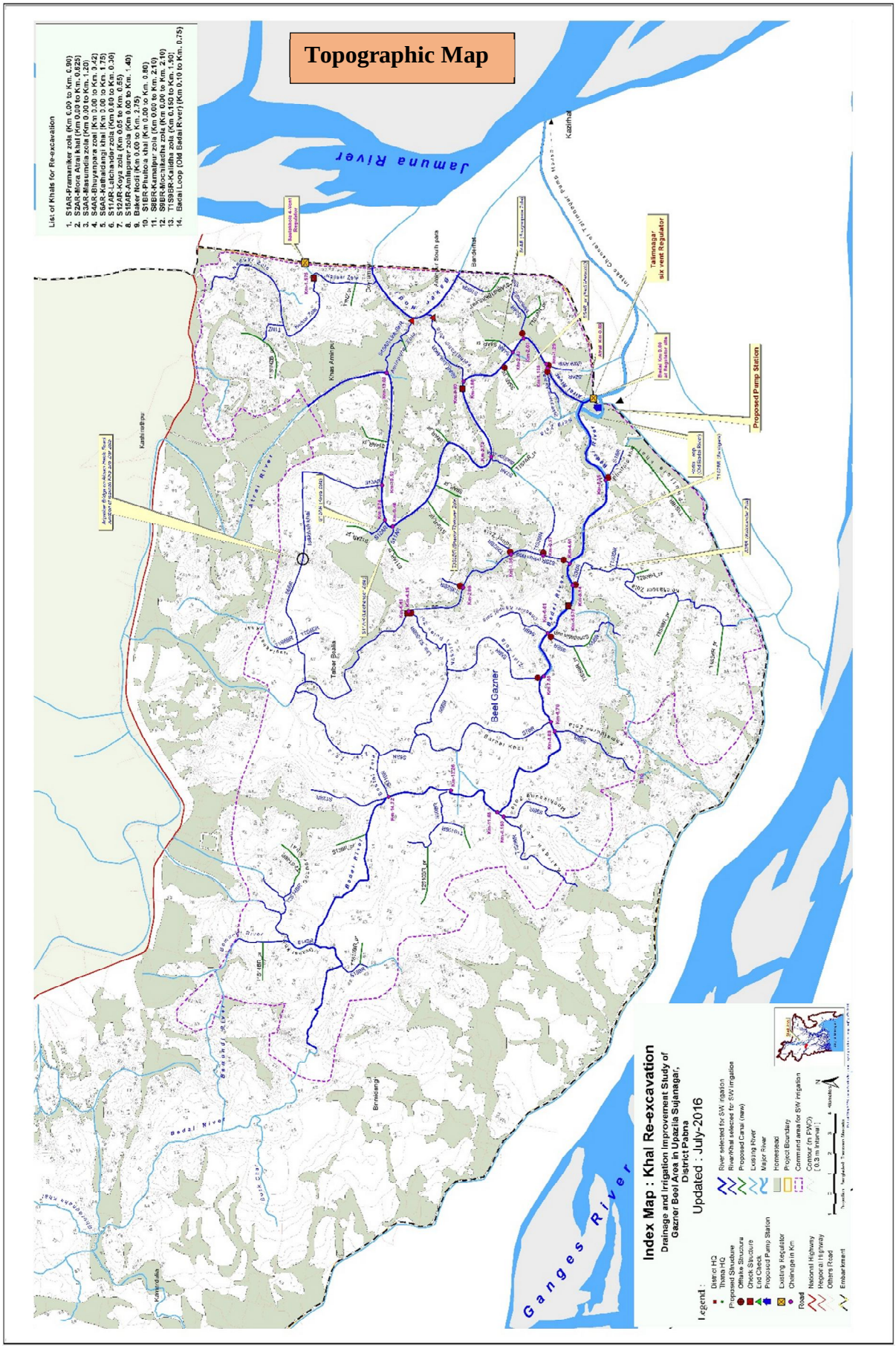
Period from ..... to .....

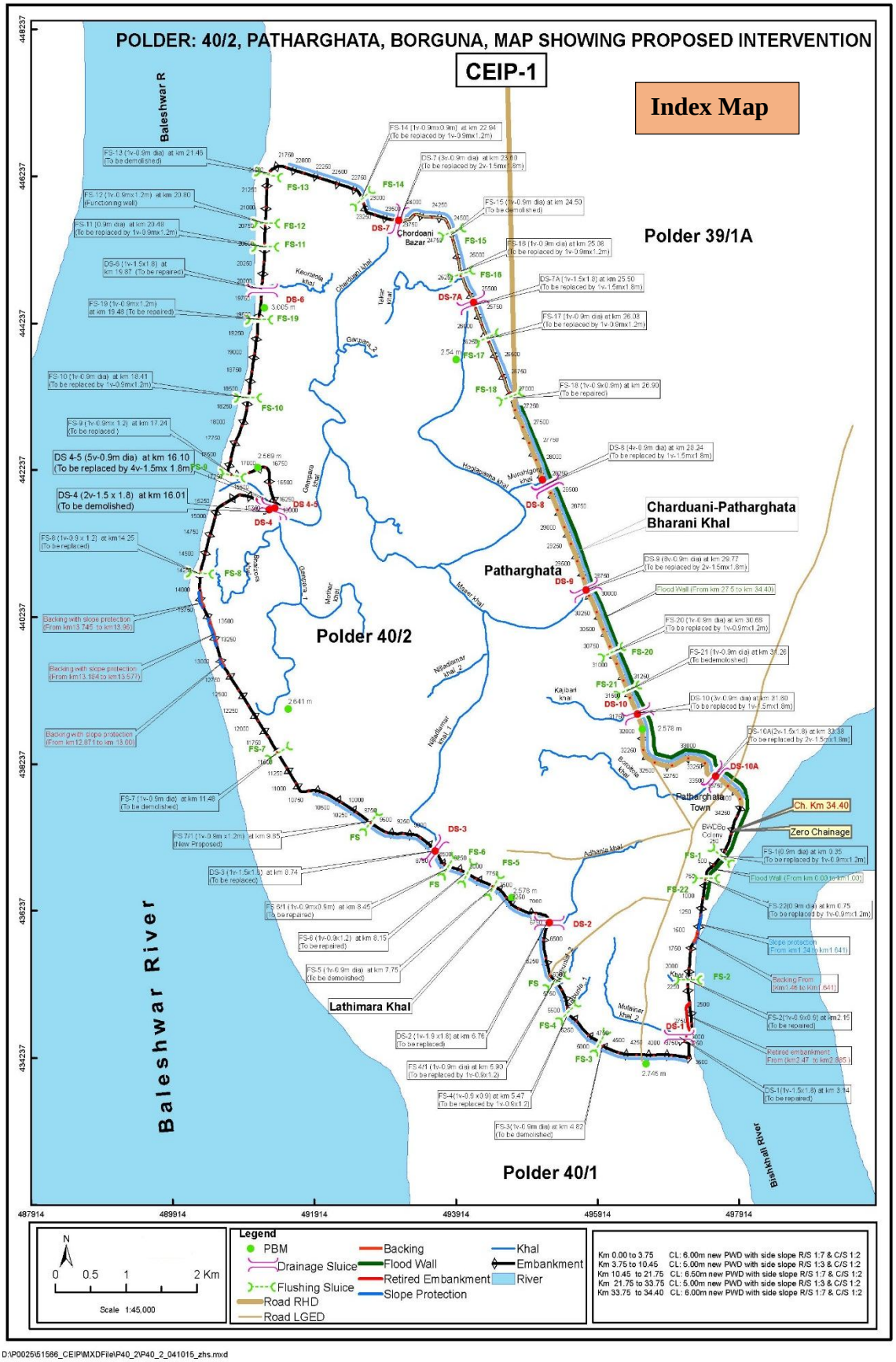
6. FOUNDATION DESIGN DATA

Soil report with the detail soil analysis report. If in the first site poor soil is found, an arrangement for boring in alternative site should be made and detail soil analysis report of the new site is to be send to Design Office.

Some Sample

Topographic Map




POLDER: 40/2, PATHARGHATA, BORGUNA, MAP SHOWING PROPOSED INTERVENTION
CEIP-1
Index Map
Polder 39/1A
Polder 40/2
Polder 40/1
Charduani-Patharghata Bharani Khal
Patharghata
Patharghata Town
Chordoani Bazar
Lathimara Khal
Baleshwar River
Baleshwar R
Bishkhali River
Ch. Km 34.40
Zero Chainage
Legend
PBM
Drainage Sluice
Flushing Sluice
Road RHD
Road LGED
Backing
Flood Wall
Retired Embankment
Slope Protection
Khal
Embankment
River
Km 0.00 to 3.75 CL: 6.00m new PWD with side slope R/S 1:7 & C/S 1:2
Km 3.75 to 10.45 CL: 5.00m new PWD with side slope R/S 1:3 & C/S 1:2
Km 10.45 to 21.75 CL: 6.50m new PWD with side slope R/S 1:7 & C/S 1:2
Km 21.75 to 33.75 CL: 5.00m new PWD with side slope R/S 1:3 & C/S 1:2
Km 33.75 to 34.40 CL: 6.00m new PWD with side slope R/S 1:7 & C/S 1:2
Scale 1:45,000
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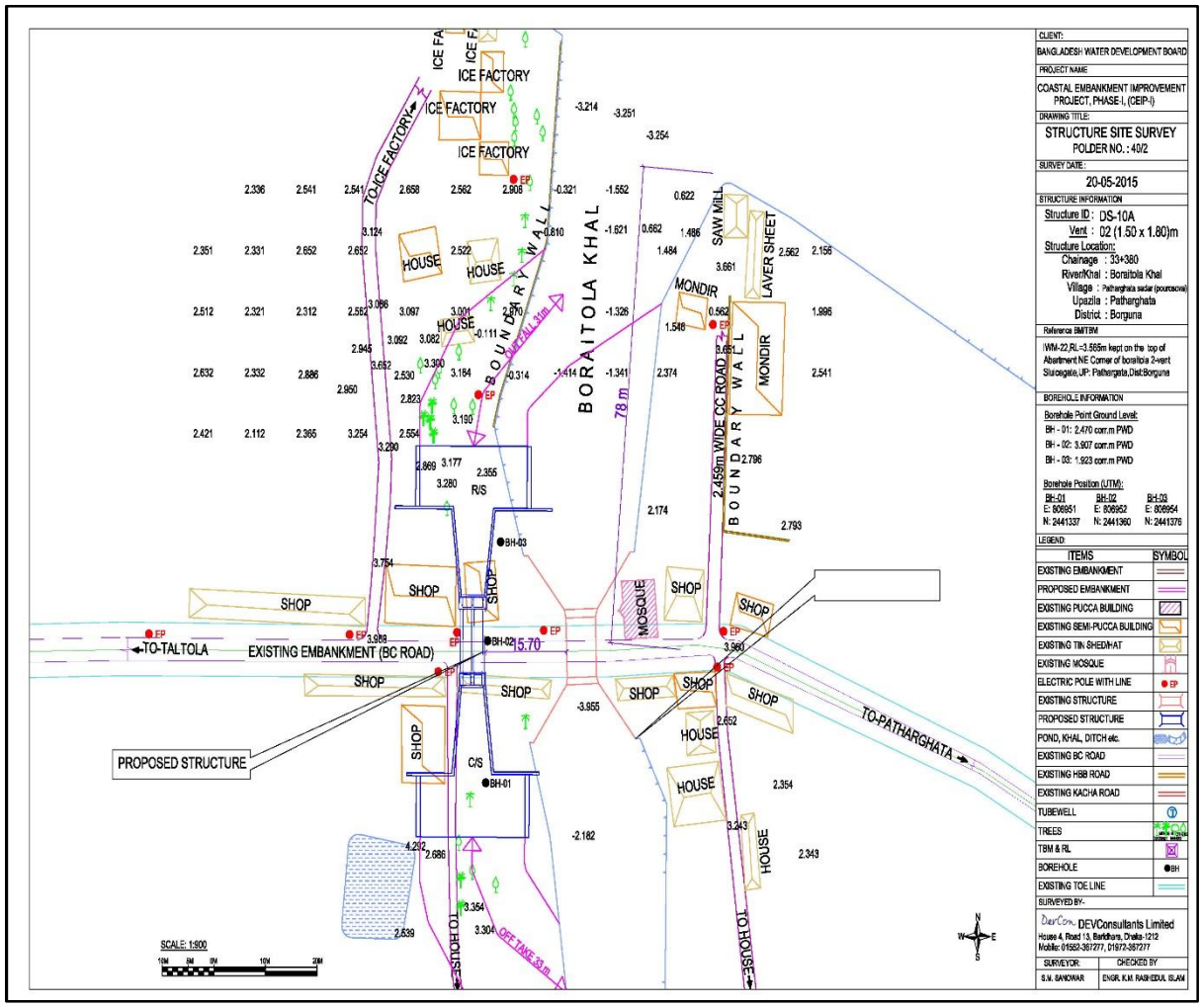
Site Plan shows location of existing structure, proposed structure, original Channel & Diversion Channel, alignment of Approach Embankment, location of Soil Bore Hole and Spot level with 5m interval



Bore Log with Ground Level

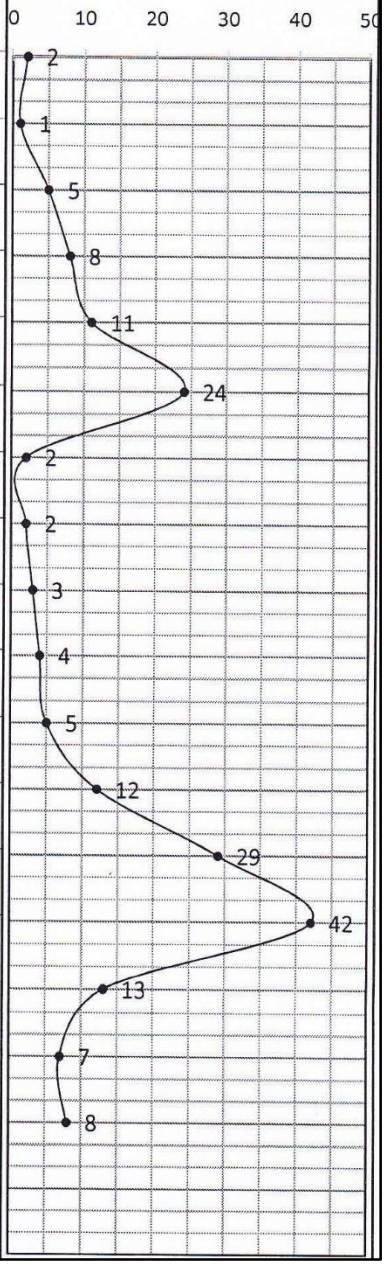
Client :	BANGLADESH WATER DEVELOPMENT BOARD			
Project :	COASTAL EMBANKMENT IMPROVEMENT PROJECT, PHASE-I			
Location:	Chainage:	: 9+420	Village	: LAXIBAZAR
	District:	: PATUAKHALI	River/khal	: MISRIPARA KH.
	Upazila	: KALAPARA	Polder ID	: 48

BORING LOG

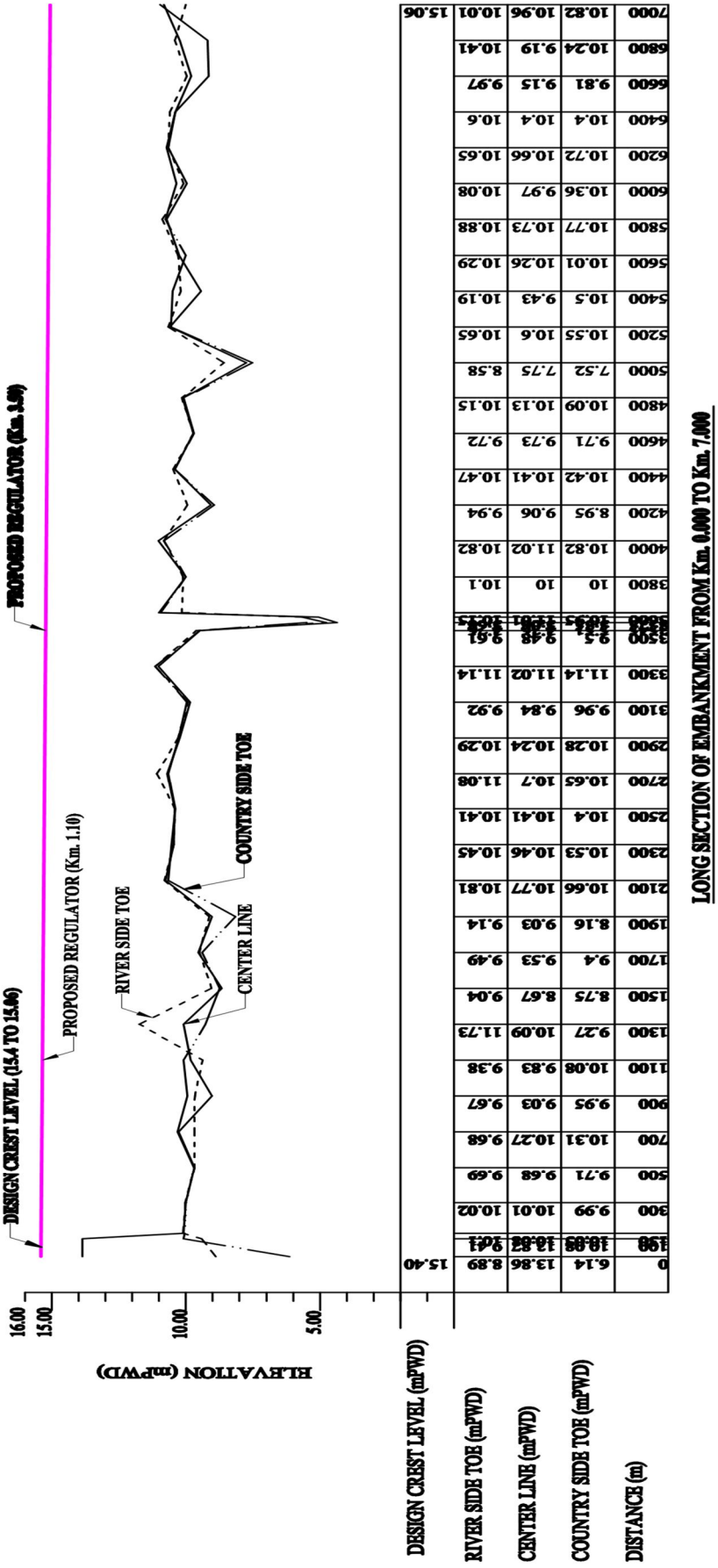
METHOD OF BORING	=	WASH	CO-EFFICIENT OF PERMEABILTY=	6E-06 cm/s	**Structure Name & ID** DS-3/2
BORE HOLE DIAMETER	=	0.10 m	BORING STARTING DATE	= 12/07/2015	**Report No.:** 3
CASING DIA & DEPTH	=	0.10 m	BORING FINISHG DATE	= 12/07/2015	
DEPTH OF BORING	=	25.500 m	BORE HOLE POSITION		
BORING POINT EGL	=	1.929 Corr. m PWD	EASTING : 208727		**BORE HOLE NUMBER** BH-03
GROUND WATER LEVEL	=	0.879 Corr. m PWD	NORTHING : 2418602		

DEPTH BELOW EGL (m)	R.L. (m)	SAMPLE ID	SYMBOL	SOIL PROFILE DESCRIPTION OF SOIL STRATA	DEPTH (mm) 150	150	150	150	SPT
0.00	1.929	-		EGL AT BORING POINT= 1.93 Corr. m PWD					
1.50	0.429	D-01		Brown very soft SILT, some clay, trace fine sand	1	1	1	2	2
3.00	-1.071	D-02		Gray very soft SILT, some clay, trace fine sand	1	0	1	1	1
4.00	-2.071	UD-1							
4.50	-2.571	D-03		Gray loose to medium dense SAND, some silt, trace clay	2	2	3	3	5
6.00	-4.071	D-04		Do	3	3	5	5	8
7.50	-5.571	D-05		Do	4	5	6	8	11
9.00	-7.071	D-06		Do	7	12	12	16	24
10.50	-8.571	D-07		Gray very soft SILT, little clay, trace fine sand	1	1	1	1	2
12.00	-10.071	D-08		Do	1	1	1	1	2
13.50	-11.571	D-09		Do	2	2	1	1	3
15.00	-13.071	D-10		Do	2	2	2	3	4
16.50	-14.571	D-11		Gray stiff SILT, some sand, trace clay	2	2	3	3	5
18.00	-16.071	D-12		Do	5	5	7	9	12
19.50	-17.571	D-13		Do	6	13	16	25	29
21.00	-19.071	D-14		Do	8	14	28	34	42
22.50	-20.571	D-15		Gray stiff SILT, little clay, trace fine sand	3	6	7	10	13
24.00	-22.071	D-16		Do	2	3	4	6	7
25.50	-23.571	D-17		Do	3	3	5	8	8

GRAPHICAL PRESENTATION



Long Section of Embankment



LONG SECTION OF EMBANKMENT FROM Km. 0.000 TO Km. 7.000

DISTANCE (m)	COUNTRY SIDE TOE (mPWD)	CENTER LINE (mPWD)	RIVER SIDE TOE (mPWD)	DESIGN CREST LEVEL (mPWD)
0	6.14	13.86	8.89	15.40
100	10.08	13.87	9.41	
300	9.99	10.01	10.02	
500	9.71	9.68	9.69	
700	10.31	10.27	9.68	
900	9.95	9.03	9.67	
1100	10.08	9.83	9.38	
1300	9.27	10.09	11.73	
1500	8.75	8.67	9.04	
1700	9.4	9.53	9.49	
1900	8.16	9.03	9.14	
2100	10.66	10.77	10.81	
2300	10.53	10.46	10.45	
2500	10.4	10.41	10.41	
2700	10.65	10.7	11.08	
2900	10.28	10.24	10.29	
3100	9.96	9.84	9.92	
3300	11.14	11.02	11.14	
3500	9.5	9.48	9.61	
3800	10	10	10.1	
4000	10.82	11.02	10.82	
4200	8.95	9.06	9.94	
4400	10.42	10.41	10.47	
4600	9.71	9.73	9.72	
4800	10.09	10.13	10.15	
5000	7.52	7.75	8.58	
5200	10.55	10.6	10.65	
5400	10.5	9.43	10.19	
5600	10.01	10.26	10.29	
5800	10.77	10.73	10.88	
6000	10.36	9.97	10.08	
6200	10.72	10.66	10.65	
6400	10.4	10.4	10.6	
6600	9.81	9.15	9.97	
6800	10.24	9.19	10.41	
7000	10.82	10.96	10.01	15.06