37TH INTERNATIONAL NO-DIG FLORENCE 2019

Fortezza da Basso • FLORENCE (Italy)

30th September • 2nd October 2019

A PIPE-DETECTING PROJECT AND TECHNICAL ASSISTANCE IN BANGLADESH

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OUTLINE

1. Introduction
2. Result
3. Specification of Equipment
4. Technology Support and Problem Solution Method
5. Further Challenges
6. Conclusion

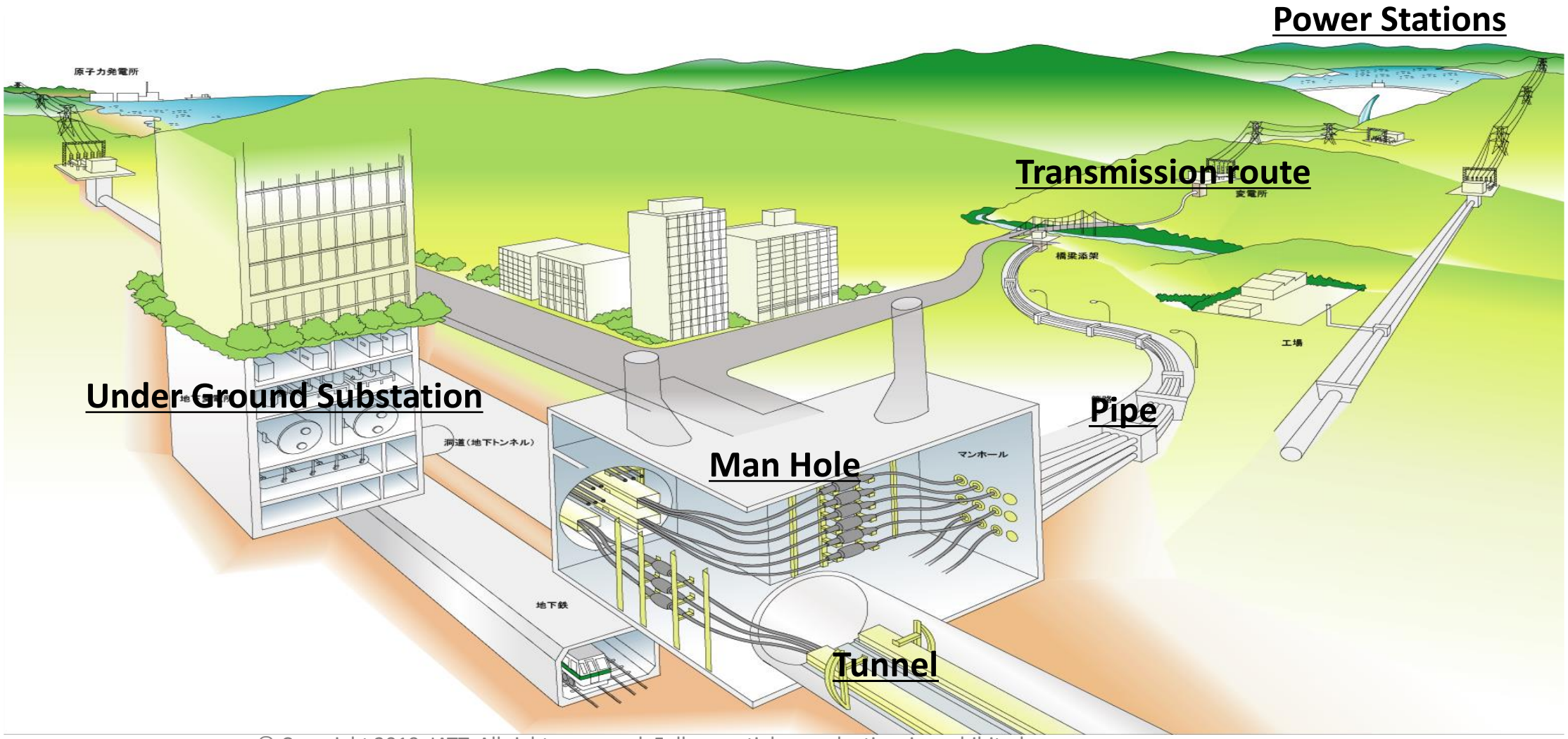
1-1 INTRODUCTION

✓ The purpose of this presentation

- TEPCO is providing consulting services for the construction of the People's Republic of Bangladesh's first underground substation and for an underground transmission-and-distribution cable improvement project (5km).

- Pipe detecting project and how it improved accuracy of available information by using **GPR** and know-how in JAPAN.

1-1 INTRODUCTION



1-2 INTRODUCTION

✓ **Challenging Problems**

I. Prohibition on road digging

II. Lack of accurate information

III. Insufficient underground detection technology

1-3 INTRODUCTION

✓ **The project consisted of**

I. Effectively selecting locations for underground detection

II. Building a better reproducible method for detection

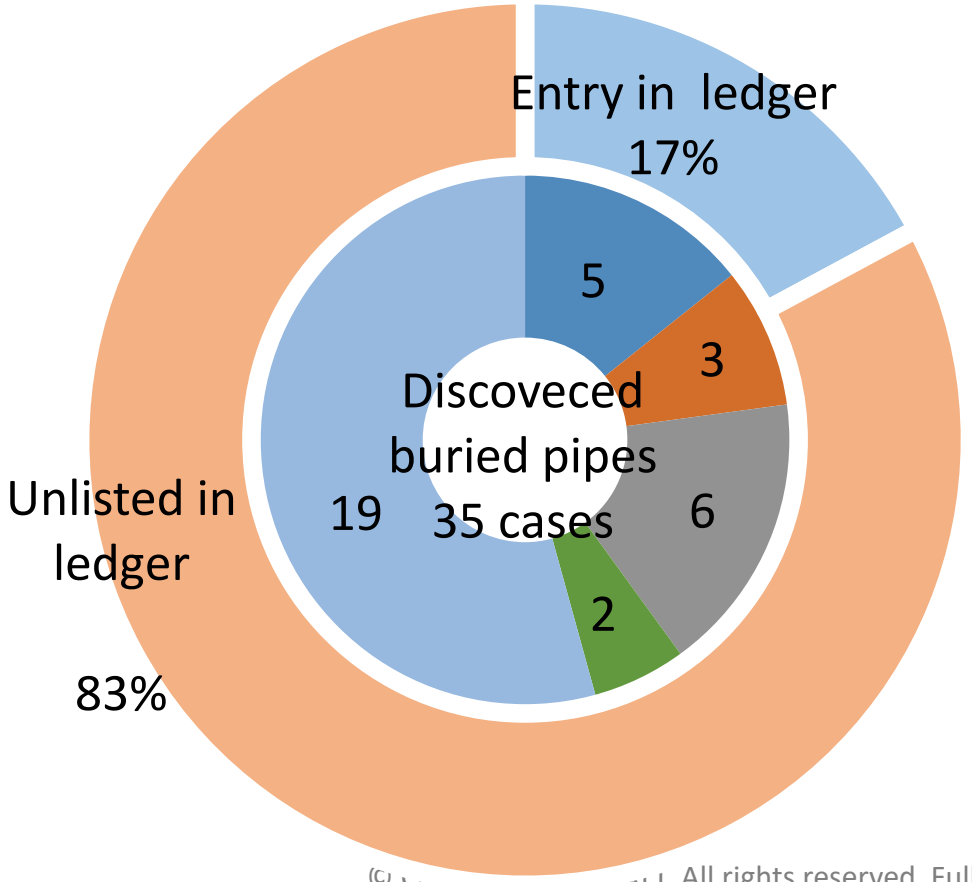
III. Planning the recording and management method witch suit for Banglades

IV. Developing an exclusive analysis software for the detection device

V. Modifying existing ledgers based on the analysis result

2 RESULT

✓ The survey found 35 buried objects, 29 of which(about 83%) were buried objects not listed in the existing ledgers



Type	Number of discovered properties	Number of properties on existing ledger	Number of properties unlisted on existing ledger
Water supply	5	5	0
Sewage	3	1	2
Electrical	6	0	6
Communications	0	0	0
Gas	0	0	0
Channel	2	0	2
Unidentified duct	19	0	19
Total	35	6	29

3-1 Specification of Equipment

✓ We decided to use the GPR equipment owned by Bangladesh University of Engineering and Technology (BUET)

Rover photograph	Specifications	
	Manufacturer	GSSI
	Equipment	Model 50400
	Frequency	400 MHz
	Depth of exploration	Approx. 2.5 m (8 ft)

I. Effectively selecting locations for underground detection

- ✓ 13 locations were selected as the buried object exploration sites in the underground transmission cable design section over a total length of about 5 km

- ✓ Consideration for maximizing the cost-effectiveness of the exploration within a limited budget and for the following points:

- ⊖ Area around the Underground substation
- ⊜ Locations where trial pits were originally planned : Original Point of access to the existing buried object
- ⊛ Planned site of manhole(MH) installation

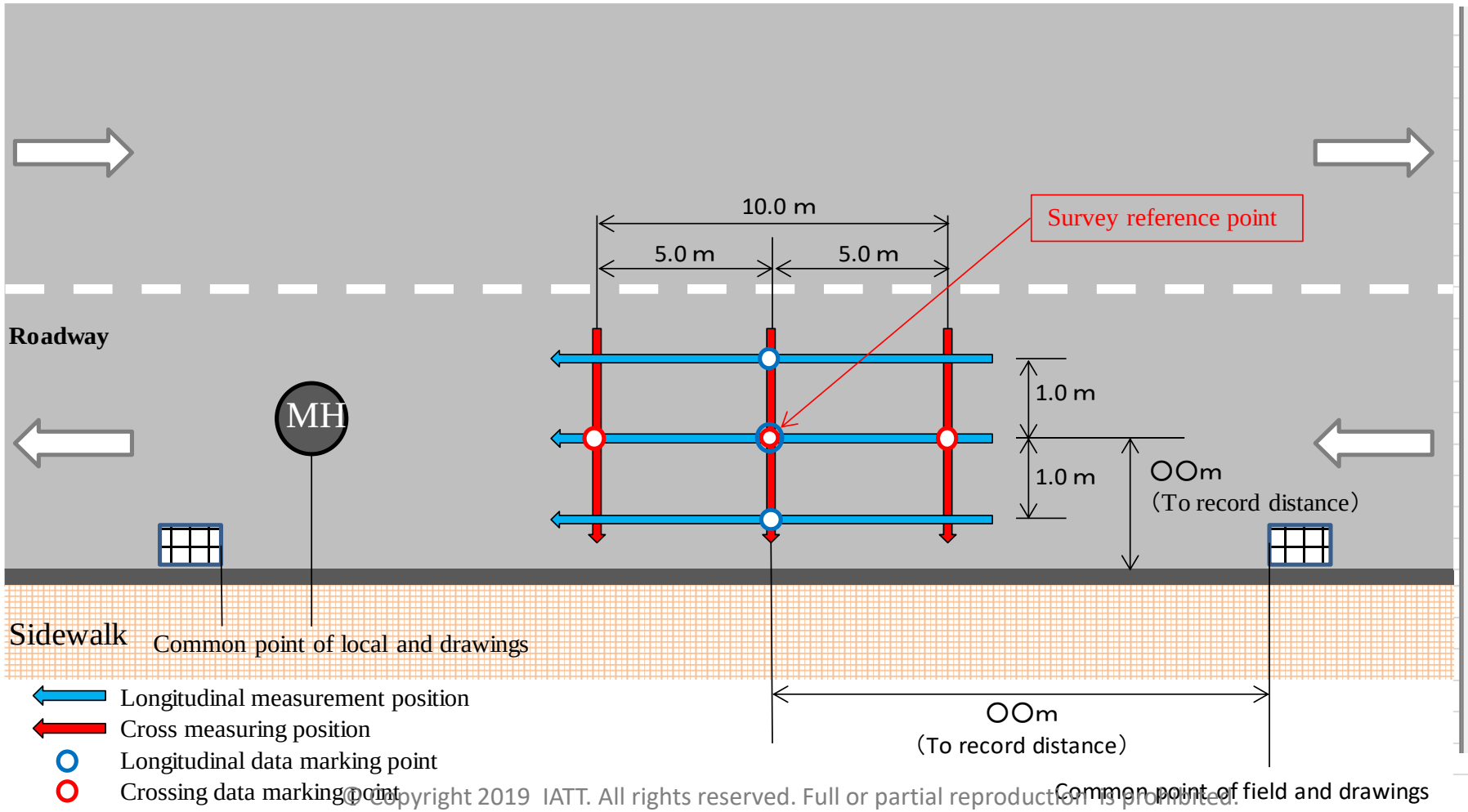
Ⅱ. Building a better reproducible method for detection

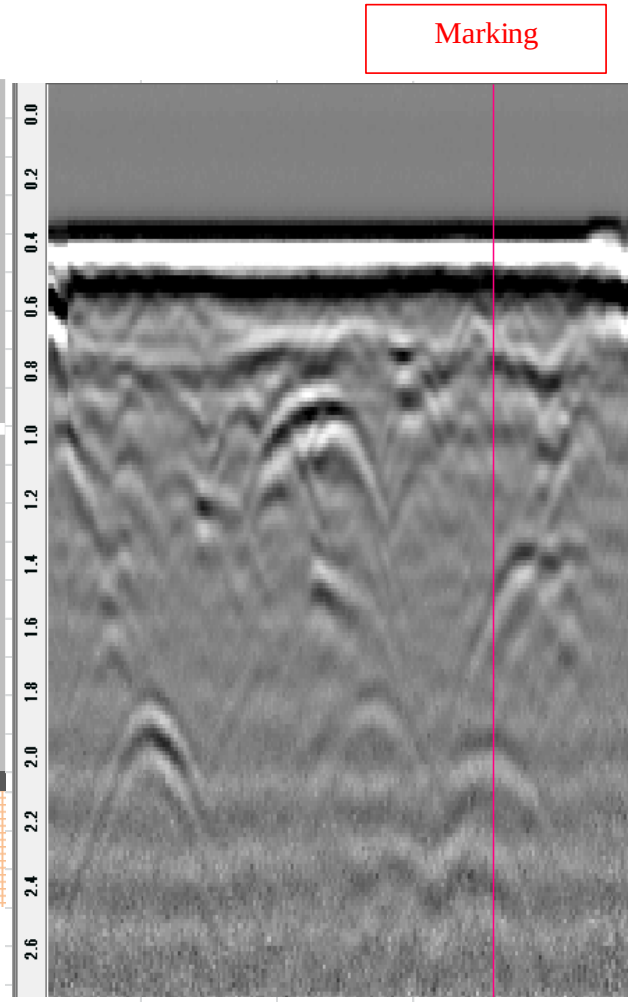
- ✓ The collection of data and operation of GPR equipment were conducted by engineers from BUET. TEPCO and Geo Search provided technical support in areas such as education, measurement methods, and data analysis.

Ⅱ. Building a better reproducible method for detection

4-2 Technology Support and Problem Solution Method

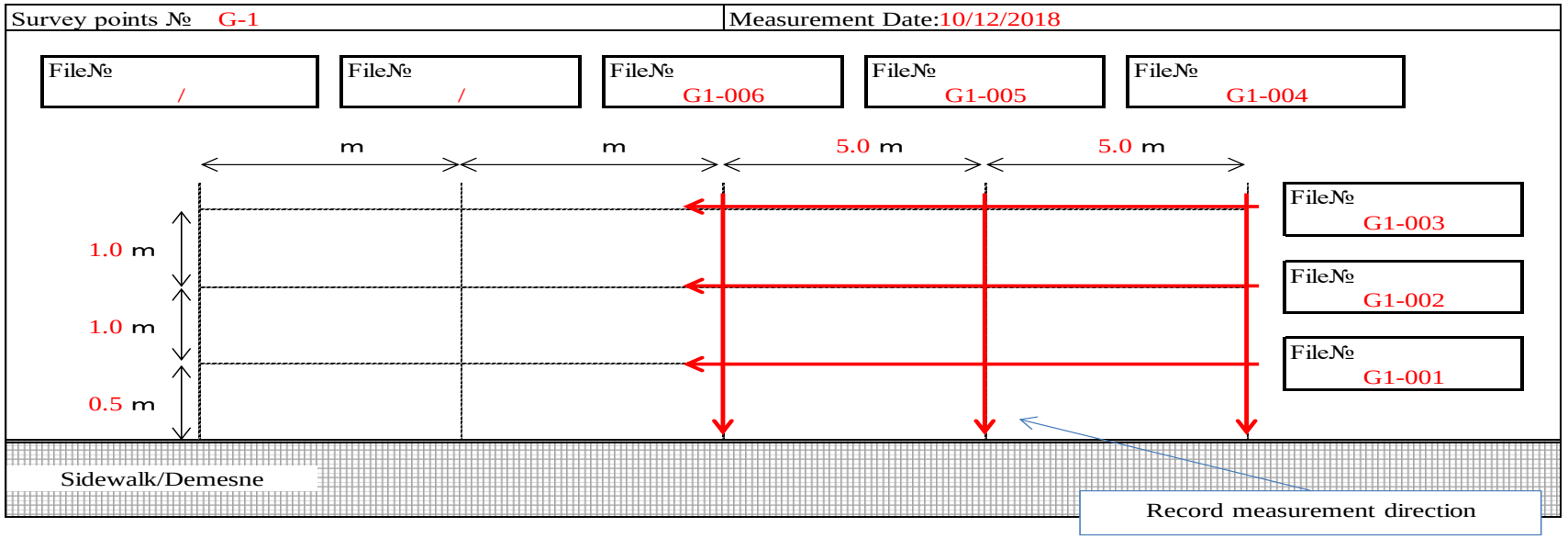
Survey line set : Measurement method





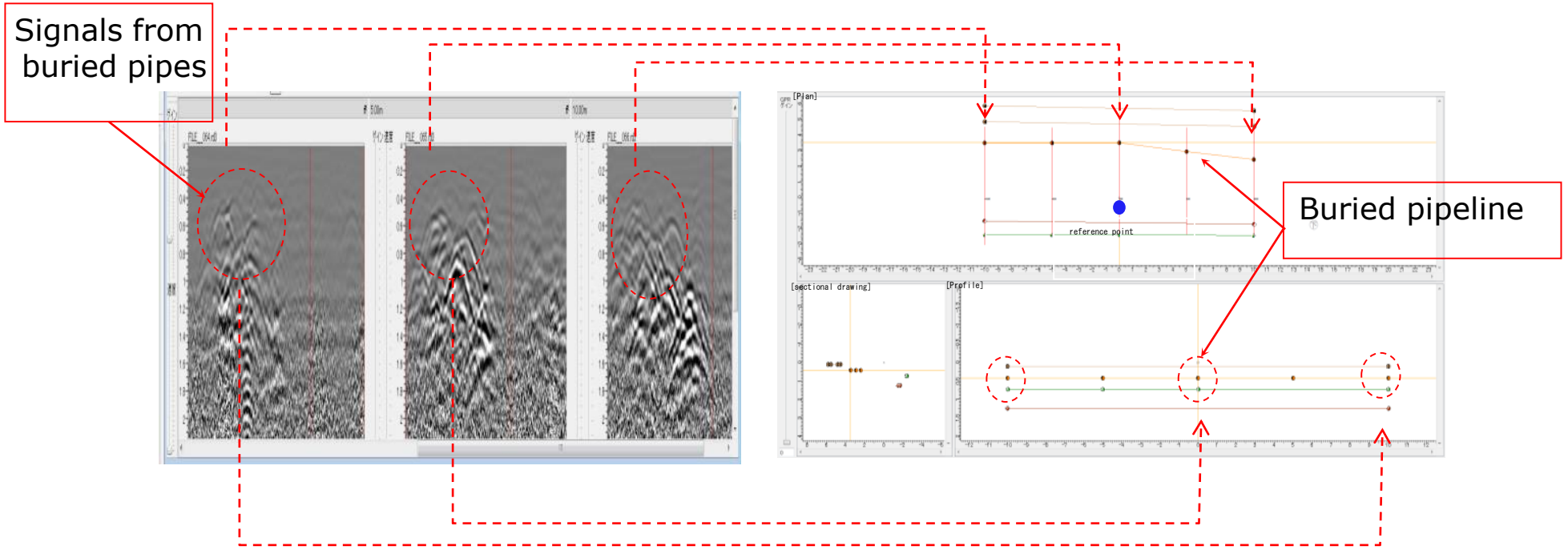
Ⅲ. Planning the recording and management method witch suit for Bangladesh

- ✓ Recording and managing the obtained data are ones of the most important tasks in mapping the results of the investigation. However, no proper management method had been established in Bangladesh.
- ✓ Decided to prepare and provide a measurement recording sheet



Ⅳ. Developing an exclusive analysis software for the detection device

- ✓ the data measured in the form of a mesh was analyzed using special analysis software developed by Geo Search.

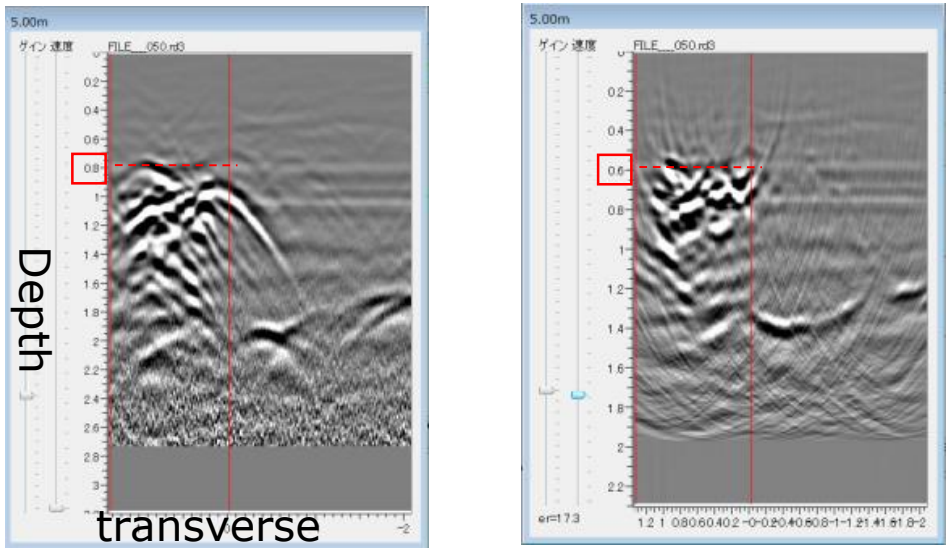


Ⅳ. Developing an exclusive analysis software for the detection device

- ✓ The GPR image is subjected to a migration process as shown in Figure , to estimate the relative permittivity of the soil on the upper part of the reflector. Then, the accuracy of the depth could be improved.

[raw data]

- ✓ Dielectric constant: 10
- ✓ Depth: 0.8 m



[processing data]

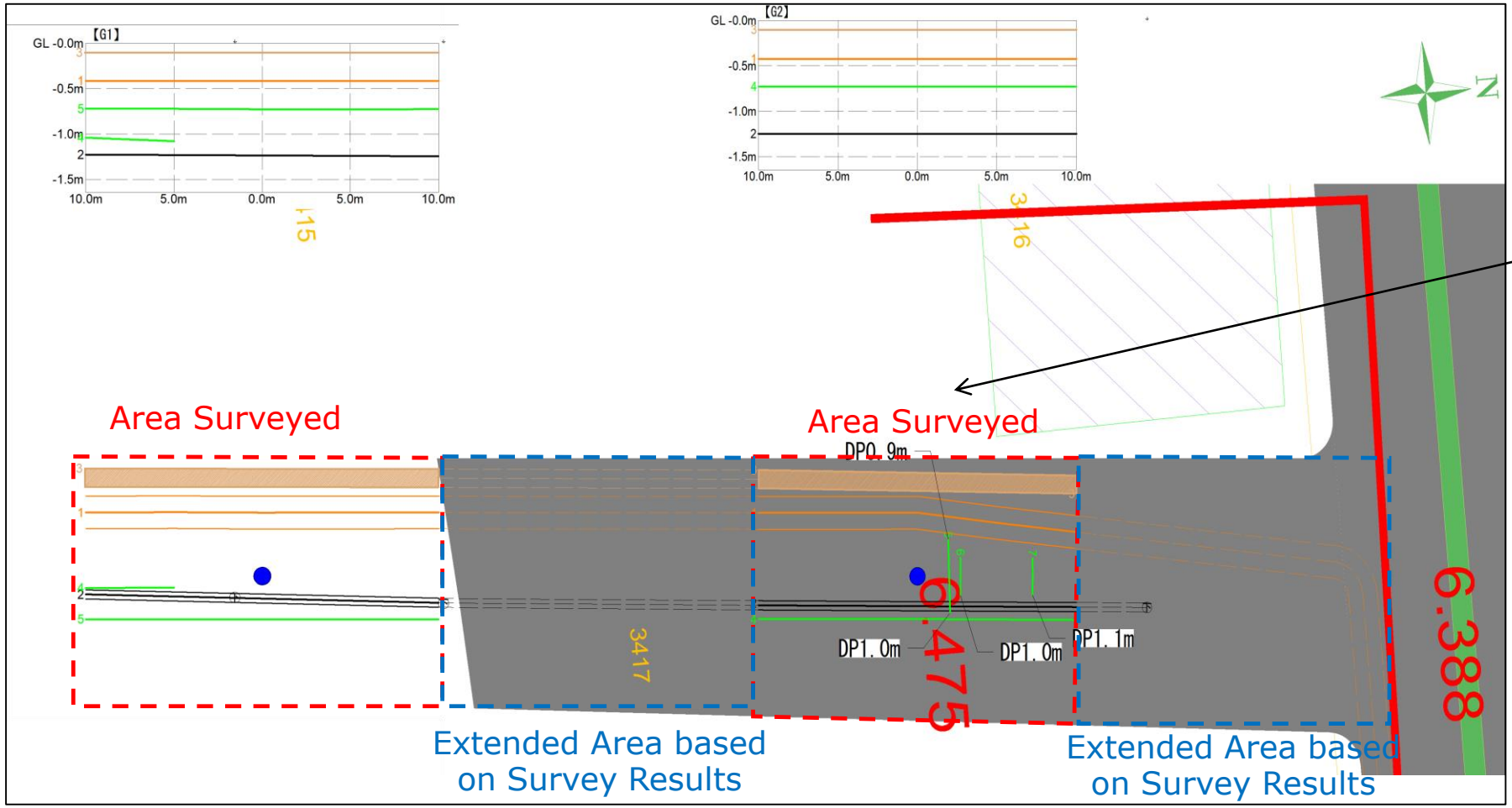
- ✓ Dielectric constant: 17.3
- ✓ Depth: 0.6 m

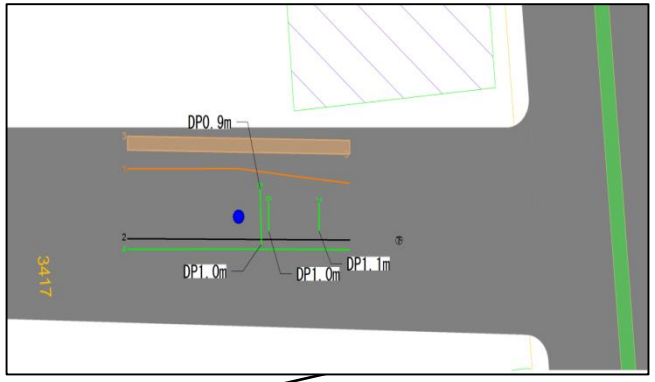
Migration process example

Ⅴ. Modifying existing ledgers based on the analysis result

- ✓ Differences between the burial location information obtained from the analysis results and that of existing ledgers
- ✓ Also the additional burial information not included in existing ledgers
- ✓ The original ledgers were modified based on the above findings and improved

4-4 Technology Support and Problem Solution Method





Legend	
●	Reference point
━	Sewage
━	Electrical
▭	Channel
━	Unidentified duct

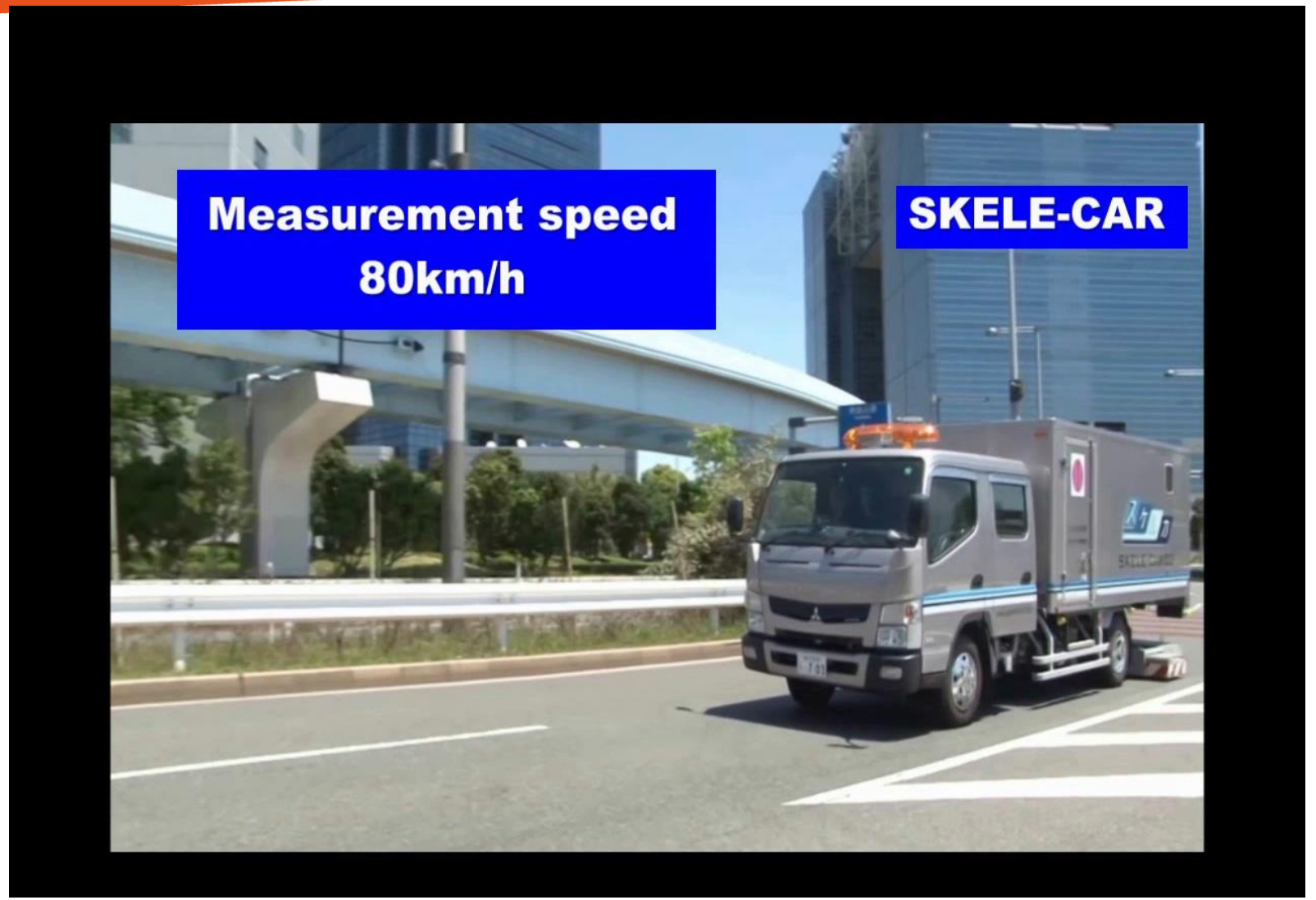
Dotted line :
Estimated line based on survey results

5-1 Further challenges

✓ Promote a more smooth and safety

- Most effective way to refine buried object location information is through a "3D ground-and-underground infrastructure map"
- Which is the latest technology in Japan, and integrates 3D information on the ground in addition to 3D information on underground objects.

5-1 Further challenges



5-1 Further challenges

✓ **The features of 3D ground-and-underground infrastructure maps include**

⊖ High-density data acquisition that turns underground information 3D

⊜ Accuracy of detection of error in buried position to approx. ±10 cm

⊛ Integrated ground and underground data improving field reproducibility

④ Visualization of the burial situation in three dimensions

⑤ Measurements of distance, angle, height, and depth

⑥ Easy for Construction simulation

⑦ Ability to update and manage information on buried objects after the completion of construction

6 Conclusion

✓ Useful information can be given to the following designing and construction project under the circumstance in Bangladesh

I. The use of GPR technology to refine the location information of buried objects is expected to be effective in promoting safe and smooth underground construction projects

II. Development of engineers and non-destructive exploration technologies in Bangladesh were successful

III. The 3D map to be updated based on the following activities will contribute to advanced infrastructure management

IV. Utilizing detailed underground 3D data will also enable the expansion of the application range of the pipe jacking method.

✓ **The productivity of construction and civil engineering will be improved consequently**.

CONTACT INFORMATION

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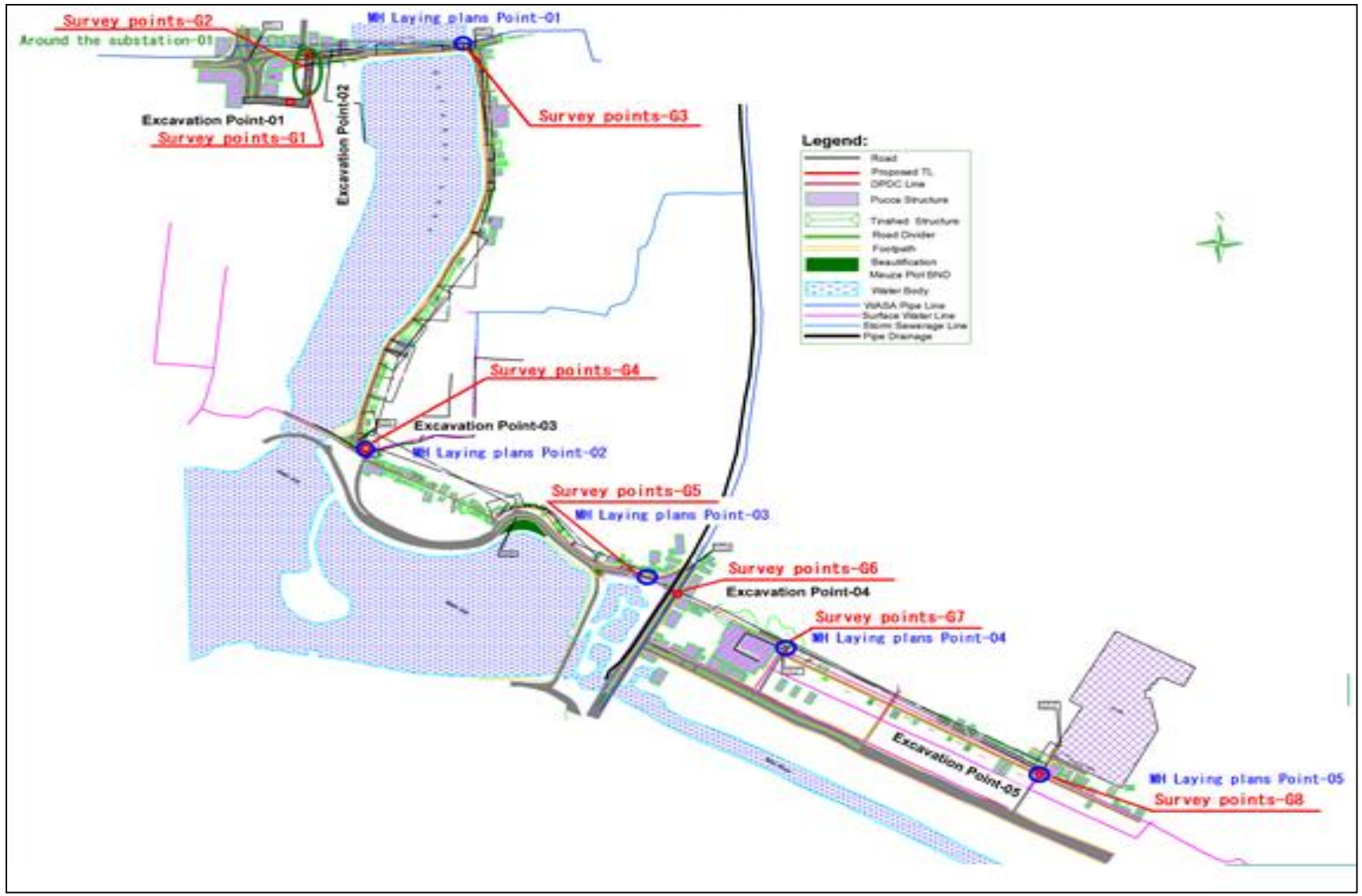
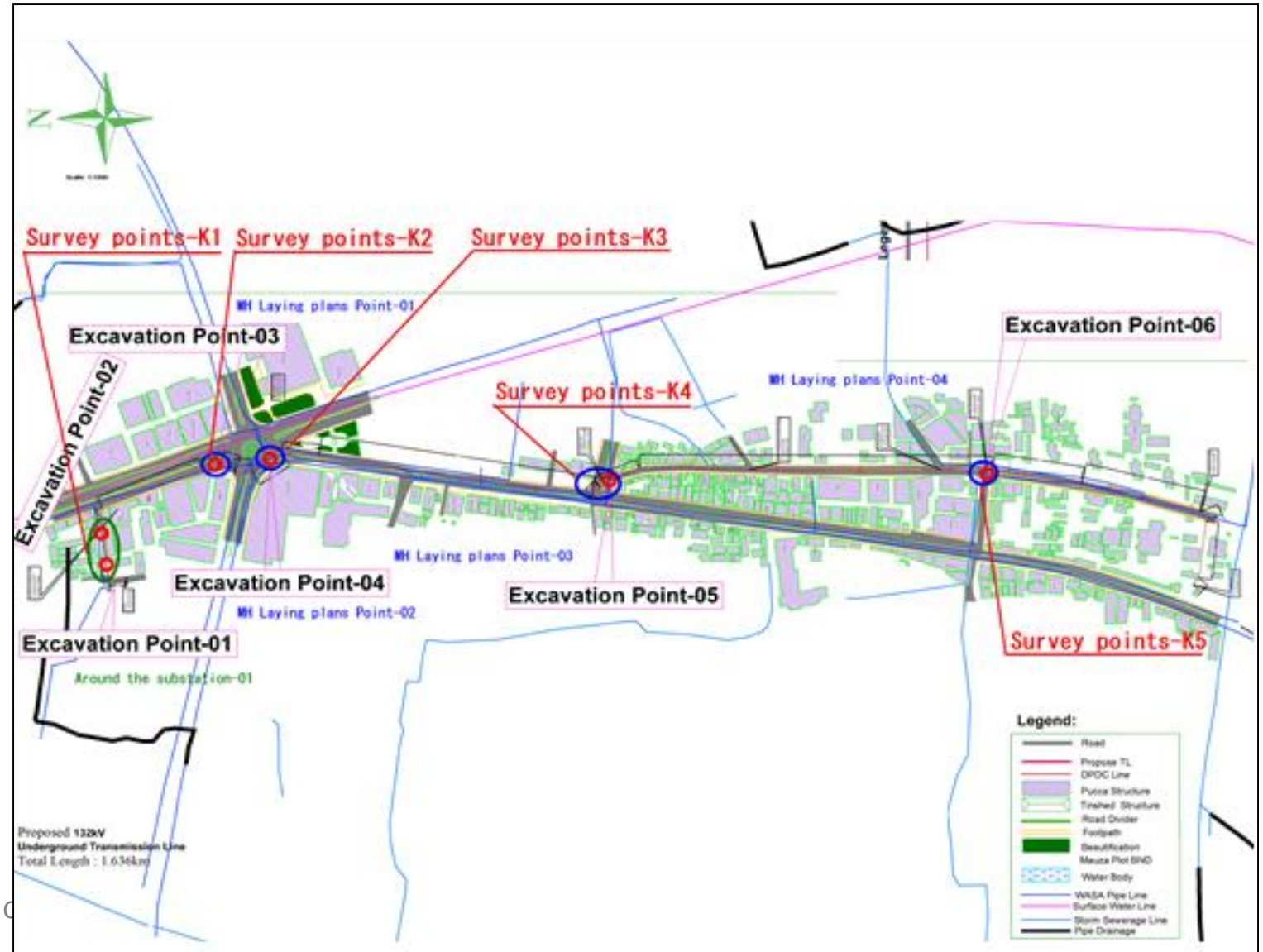
Appendix


Survey points-G2
Around the substation-01
MH Laying plans Point-01
Excavation Point-01
Survey points-G1
Excavation Point-02
Survey points-G3
Legend:
Road
Proposed TL
DPDC Line
Pucca Structure
Tinshed Structure
Road Divider
Footpath
Beautification
Mauza Plot SNO
Water Body
WASA Pipe Line
Surface Water Line
Storm Sewerage Line
Pipe Drainage
Survey points-G4
Excavation Point-03
MH Laying plans Point-02
Survey points-G5
MH Laying plans Point-03
Survey points-G6
Excavation Point-04
Survey points-G7
MH Laying plans Point-04
Excavation Point-05
MH Laying plans Point-05
Survey points-G8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Survey points-K3
Survey points-K4
Survey points-K5
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Around the substation-01
Proposed 132kV
Underground Transmission Line
Total Length : 1.636km
Legend:
Road
Propose TL
DPDC Line
Pucca Structure
Tinshed Structure
Road Divider
Footpath
Beautification
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