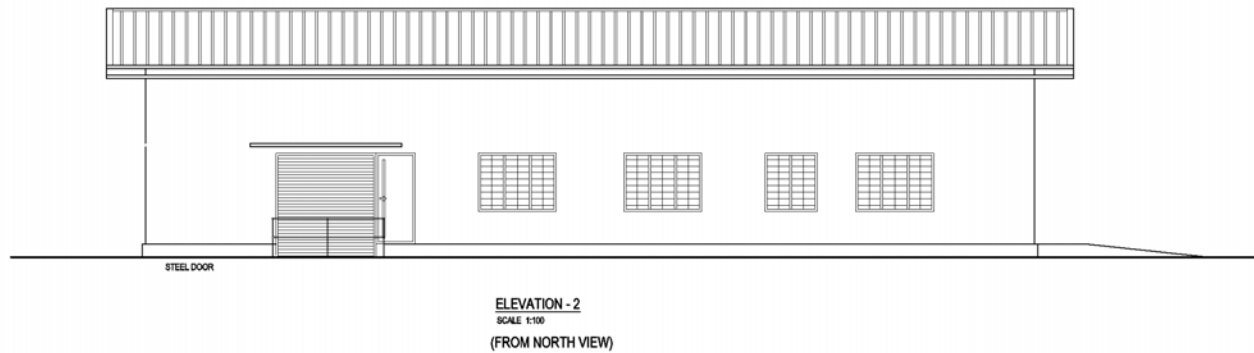
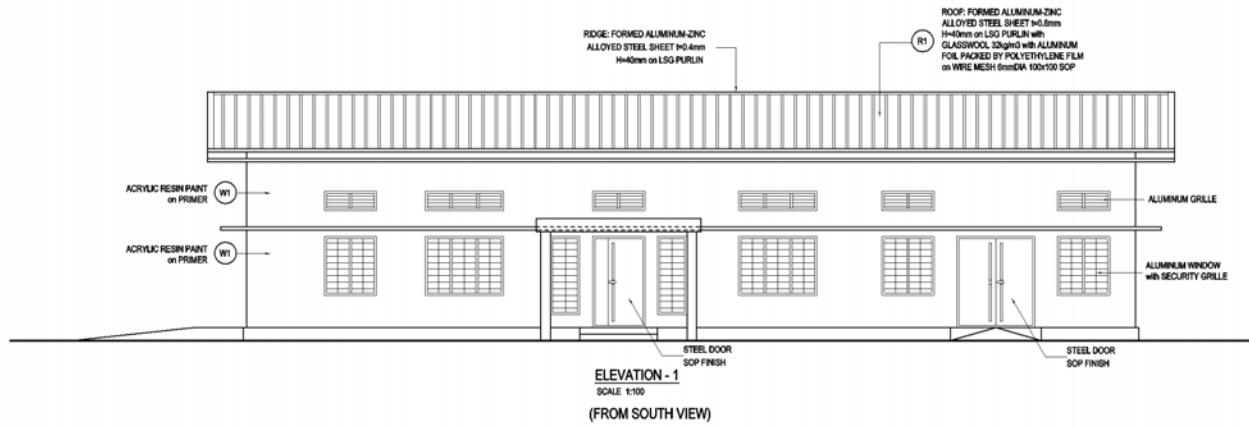
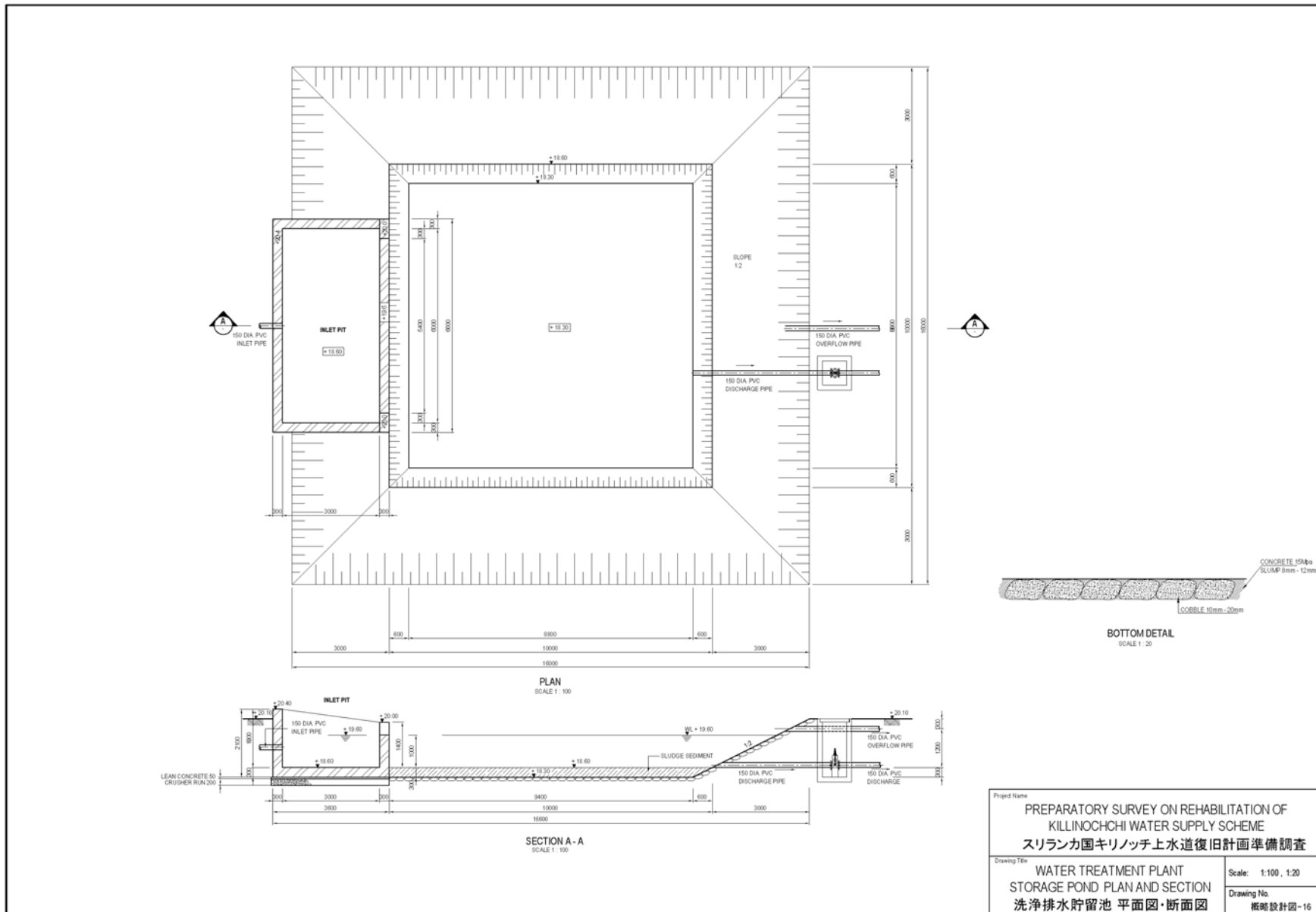
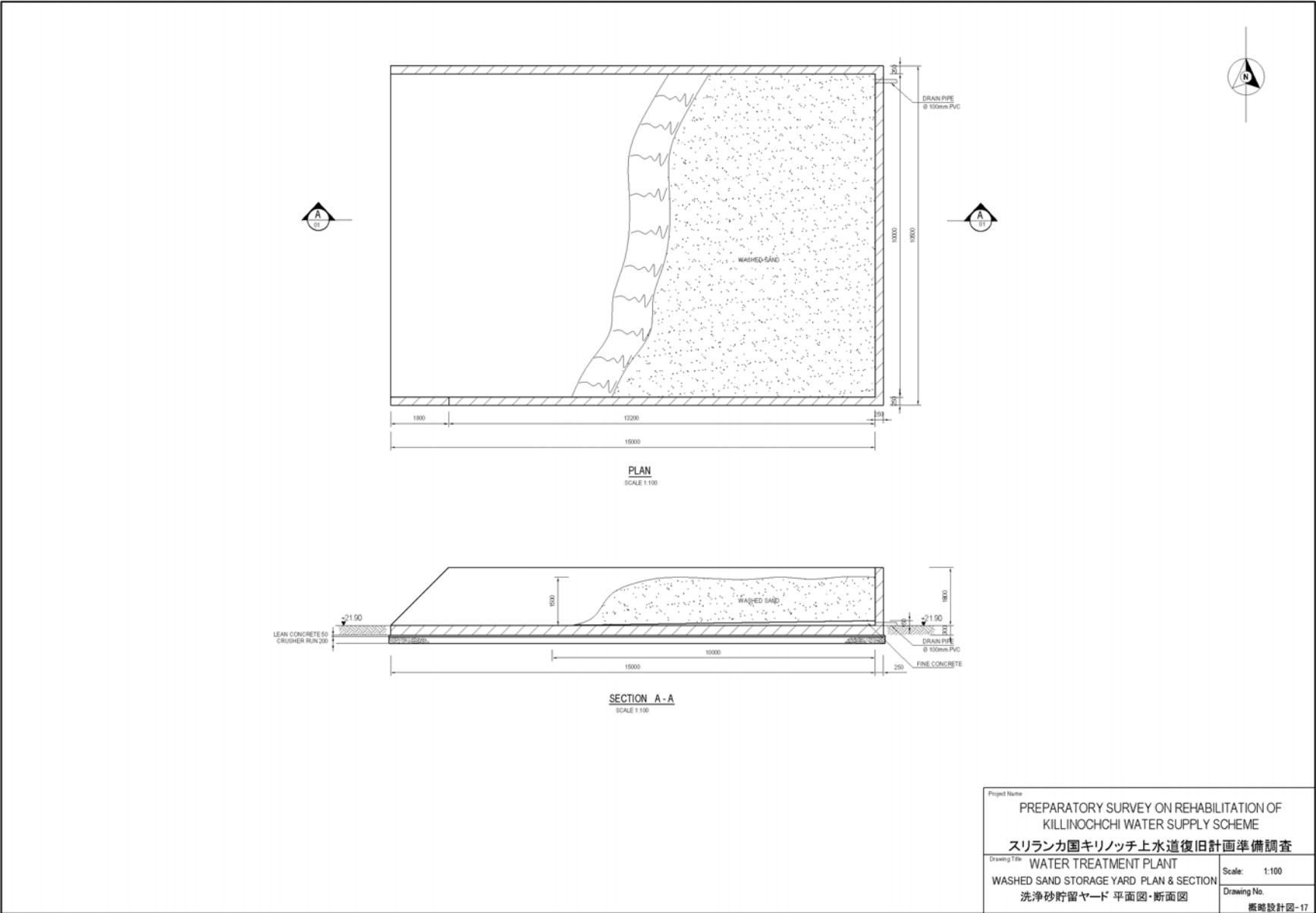


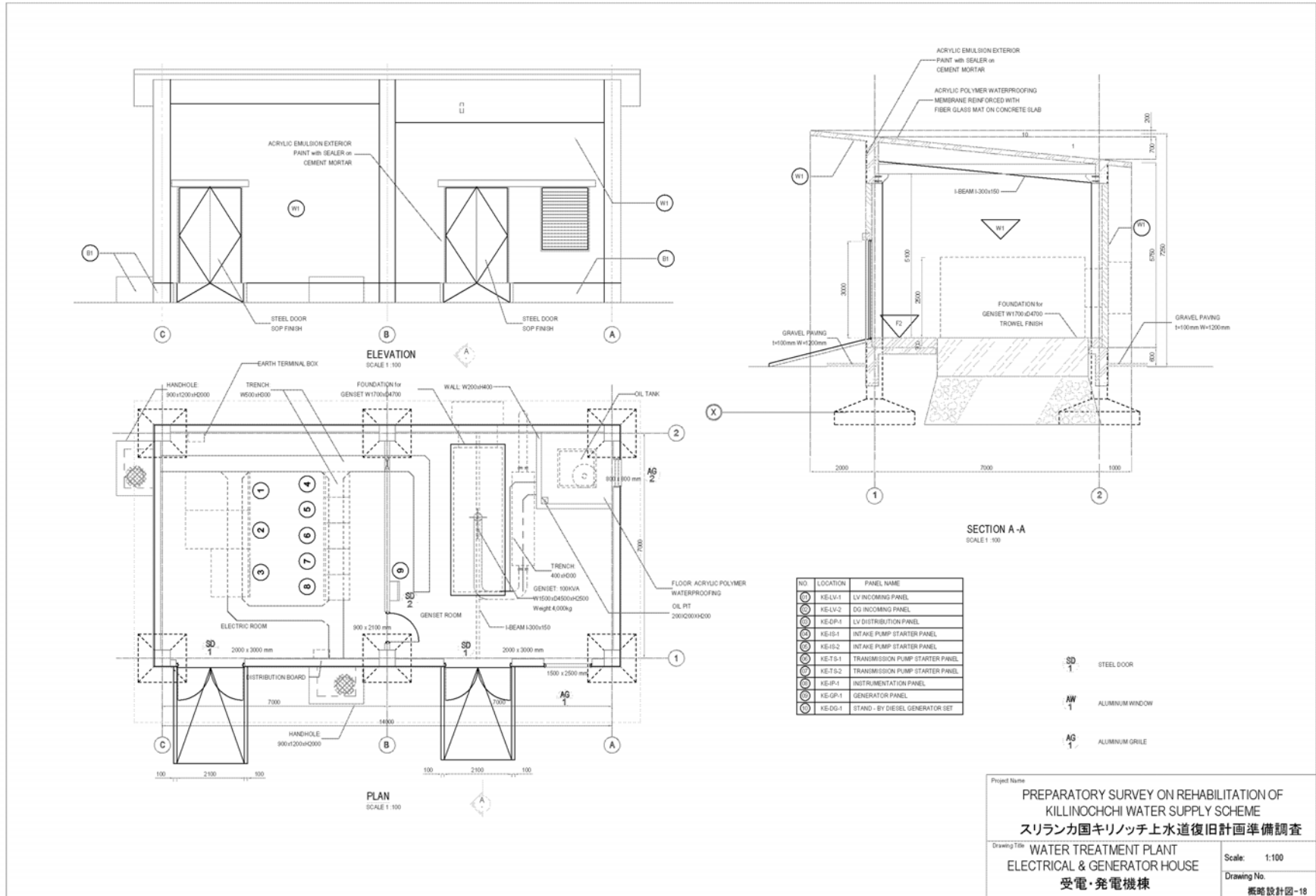
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Drawing Title WATER TREATMENT PLANT ADMINISTRATION BUILDING / CLEAR WATER RESERVOIR - PLAN 管理棟・浄水池 平面図	Scale: 1:100 Drawing No. 概略設計図-14

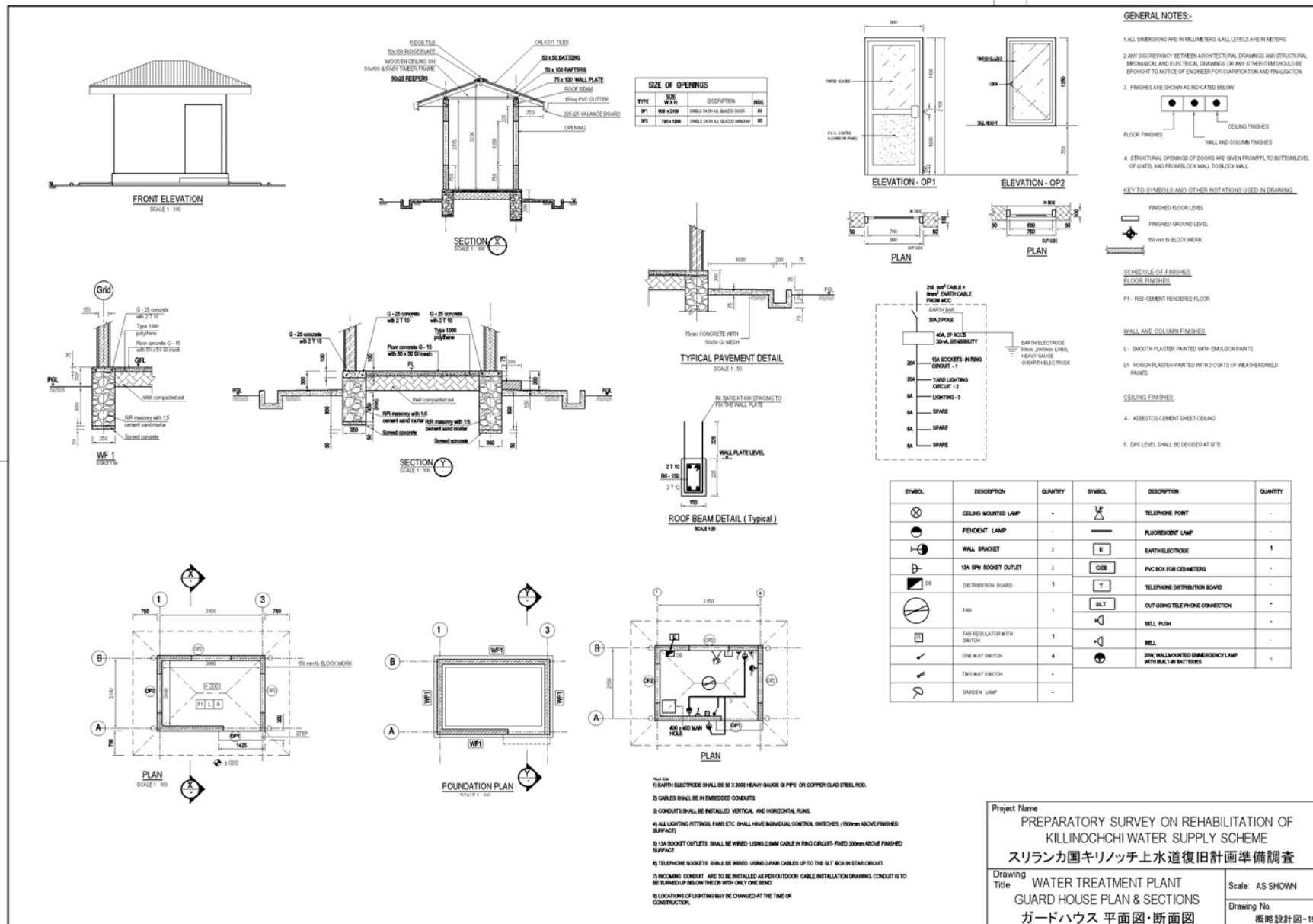


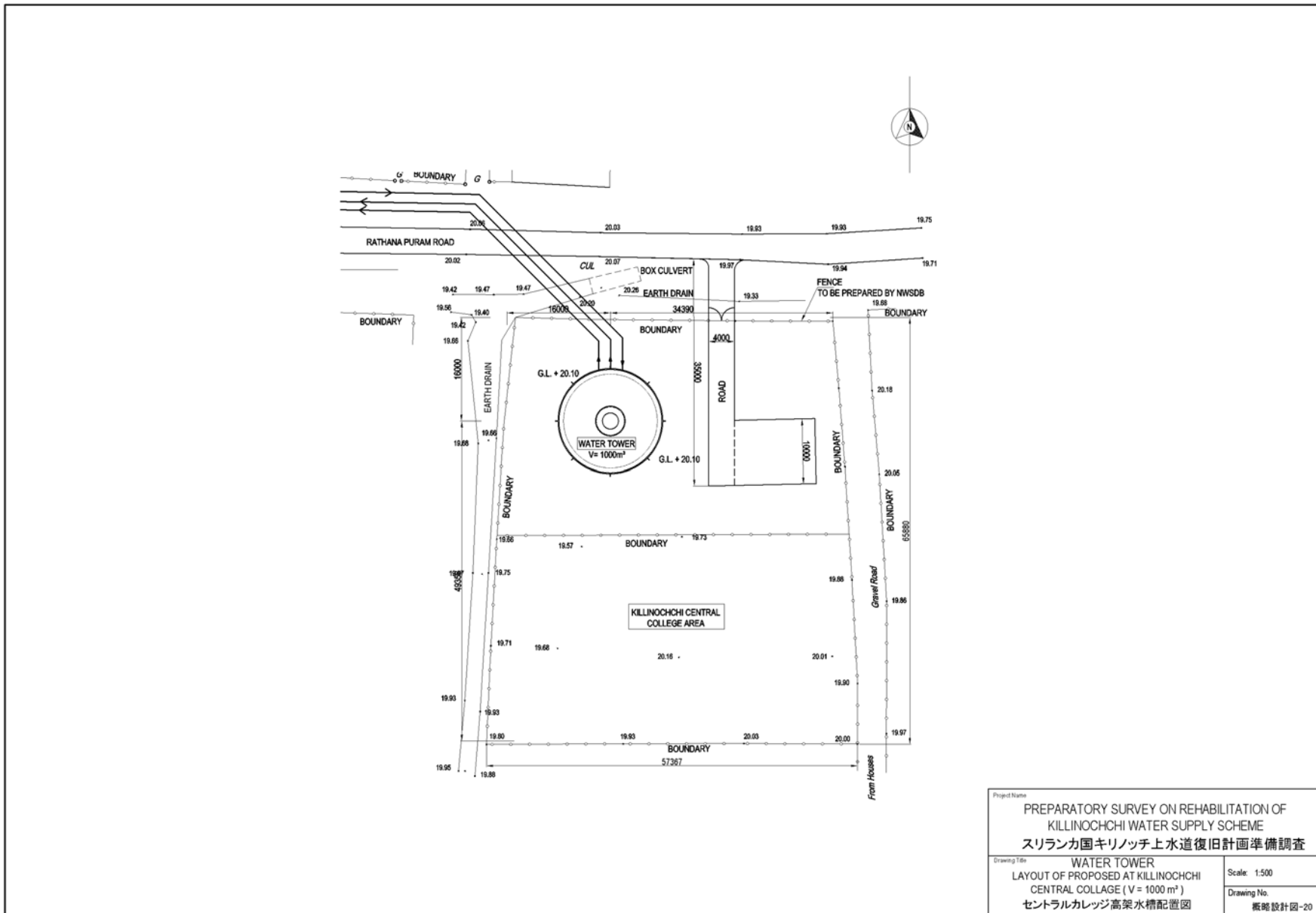
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Drawing Title	Scale: 1:100
WATER TREATMENT PLANT ADMINISTRATION BUILDING / CLEAR WATER RESERVOIR - ELEVATIONS 1 管理棟・浄水池 断面図	Drawing No. 概略設計図-15

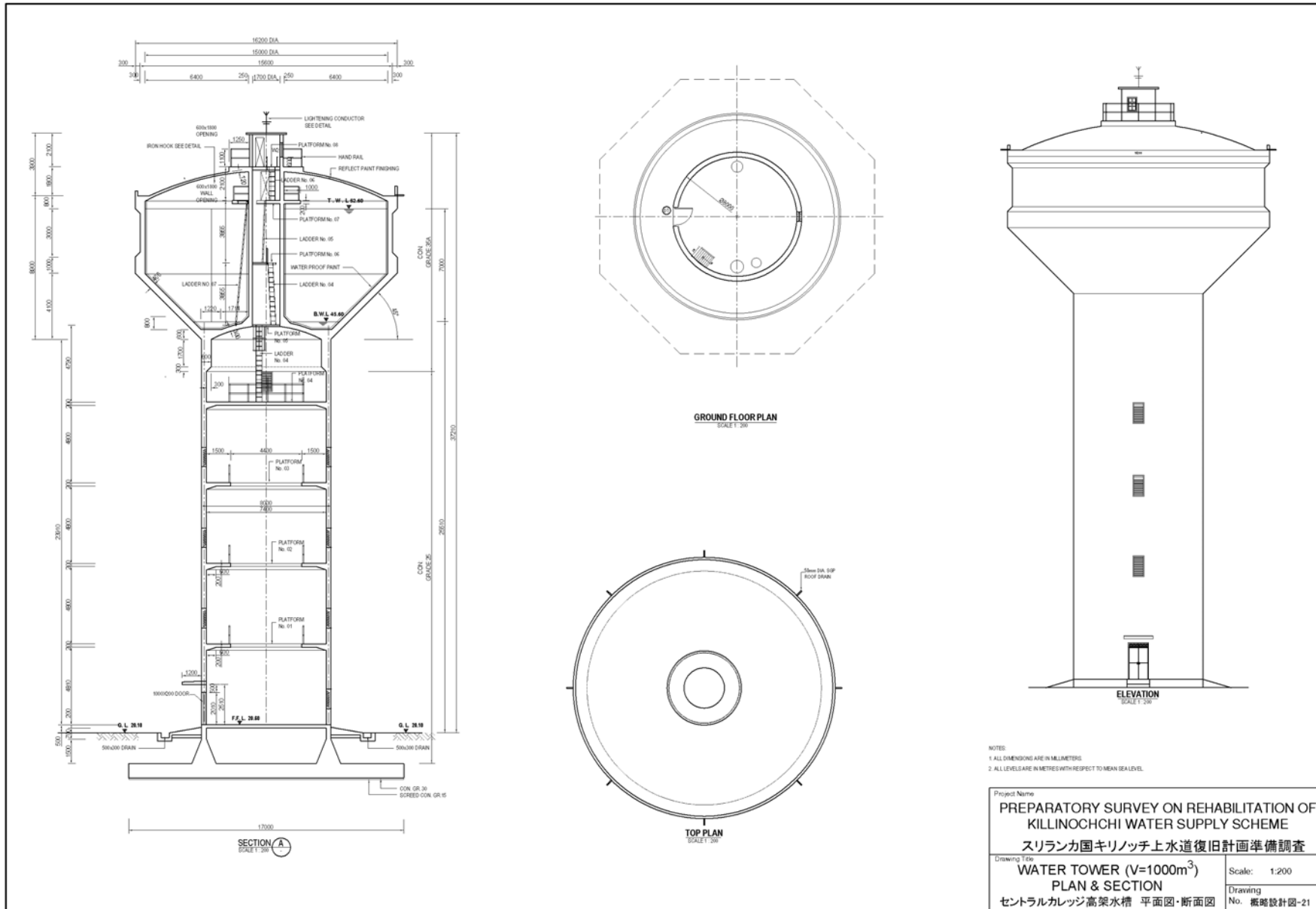


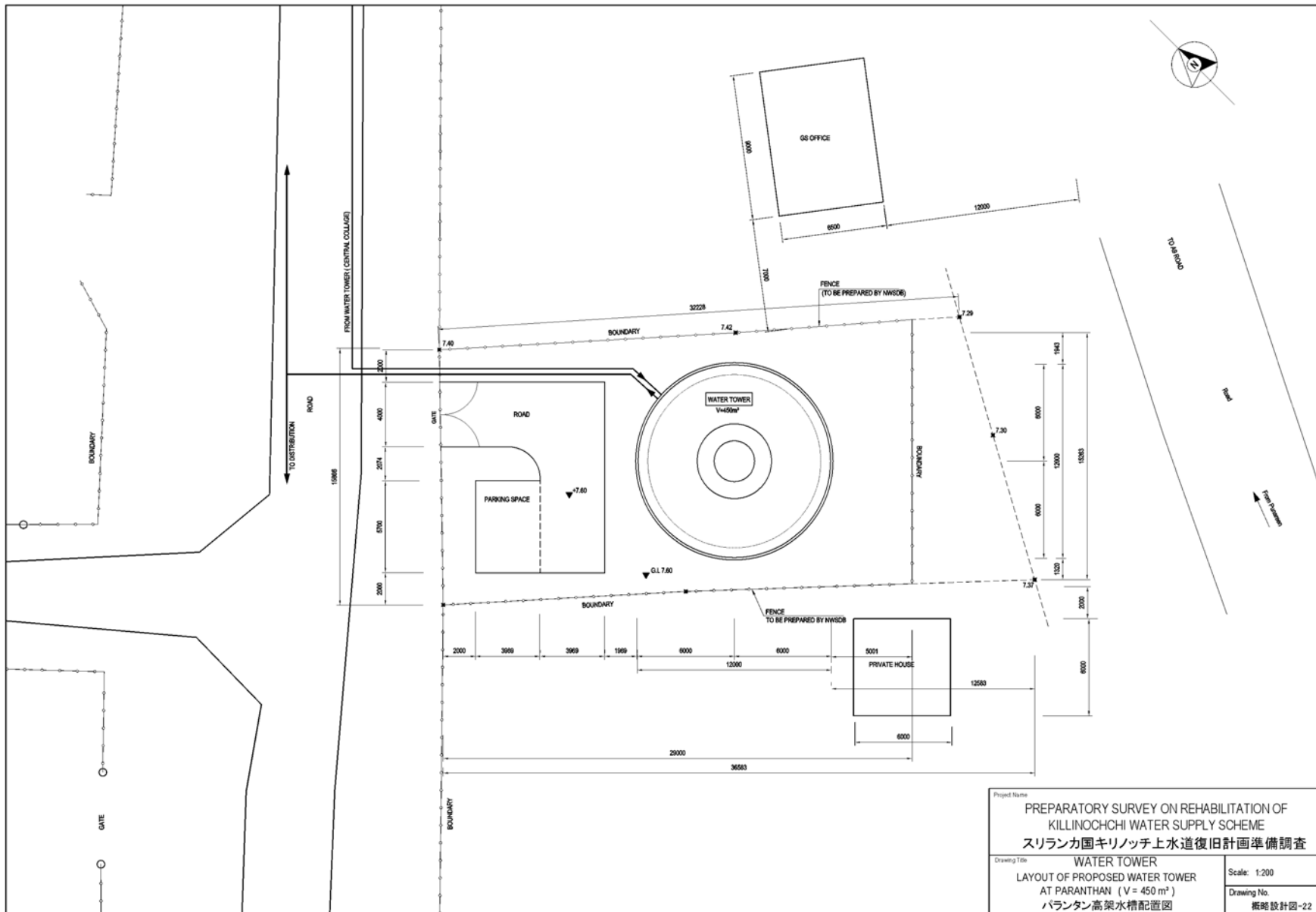


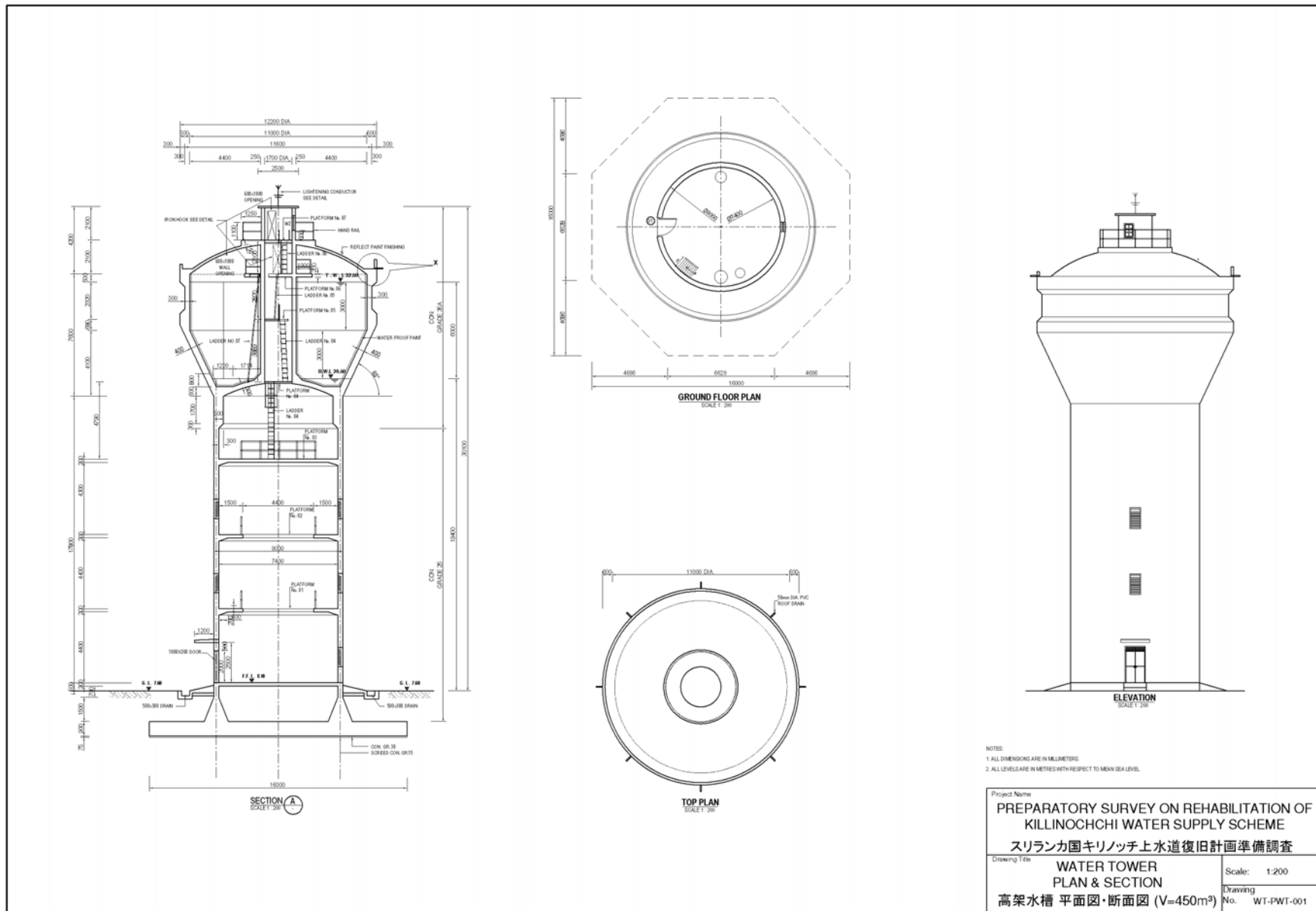


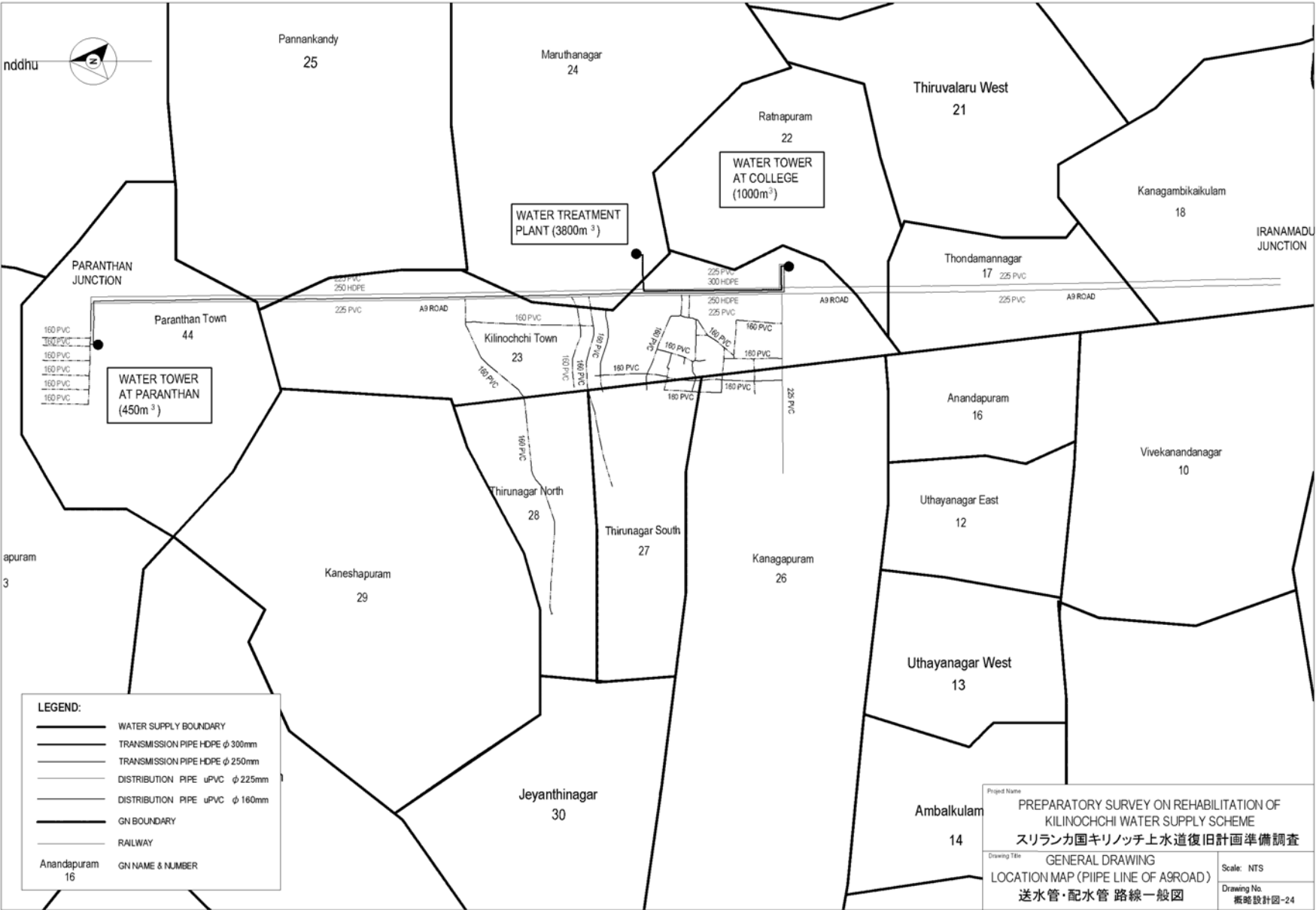


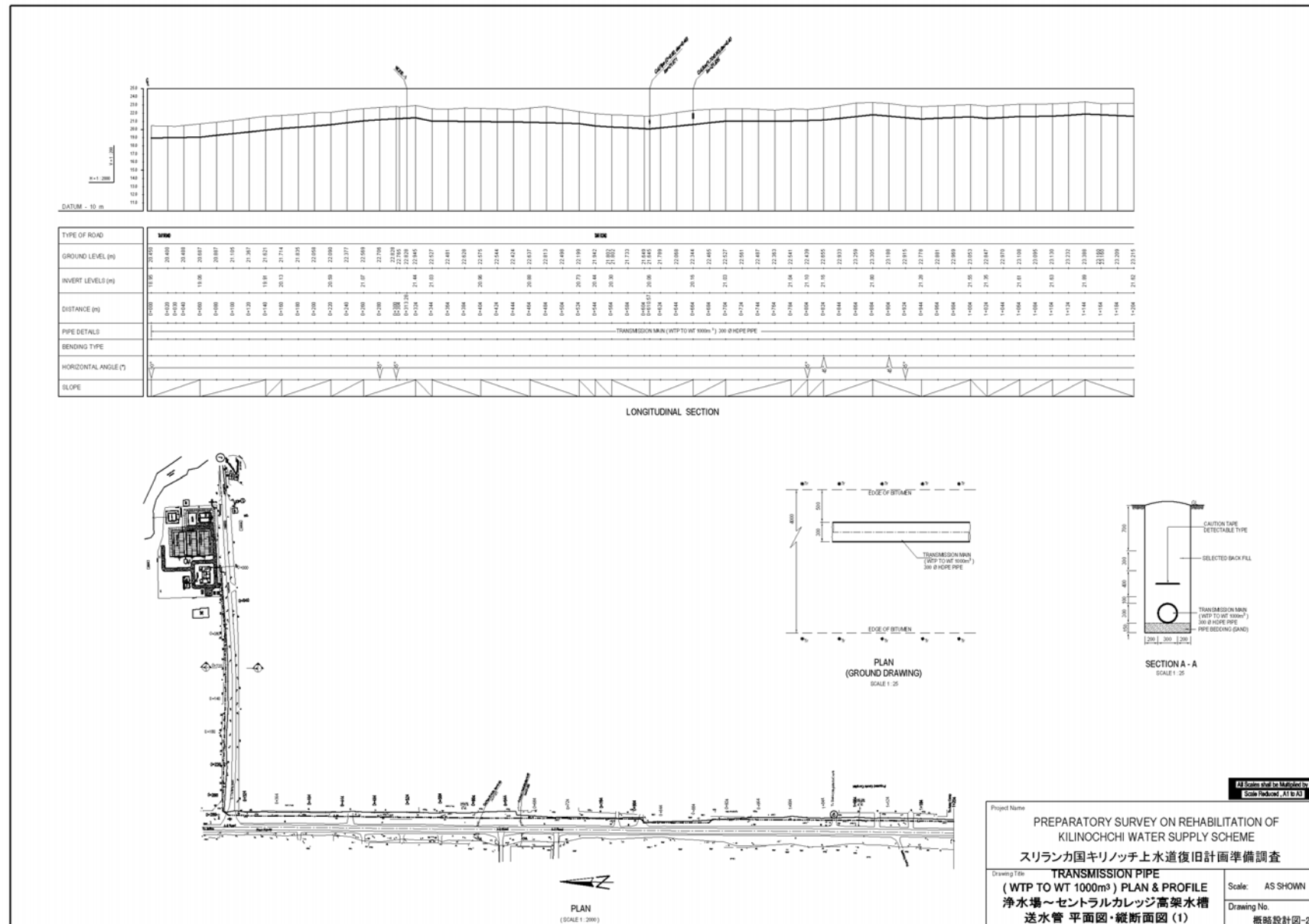










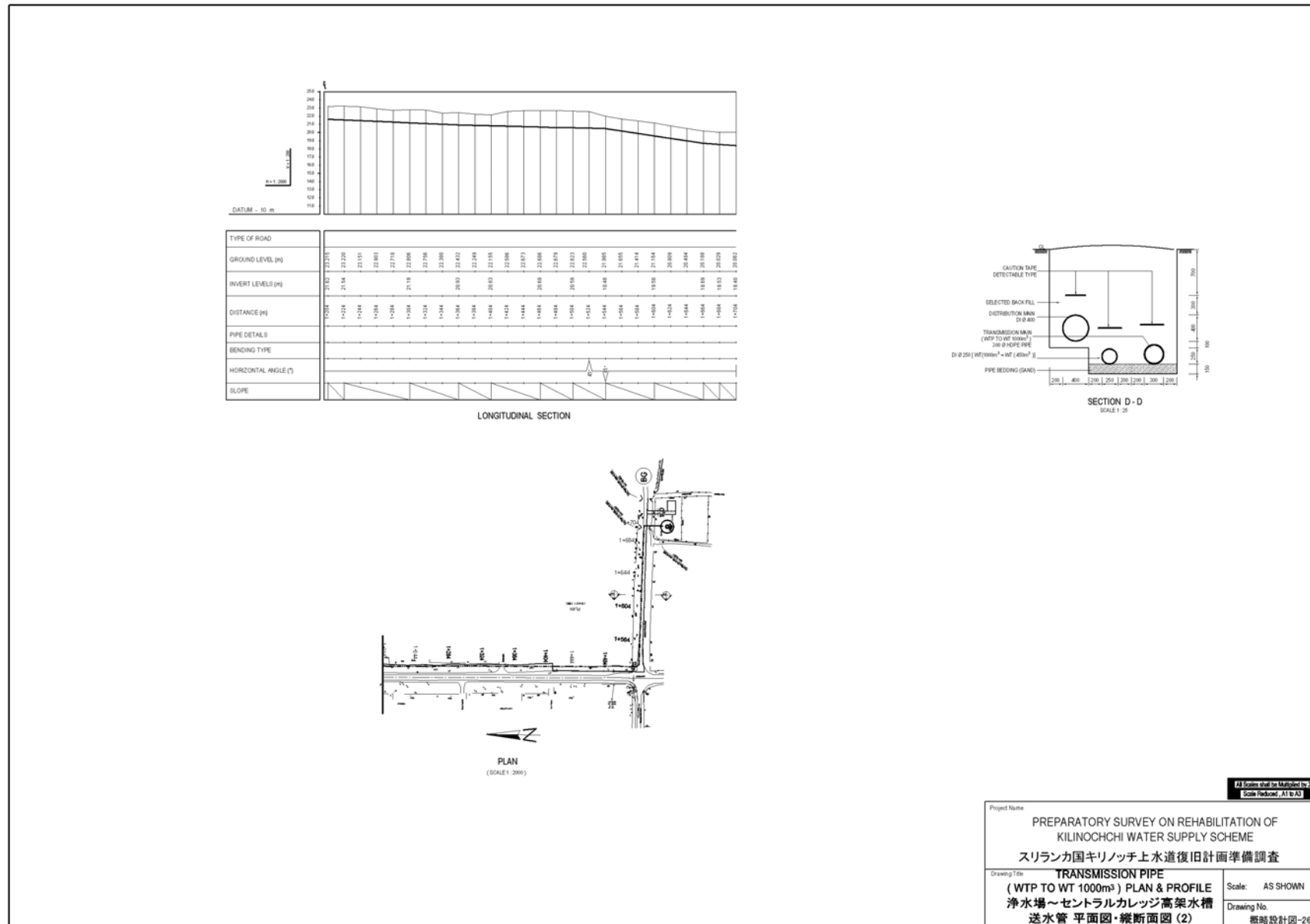


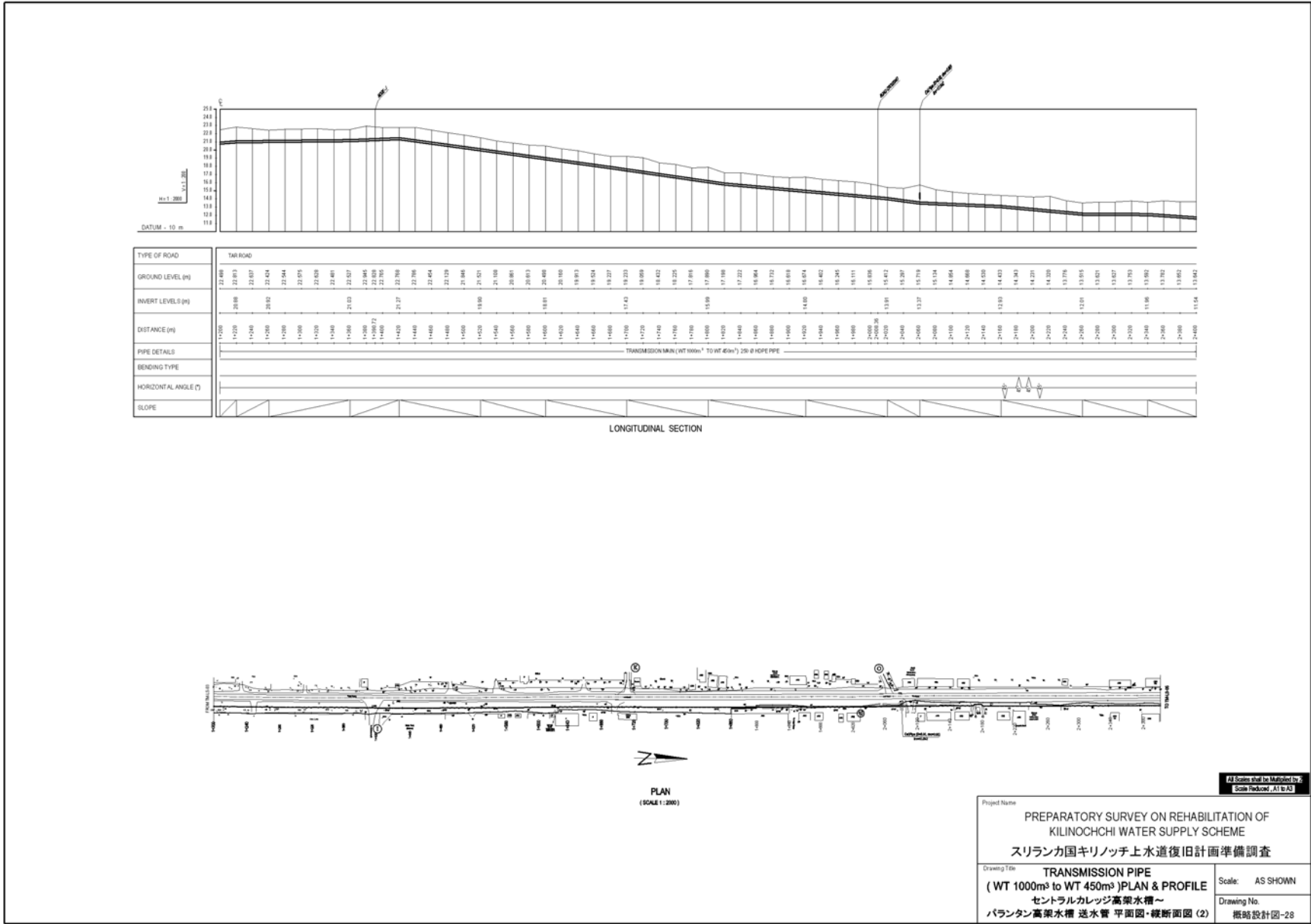
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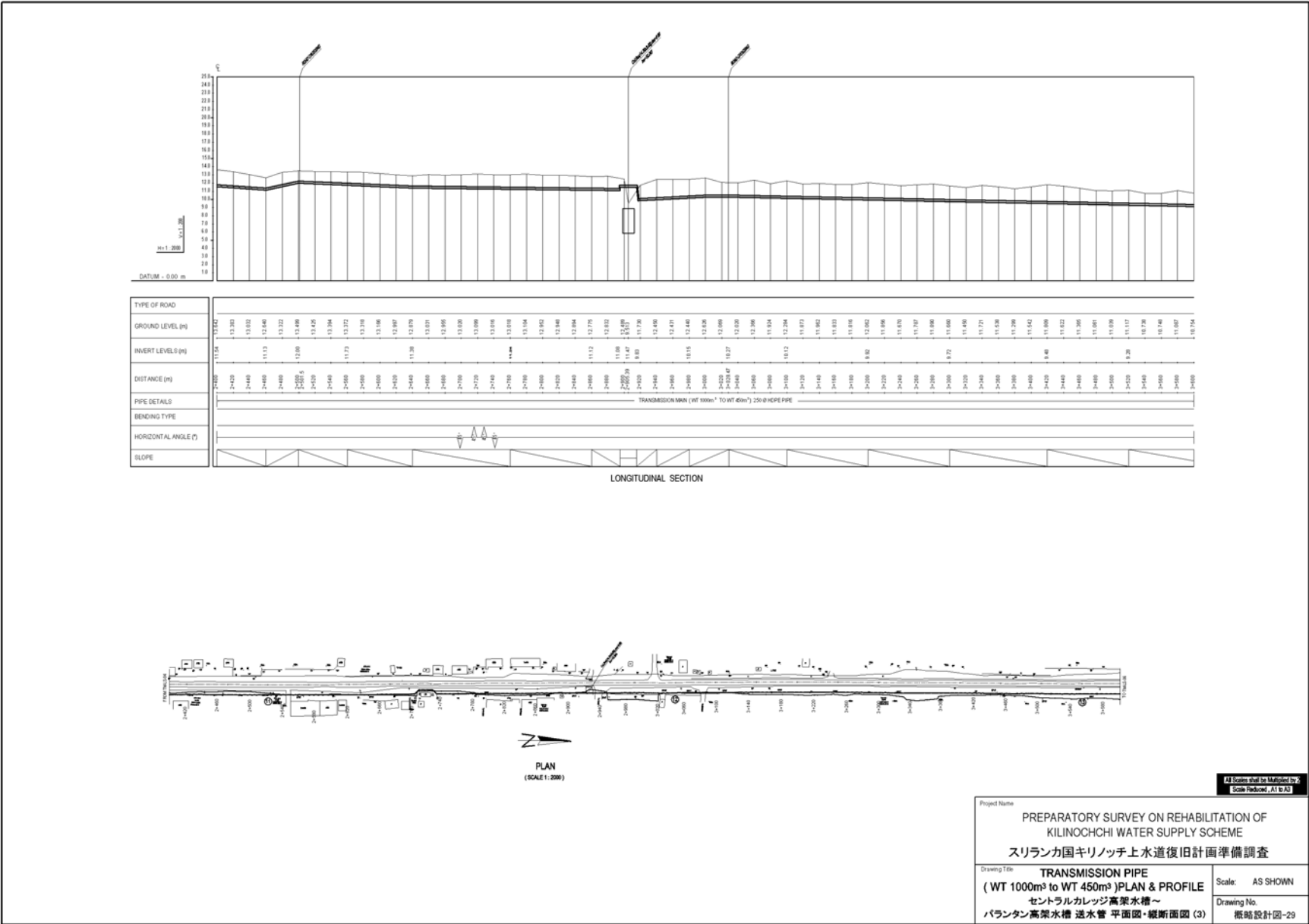
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スリランカ国キリノッチ水道復旧計画準備調査

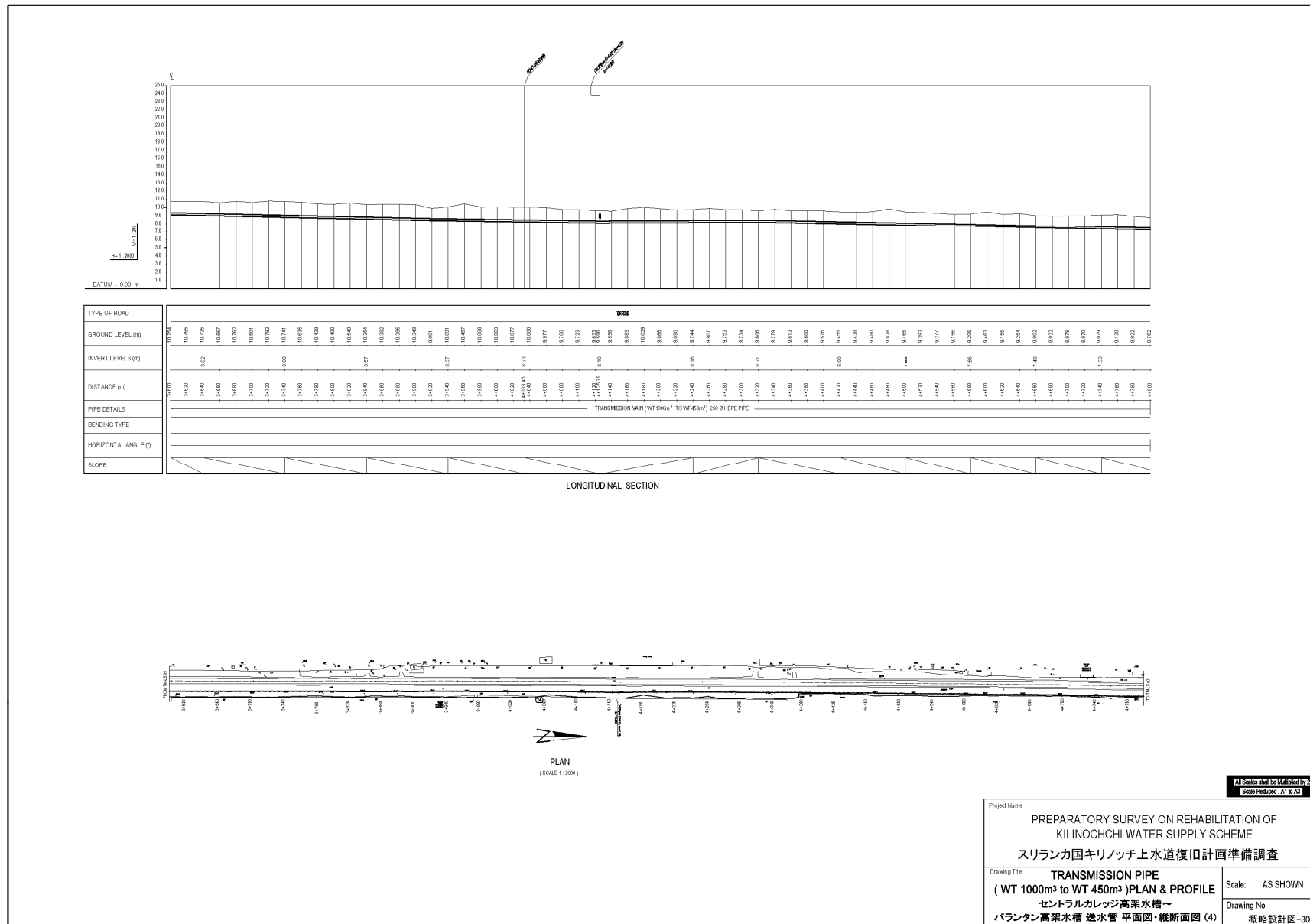
Drawing Title
TRANSMISSION PIPE (WTP TO WT 1000m³) PLAN & PROFILE
浄水場～セントラルカレッジ高架水槽 送水管 平面図・縦断面図 (1)

Scale: AS SHOWN
Drawing No. 概略設計図-25



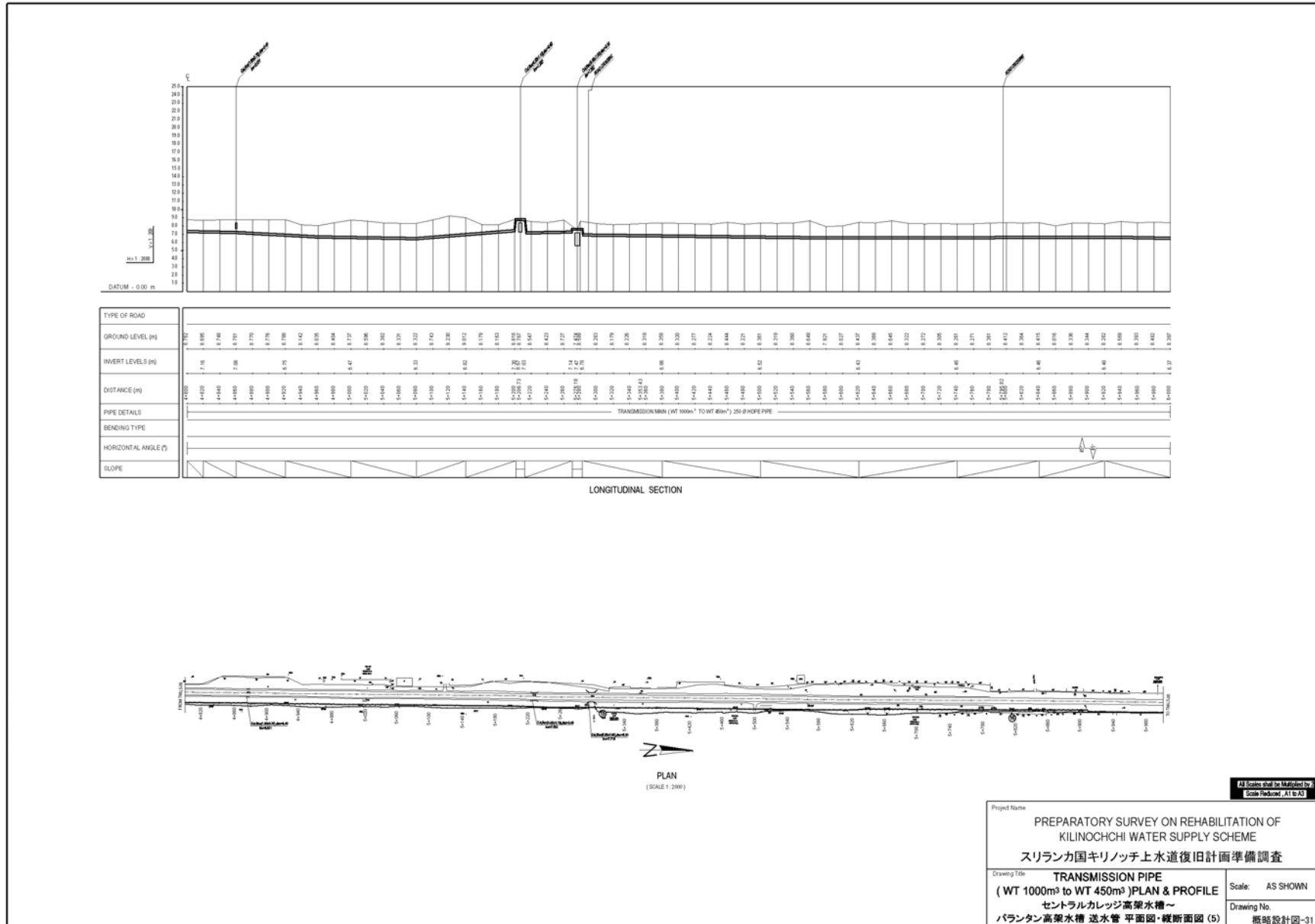


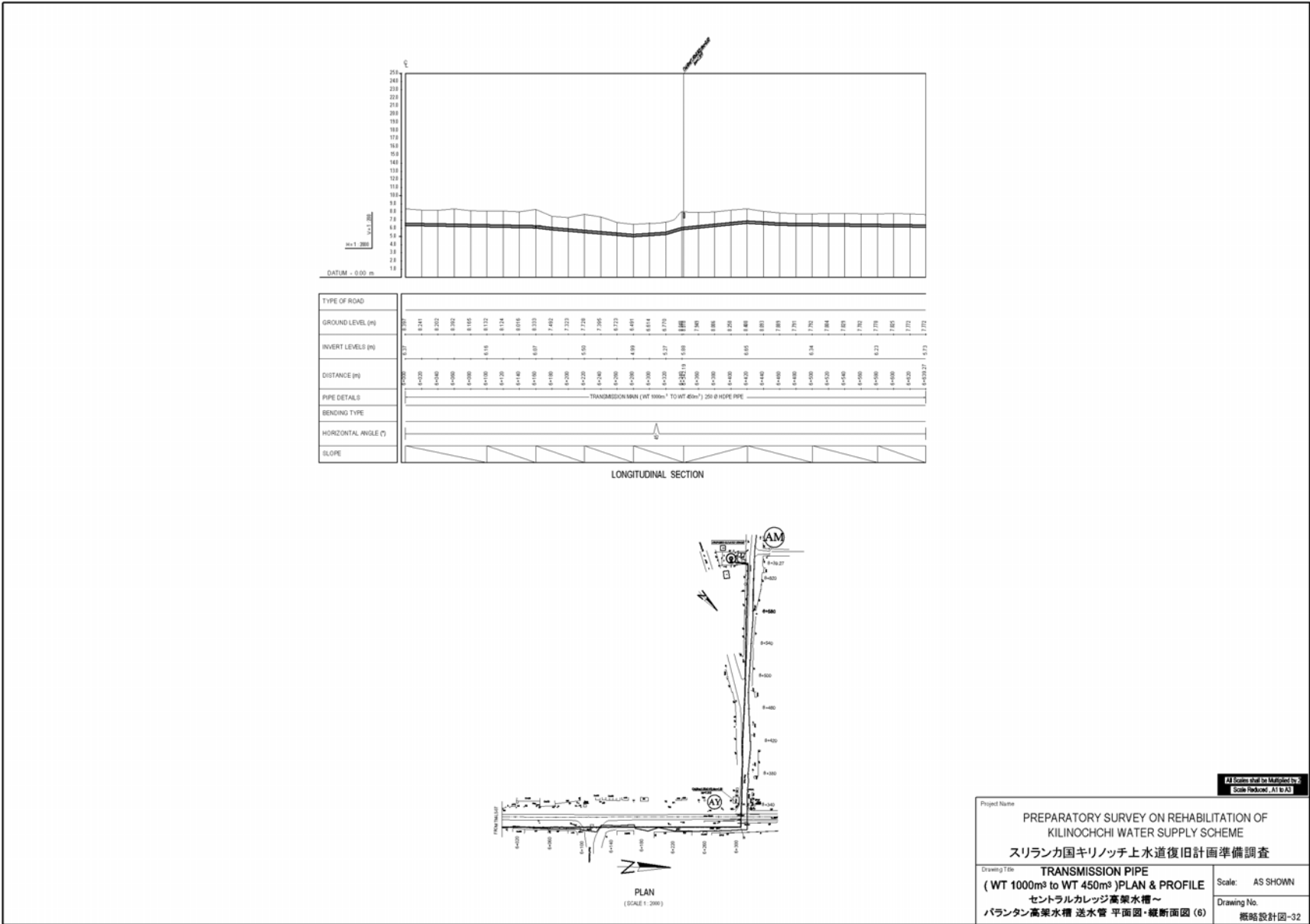


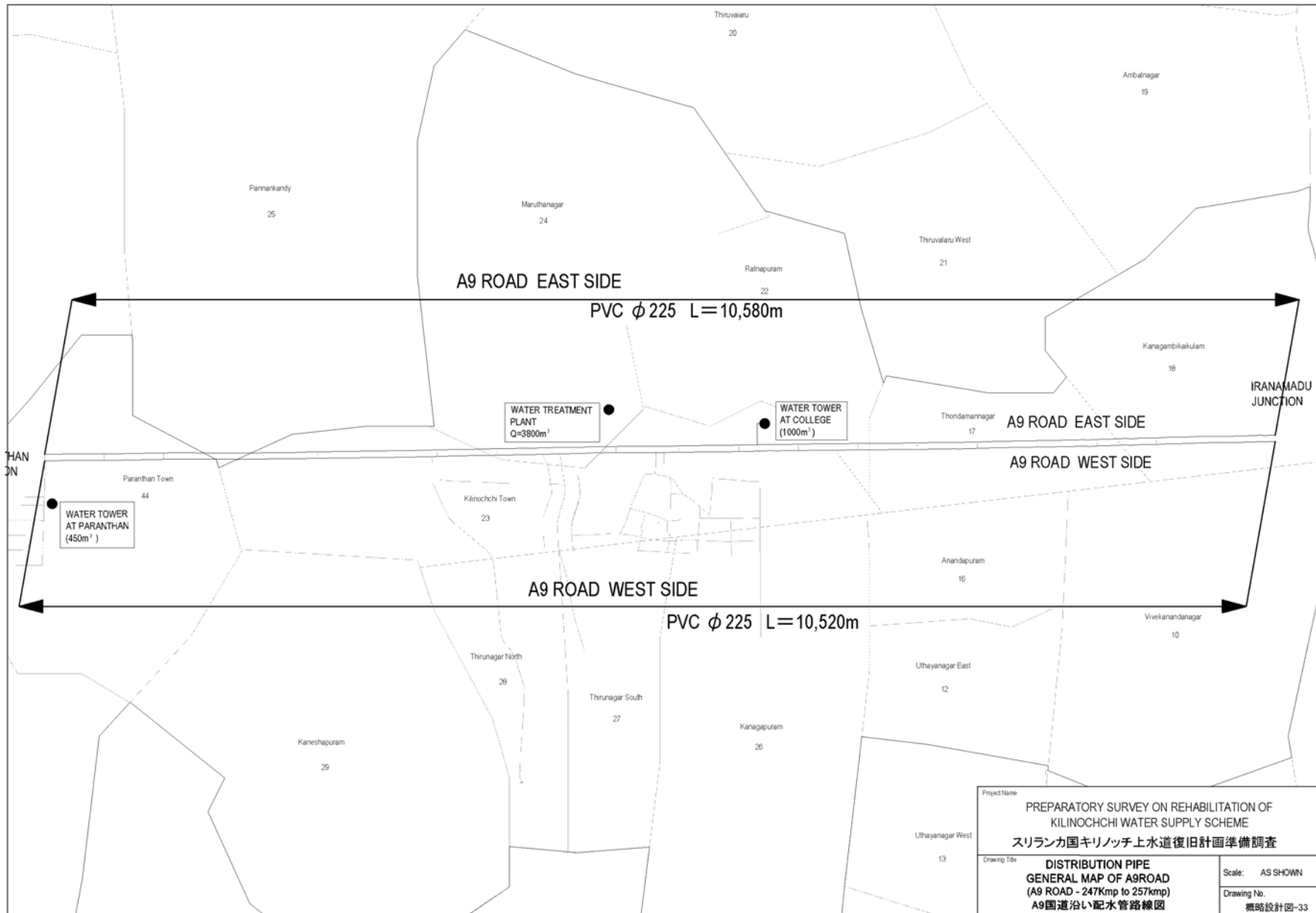


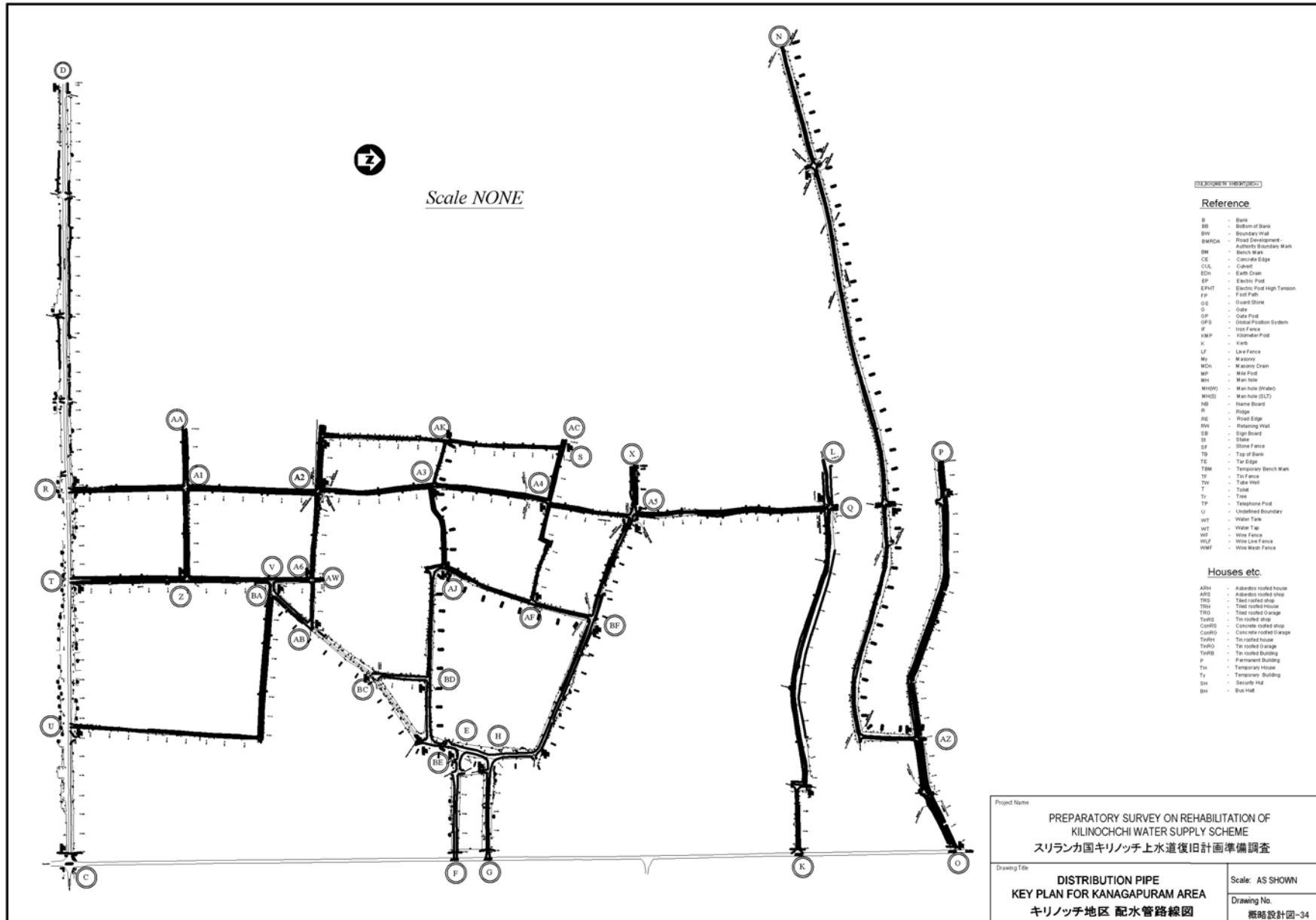
All Units shall be Metric by 3
Scale Reduced, A1 to A3

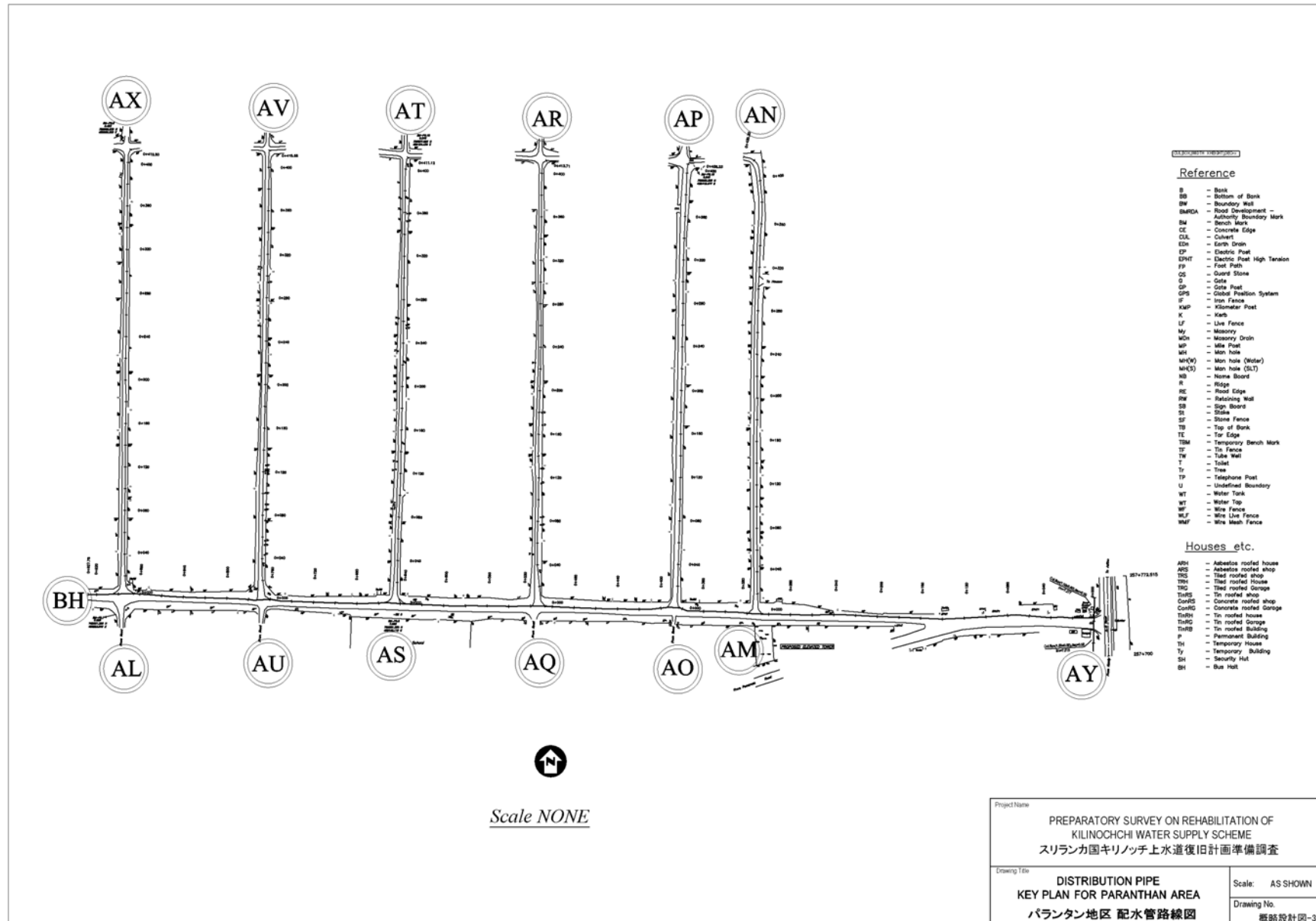
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Drawing Title	TRANSMISSION PIPE (WT 1000m ³ to WT 450m ³) PLAN & PROFILE セントラルカレッジ高架水槽～ パランタン高架水槽 送水管 平面図・縦断面図 (4)	
Scale:	AS SHOWN	
Drawing No.	概略設計図-30	

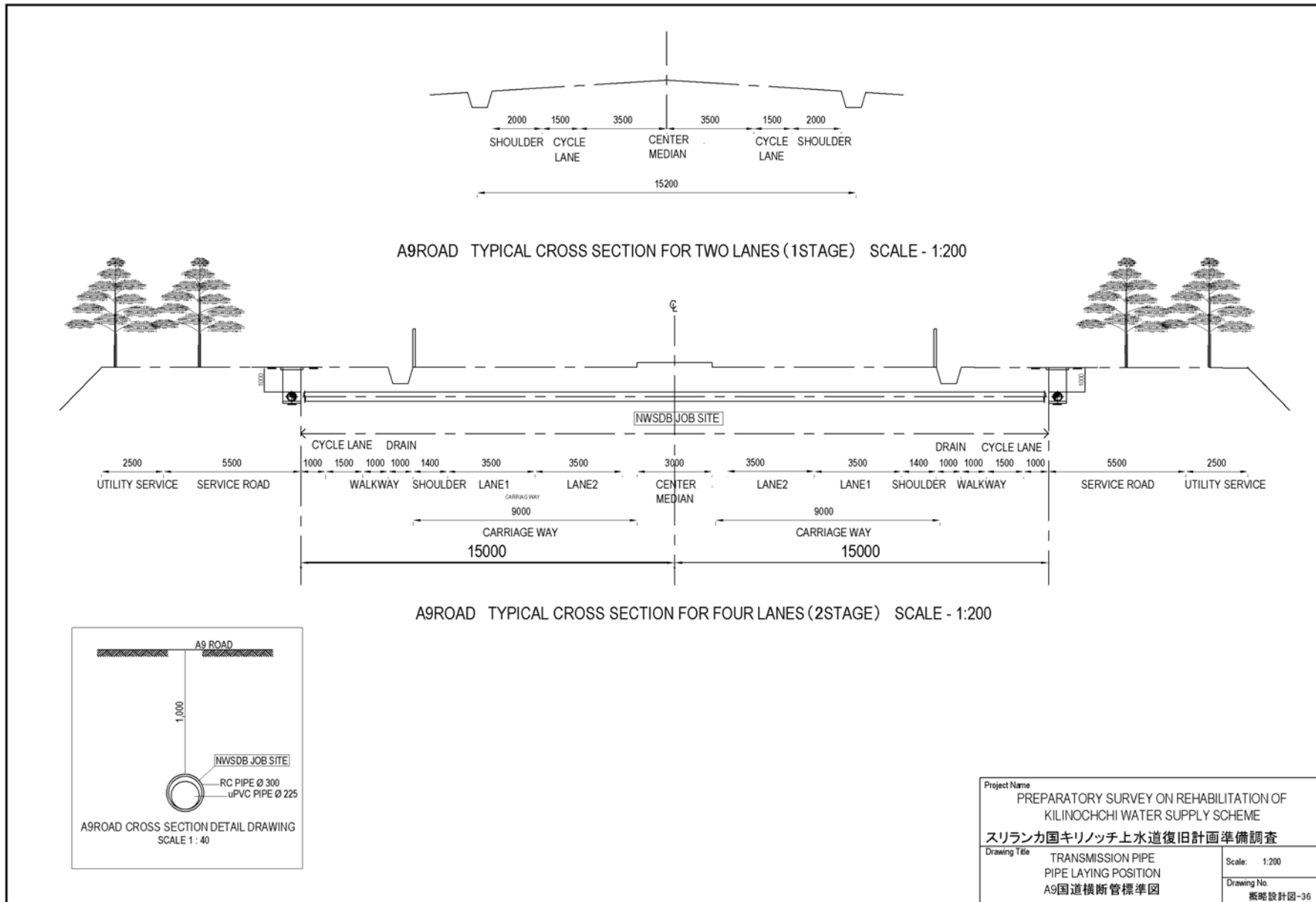


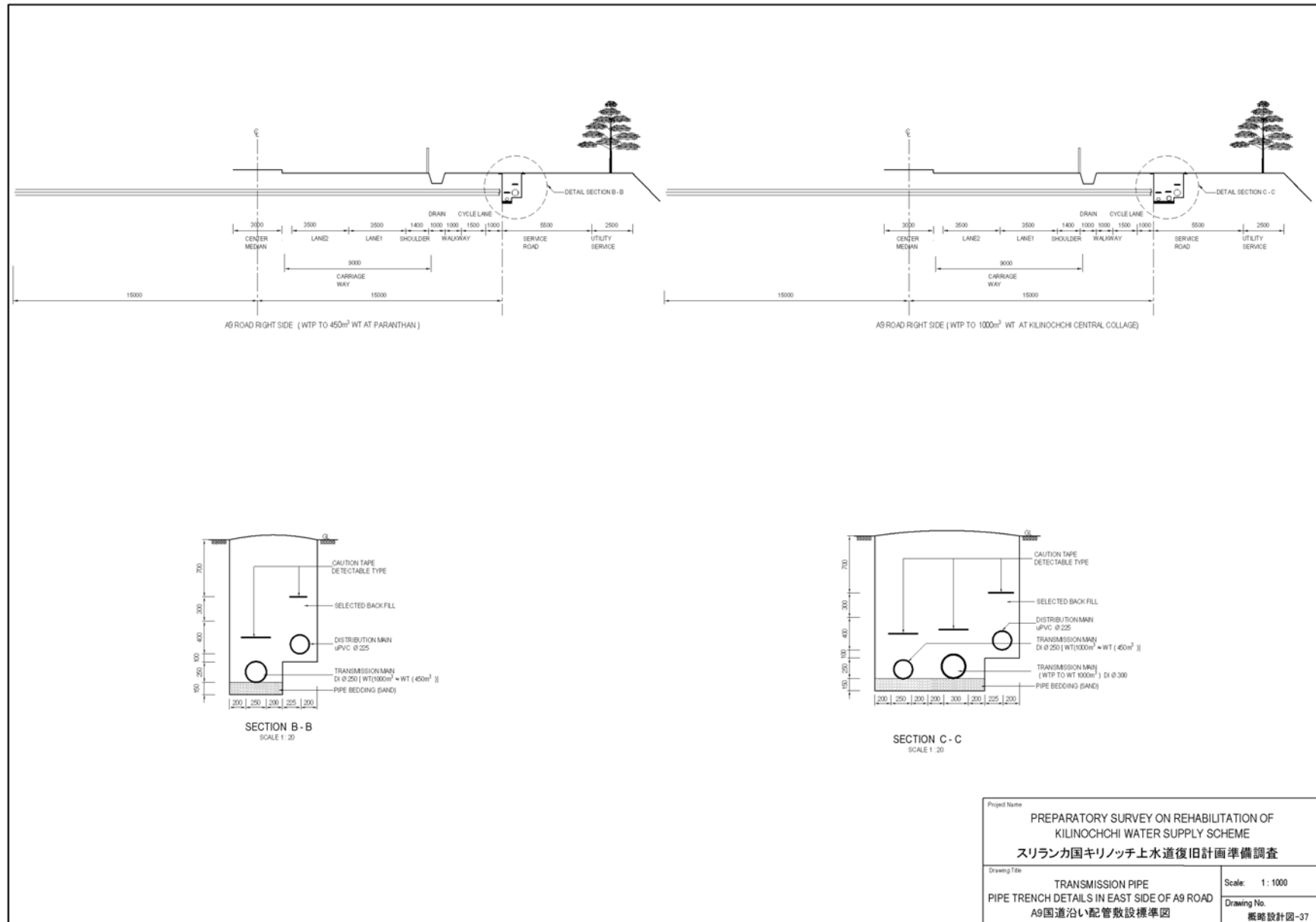




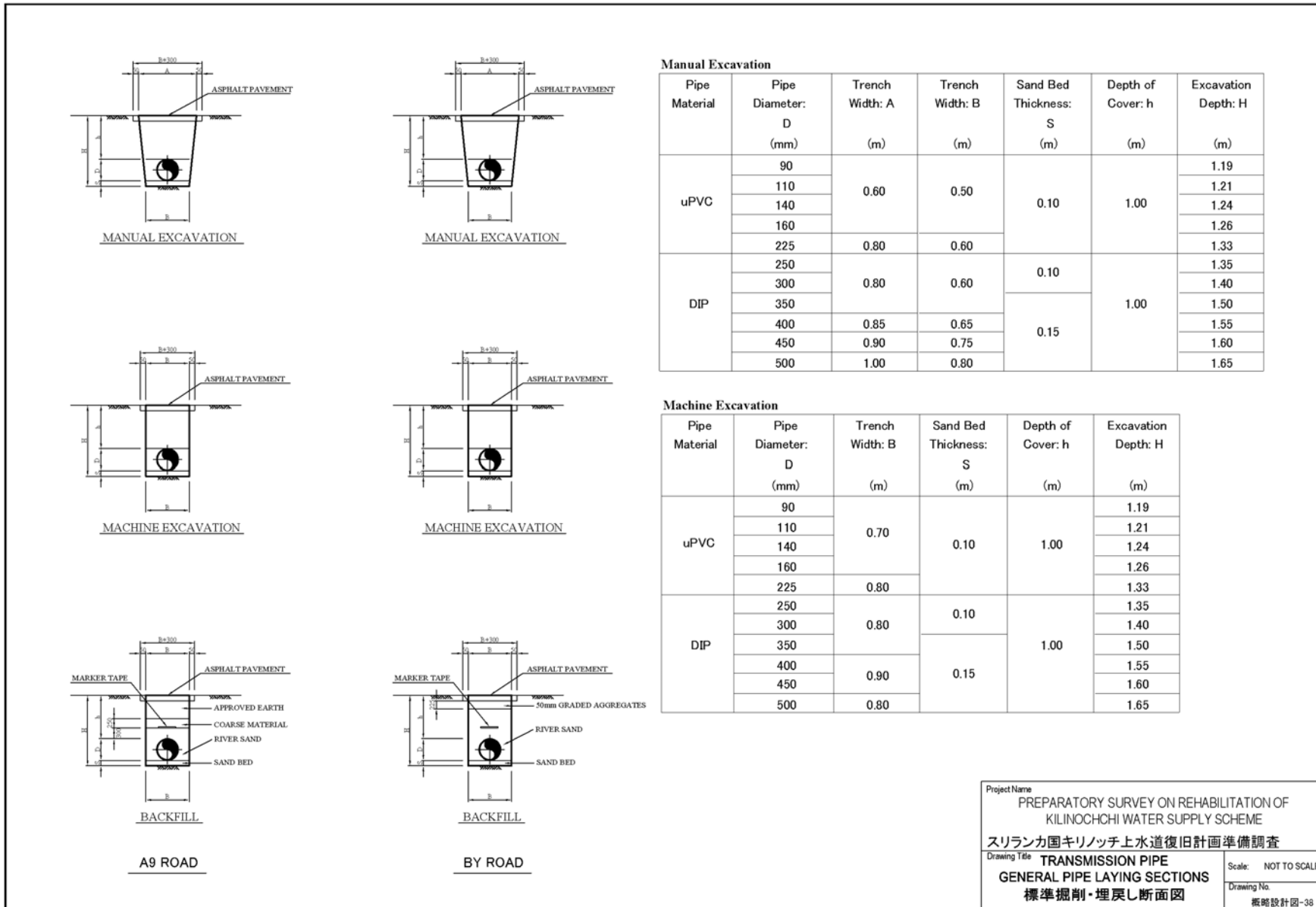


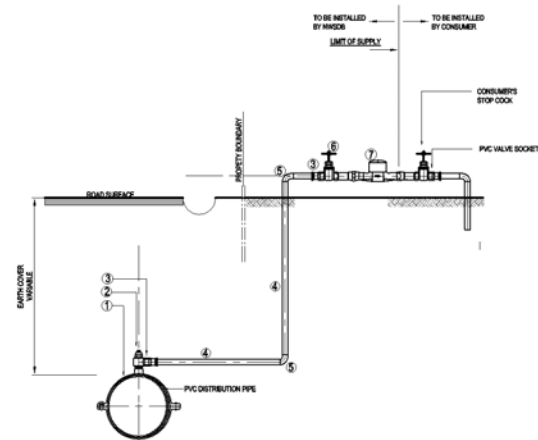






Project Name	PREPARATORY SURVEY ON REHABILITATION OF KILINOCCHI WATER SUPPLY SCHEME スリランカ国キリノッチ上水道復旧計画準備調査	
Drawing Title	TRANSMISSION PIPE PIPE TRENCH DETAILS IN EAST SIDE OF A9 ROAD A9国道沿い配管敷設標準図	Scale: 1 : 1000
		Drawing No. 概略設計図-37





HOUSE CONNECTION - TYPE A

THE WATER MAIN & THE PROPERTY ARE ON THE SAME SIDE OF THE ROAD

LIST OF MATERIALS PER HOUSE CONNECTION

ITEM NO	SIZE (INCH)	DESCRIPTION	UNIT	QTY
1	TO SUIT DISTRIBUTION PIPE	PVC CLAMP BRADLE WITH 1/2" FEMALE OUTLET	Nk	1
2	1/2"	BRASS FERRULE	Nk	1
3	1/2"	PVC VALVE SOCKET	Nk	2
4	1/2"	PVC PIPE, AVERAGE LENGTH 4000mm	Nk	1
5	1/2"	PVC ELBOW	Nk	2
6	1/2"	BRASS STOP COCK	Nk	1
7	1/2"	WATER METER	Nk	1

All Symbols and Dimensions in Metric Units
Scale Reduced - A1 to A3

Project Name	
PREPARATORY SURVEY ON REHABILITATION OF KILINOCCHI WATER SUPPLY SCHEME スリランカ国キリノッチ上水道復旧計画準備調査	
Drawing Title	Scale: NOT TO SCALE
SERVICE CONNECTION DETAILS 給水管接続標準図	Drawing No. 概略設計図-39

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

Implementation agency from Sri Lankan side is NWSDB. PIU (project implementing unit) composed of concerned organizations shall be established and will be in charge of this project consistently on behalf of NWSDB. Following are major role of PIU.

- Front desk of NWSDB for this project
- Liaison and coordination with the divisions concerned in NWSDB
- Liaison and coordination with the divisions concerned such as national government, province government, district government, and divisional secretariats, RDA, CEB, etc.
- Arrangement of designing and bidding works as the counterparts of the Japanese Consultant
- Securing the budgets and human resources under responsibility of the Sri Lankan side.

PIU will be organized in NWSDB Vavuniya North Support Centre Office (North) at Vavuniya, and Jaffna Regional Office will assist PIU management.

The Consultant, on behalf of NWSDB, will undertake the detailed design, bidding procedure and construction supervision in order to proceed with the construction work smoothly and to complete the scope of work within the given construction period. The Consultant will send specialist, who will be stationed in Killinochchi, to assist supervision of the whole of the construction work and other engineers as required at the completion time of the major facilities and at the end of the entire works.

In the detail design stage, detailed discussion regarding the project works especially for machinery and electrical works with NWSDB Planning & Design Section will be required. Therefore, it is considered appropriate that the Consultant team will be stationed in Colombo.

In the construction stage, the Consultant will send supervisor-engineers and appoint one of them as the chief supervisor who will undertake arrangements regarding all works with NWSDB.

The main part of the project is to rehabilitate and reconstruct water intake and treatment facilities, and install mechanical and electric equipment in a coordinated manner. Therefore, it is considered appropriate that a Japanese civil engineering contractor who has experience in the construction of water supply facilities will undertake the project works. In selecting the contractor, the open bid system will be adopted and the qualification and selection criteria for bidders will be defined during the preparatory work for bidding through negotiation and with confirmation from NWSDB.

This project is to construct the water supply system consists of civil, mechanical and electrical works. During construction works, Japanese Contractor shall dispatch engineers headed by the manager, who will direct the construction works at the site with local contractors.

One or combination of construction works can be commenced at the same time, but may have different schedule due to scope of works. The construction works will be implemented separately according to the category of works as follows.

Facility Construction Sites

- ① Water Intake and WTP site: Water intake facility, WTP and pipe lines within the sites
- ② Killinochchi Central College Water Tower site: 1,000 m³ water tower construction
- ③ Paranthan Water Tower site: 450 m³ water tower construction

Water Pipe Line Installation Sites

- ① Transmission Pipelines
- ② Distribution Pipelines along A9 Road
- ③ Distribution Pipelines in Killinochchi Town area
- ④ Distribution Pipelines in Paranthan Area

2-2-4-2 Implementation Conditions

(1) Implementation Conditions

Following are special conditions for construction.

- Construction work sites to be mainly divided into two categories namely facility construction site and pipe line laying site. Facility construction site can be divided into 4 sub divisions and the pipe line site can be divided into 4 sub division.
- Project progress needs many kinds of approvals and permissions from concerned government offices, and coordinating with the concerned organizations through PIU smoothly.
- In the detail design stage the Consultant's office will be locate in NWSDB's HQ office. Necessary arrangement and discussion will be done occasionally with PD and other PIU members in NWSDB Vavuniya Office and/or NWSDB HQ.
- In the implementation stage the Consultant's offices will be located in the premises of NWSDB OIC Office. One of the Japanese consultants will be nominated as a chief supervisor to coordinate with PIU.
- Contractor's offices will be set up at WTP site, Killinochchi Water Tower site and Paranthan Water Tower site.
- Interim and completion inspections, to be done by the spot engineers and supervisor depending on the works, will be scheduled according to the progress of each site.
- Basically, daytime works will be considered.
- Safety measures shall be secured strictly for traffic conditions of pedestrian and vehicles in the

project sites especially for the pipeline routes along A9 Road. Open excavated trenches for pipe laying shall be backfilled and temporarily restored within the same day.

- Excavation depth exceeds more than 1.5 m shall be executed with necessary earth retaining if necessary.
- House connecting pipes shall be installed by NWSDB after installation of distribution pipes.
- Schedule of pipe replacement shall be considered with the time sharing for service pipe re-connection (clamp saddle) to be done by the NWSDB.
- The defect liability period shall commence from the date of completion of work.

(2) Procurement Conditions

Following are special conditions for procurement.

- The first priority of procurement shall be given to the product of Sri Lanka. Japanese products will have the second priority. In case that the products are not available in Sri Lanka or Japan, the product from the third countries will be procured.
- Materials for service connection will be procured with due consideration of continuous order from the NWSDB. Imported materials available in the Sri Lankan local market will be procured.
- Packing style of imported materials will be fixed according the site locations. Re-packing will be considered from seaport to work site.

2-2-4-3 Scope of Works

General work sharing for Japan's Grant Aide Scheme is as shown in the following table,

Table 2-2-15 Major Undertakings to be taken by Each Government

No	Items	Japan	Sri Lanka
1	To acquire lands at the sites for the water treatment plant and water towers		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates and perimeter fences around the water treatment plant and water towers		●
4	To construct the parking lot	●	
5	To construct roads		
	1) Within the site	●	
	2) Outside the site		●
6	To construct and rehabilitate the water supply facilities	●	
7	To provide a stock yard of the construction materials and equipment		●
8	To carry out Technical Survey on UXO (including landmines) and UXO disposal if found		●
9	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1) Electricity		
	a. To construct permanent electric power receiving facilities for the water treatment plant		●
	b. The drop wiring and internal wiring within the site	●	

No	Items	Japan	Sri Lanka
	c. The main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and/or elevated tanks)	●	
	c. The clean water for pressure test and flushing		●
	3) Drainage		
	a. The city drainage main (for storm, sewer and others) to the site		●
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage, etc.) within the site	●	
	4) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	5) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
10	To organize the Project Implementation Unit (PIU) and to allocate the staff to operation and maintenance of the Killinochchi water supply system before the comment of the soft component programs		●
11	To install approximately 40 km distribution pipes which will be procured by the Sri Lankan side		●
12	To install 1,500 house connections including water meters which will be provided under the grant aid		●
13	To construct a treatment plant of wastewater from the Killinochchi General Hospital and an army camp		●
14	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment of banking commission for the Authorization to Pay (A/P) and payment to a Japanese bank based upon the Banking Arrangement (B/A)		●
15	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	
	2) To facilitate prompt customs clearance and to pay the custom duties on the equipment and materials required in the implementation of the Project at the port of offloading, and support for smooth delivery of the equipment and materials		●
	3) Internal transportation from the port of disembarkation to the project site	●	
16	To facilitate the Japanese nationals involved in the Project in accordance with the verified contracts to obtain relevant visas and stay permits in Sri Lanka		●
17	To pay internal taxes and other levies on the equipment and materials brought into the Sri Lanka and services provided by the Japanese nationals in accordance with the verified contracts		●
18	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
19	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment		●

Basically the components which had been destroyed during the internal conflict will be rehabilitated and reconstructed by the Japanese, and the components which will provide for future provision will be implemented by the Sri Lankan government (NWSDB) such as water distribution network extension works. Regarding house connection works, Japanese will procure material and Sri Lankan government (NWSDB) will implement. Following table indicates the work sharing between both sides.

Table 2-2-16 Scope of the Project Works

Category	Contents	Japan	Sri Lanka
Facility	Water Intake	○	
Construction	Raw Water Transmission	○	

Category	Contents	Japan	Sri Lanka
	Water Treatment	○	
	Transmission Pipe	○	
	Water Towers	○	
	Distribution Pipe	○	○
	House Connection		○
Procurement	House Connection Materials	○	
	Laboratory Instruments	○	
	O&M Equipment	○	
Inspection:	Completion Inspection, Defect Liability Inspection	○	○

2-2-4-4 Consultant Supervision

If the GOJ decides to implement the project based on the result of the basic design study, E/N (the exchange of notes) of GA (grant agreement) for the project will be concluded between GOJ and GoSL. After the E/N signing, a contract with a Japanese consultancy firm will be prepared, GOJ will verify the contract, and the Consultant will start the project design.

(1) Detailed Design

Upon commencement of the work, the Consultants will conduct detailed site survey and topographical survey. Project cost will also be estimated and detailed design report will be prepared.

The project design period will be totally 4.5 months which will consist 2 months of site survey and 2.5 months of detailed analysis in Japan including project cost estimation.

(2) Bidding Works

The Consultants will prepare the bid documents for approval from NWSDB.

Invitation for P/Q (pre-qualification) for Japanese Contractor will be appear in Japan newspapers only. The Consultants will issue the bid documents to all candidate bidders. Bids will be opened after 45 days from the bid documents issued with presence of NWSDB and JICA. The Consultants will assist NWSDB until the construction agreement signed with successful bidder. The GOJ will verify the said contract and the construction works will be commenced.

The bidding works need 4.5 months including; 2 months for document preparation and approval, and 2.5 months from document distribution, and evaluation. The Consultants will take following responsibilities.

- ① The Consultants will receive the P/Q documents from the eligible contractors within 1 week interval from P/Q publication,
- ② The Consultants will evaluate the received P/Q documents immediately and inform the

bidding schedule to the candidate bidders.

- ③ The Consultants, on behalf of NWSDB, will conduct the bid opening at Tokyo after 45 days from the document distributed. NWSDB and JICA will presence at the bid opening, and the consultants will submit the bidding report to JICA immediately.
- ④ The Consultants, on behalf of NWSDB, will evaluate the bid documents submitted by the contractors and arrange them in order, the lowest bidder less than the sealing price technically. The consultants will recommend the said bidder to NWSDB as successful contractor.
- ⑤ The Consultants will assist NWSDB to conclude the construction agreement including governmental verification, etc.

(3) Supervisions for Construction and Procurement

Facility construction includes the civil, mechanical and electrical works. The Consultants will dispatch the chief supervisor and the project manager, a pipeline engineer, a mechanical engineer and an electrical engineer. The Consultants also assign Sri Lankan engineers and specialists to support Japanese engineers.

The project manager will be assigned for the construction commencement period and the inspection of the work completion for shortly. The chief supervisor will stay on site during the construction period. Other engineers and specialist will be assigned shortly to inspect the procurement materials and the work completion.

Procurement scheme composes of materials and equipment for O&M, laboratory and service connections. The schedule of supply will affect the schedule of facility construction. Therefore the Consultants to be appoint the project manager and supervisors for early approval.

The Consultants will implement the project with well coordinating to concerned organizations of the Sri Lankan side, Japanese side (Contractor, JICA, etc.) and others.

(4) Operation Guidance

The contractor will prepare the instruction manuals for operation and repair of the equipment installed by this project. Initial training will be scheduled upon completion of the said facility or equipment by the Contractor.

The consultants will explain the design concepts and facility functions to the NWSDB and in accordance with the stage of implementation of soft components to instruct management and skills for operation and maintenance of facilities, house connection installation and water quality mentoring and control.

2-2-4-5 Quality Control

Facility and materials/ equipment shall be required to have a quality and functions in accordance with the general specifications, particular specifications, drawings and standards mentioned in the bid documents, which shall be studied and prepared in the detailed design stage. Followings will be required for the construction works.

Table 2-2-17 Quality Control Items and Method

Category	Item	Method	Remarks
Pipe Materials	Strength, Appearance, Dimensions	Confirmation of Product Inspection Result Visual Inspection, Dimensional Inspection Gauging Inspection	Japanese Industrial Standard
Pipe Works	Torque Leakage	Torque Wrench Water Pressure Test	Japanese Industrial Standard, NWSDB's Standards for Pipeline Works
Concreter	Gravel, Cement, Water Flesh Concrete Concrete Strength	Physical Test, Chemical Test Particle Analysis, Slump, Air, Water, Water Cement Ratio, Compression Strength Test	Japanese Industrial Standard
Reinforcing Bar	Strength	Tensile Strength Test Bar Arrangement Inspection	Japanese Industrial Standard
Facility		Dimensional Inspection	Japanese Industrial Standard

2-2-4-6 Procurement Plan

Construction materials will be procured in Sri Lanka as much as possible. The items which are difficult to be procured in Sri Lanka will be procured from Japan or the third countries.

As to the pipe materials all materials, including imported PE and DIP, are available in Sri Lankan market. Especially for house connection materials those shall be procured sustainably during and after the project. Therefore all of the materials shall be procured including water meters for this project.

On the other hand, mechanical and electrical equipment are difficult to be procured in Sri Lanka. Therefore they will be procured in Japan and transferred to Sri Lanka, Colombo Port by marine transportation. From the port to the site transferred by vehicles.

Construction machinery for construction works are available in Sri Lanka. Therefore they will be procured by lease agreements.

Following tables summarize the lists of materials to be procured by this project.

Table 2-2-18 Summary of Construction Material Procurement

Items to be procured		Procurement from			Remarks
Classifications	Descriptions	Sri Lanka	Japan	Third	
Pipes and Fittings	DCIP (Pipe, Fittings)	○			
	Valves(PRV, FCV, GV, CV, ARV, BOV, etc)	○			
	Man-hole Cover, Valve Box, etc	○			
	HDPE	○			
	PVC	○			
	House Connection (including Water Meter)	○			
Civil Materials	Cement, Gravel, Sand, Form, etc)	○			
	Reinforcing Bar	○			
	Paint	○			
	Fuel (Kerosene, Gasoline, Oil)	○			
Mechanical/Electrical Equipment	Pumps		○		
	Diesel Generator		○		
	Chlorinator		○		
	Control Panel		○		
	Filter Sand	○			
Construction Machine	Backhoe, Lift Crane, Dump Truck, etc. (Lease Contract)	○			

Table 2-2-19 Summary of Procurement Equipment

Items to be procured		Procurement from			Remarks
Classifications	Descriptions	Sri Lanka	Japan	Third	
House Connection	Pipe Fittings	○			
	HDPE Pipe	○			
	Water Meter	○			
Laboratory Instrument	Colorimeter	○			
	Turbidity Meter	○			
	Microscope	○			
	Electrical Conductivity Meter	○			
	pH Meter	○			
	Residual Chlorine Meter	○			
	DO Meter	○			
	Refrigerator	○			
	Laboratory Equipment	○			
Operation & Maintenance	Under Pressure Tapping Machine	○			
	PC	○			
	LCD Projector	○			

2-2-4-7 Operational Guidance Plan

Prior to the turn-over of the facilities, the start-up and commissioning program will be carried out in order to verify the function and operation of the equipment, such as pumps, sand washing equipment, generator and chlorination equipment installed at the WTP. In this program, the Contractor will provide the required guidance/trainings mainly on how to operate the equipment and in troubleshooting. Training will initially be conducted to the operating staff of NWSDB as an

operational guidance.

Table 2-2-20 Initial Operational Guidance

Facility	Contents	Remarks
WTP	Raw water pump: Function test, ON-OFF operation, Set-up of pumping rate, Daily inspection Clear water pump: Function test, ON-OFF operation, Set-up of pumping rate, Daily inspection Chlorination equipment: Set-up of dosing rates, Hand mixer operation, Daily inspection Electrical facilities: Function test, Daily Inspection Generator: Operation methods, Function test	
Elevated Towers	Water level indicator: Function test	
Raw Water Transmission/ Transmission/ Distribution Pipelines	Valves: Function test, Valve operation	

2-2-4-8 Soft Components Plan

The project is to recover the capacity of water supply system of Killinochchi WTP, to cope with increasing demand of water supply in Killinochchi Town and its surrounding area. The project will rehabilitate the original function of raw water intake, raw water transmission main, water treatment system and distribution system.

There is no proper numbers of operating staff, since the system was not operated for many years. It is required to provide training to be familiar with the operation and maintenance of the new water supply system. Presently, only limited number of staff was employed, and additional staff will be needed for the operation upon the completion.

In terms of water quality, the project will supply water quality instruments, which will enable the required monitoring of water quality, maintain proper operation and maintenance of WTP, and to ensure the quality of clean water. This also requires training to the staff to familiar with proper handling of the equipment.

It is also important to set up an organization for proper operation and maintenance and water quality control. In this aspect, the project will support followings, as soft component programs, for smooth start up of the project operation.

- a. Water treatment plant operation
- b. Water Distribution Network maintenance
- c. House connection and water meter installation
- d. Mechanical/electrical facility maintenance
- e. Water quality monitoring and control

2-2-4-9 Implementation Schedule

Following figure shows the tentative project schedule:

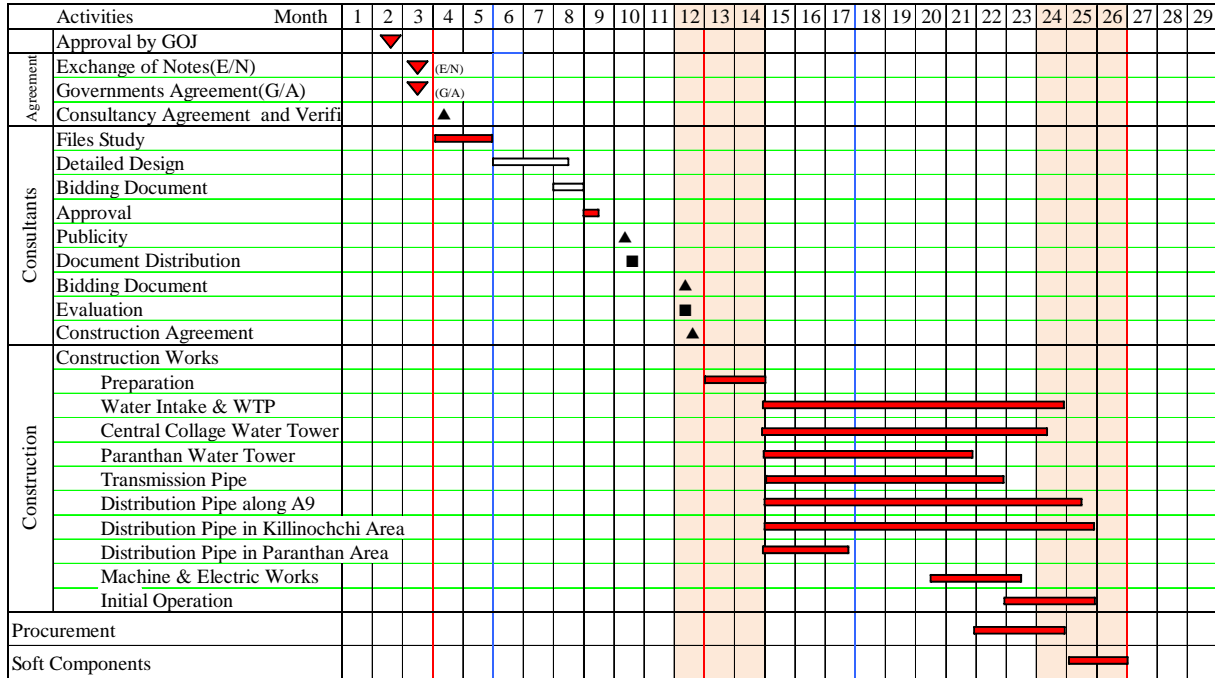


Figure 2-2-8 Implementation Schedule

2-3 Obligations of Recipient Country

To achieve the objectives of the project and on the basis of the scope of works covered by GOJ, the following obligations shall be undertaken by GoSL. Additionally, GoSL will be required to incorporate the post monitoring study to be scheduled by JICA.

(1) Pre-project period

- ① To organize the PIU composed of NWSDB
- ② To ensure the project budgets for undertaken activities of Sri Lankan side
- ③ To proceed the banking arrangement
- ④ To obtain all the acceptances for public land use
- ⑤ To obtain all the permission for pipe laying and construction of pipeline accessories

(2) During Project Implementation

- ① To fix the banking arrangement and to disburse the cost for A/P (authorization to pay)
- ② To exempt the levies for Japanese nationals and the taxes for imported materials
- ③ To bear all the dispatch costs of PIU
- ④ To notify, announce and coordinate project information to relative organizations and persons
- ⑤ To ensure the staffs and their competent who will participate in the soft component programs
- ⑥ To collect and accumulate all necessary data for project monitoring.

(3) Post-project

- ① To maintain properly the facility constructed under the project
- ② To use the materials for promotion of service connection procured under the project
- ③ To use and manage appropriately of in accordance with the documents prepared under the project
- ④ To promote the new service connection
- ⑤ To increase staffs of with their appropriate arrangement to the project components
- ⑥ To collect and accumulate all necessary data for post-project monitoring.

2-4 Project Operation Plan

(1) Project Operation Plan

Prior to the project implementation NWSDB shall establish PIU and undertake necessary staff arrangements and project budget allocation. Following figure shows a proposed project operation organization. It might be effective that to utilize the timing of soft component programs for the smooth set-up of the organization.

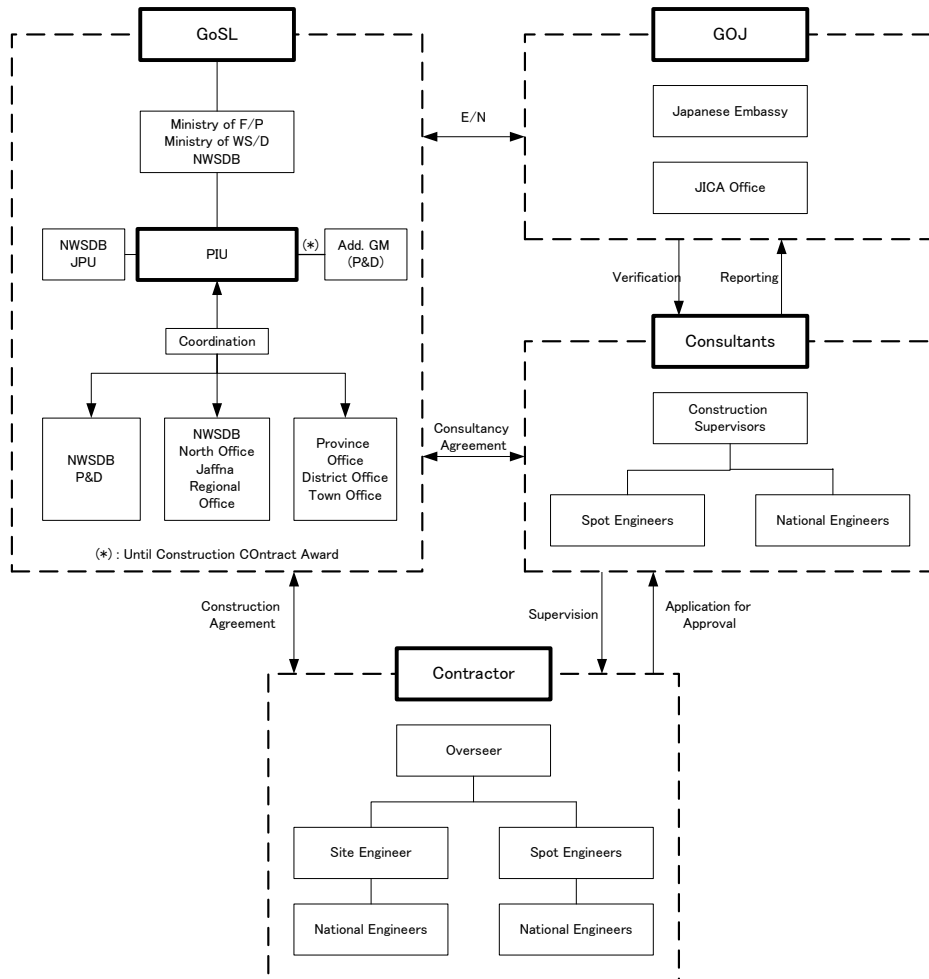


Figure 2-4-1 Proposed Project Operation Organization

PIU for this project shall coordinate closely with NWSDB HQ, especially with Planning & Designs Section in the detailed design stage and the construction contract stage. In this context it is appropriate that the Consultants also will be assigned in Colombo area.

During the implementation stage the PD of NWSDB will stay in Vavuniya office or Killinochchi office with the Consultants' supervisor to manage construction work properly.

(2) Organization Structure for Operation and Maintenance

The number of current operation staff in Killinochchi Water Supply System is limited, because water is only supplied by water tankers.

Upon completion of the project, the plant capacity will be 3,000m³/day, and the number of water connections will increase drastically. Therefore some staffs will be transferred from the other sections in NWDB and some will be newly hired for operation of the water treatment plant and distribution system

It is not included in project; however, but to organize billing and fare collection system will be required in Killinochchi OIC Office.

The following figure shows a proposed organization which will be required for proper operation for Killinochchi Water Supply system.

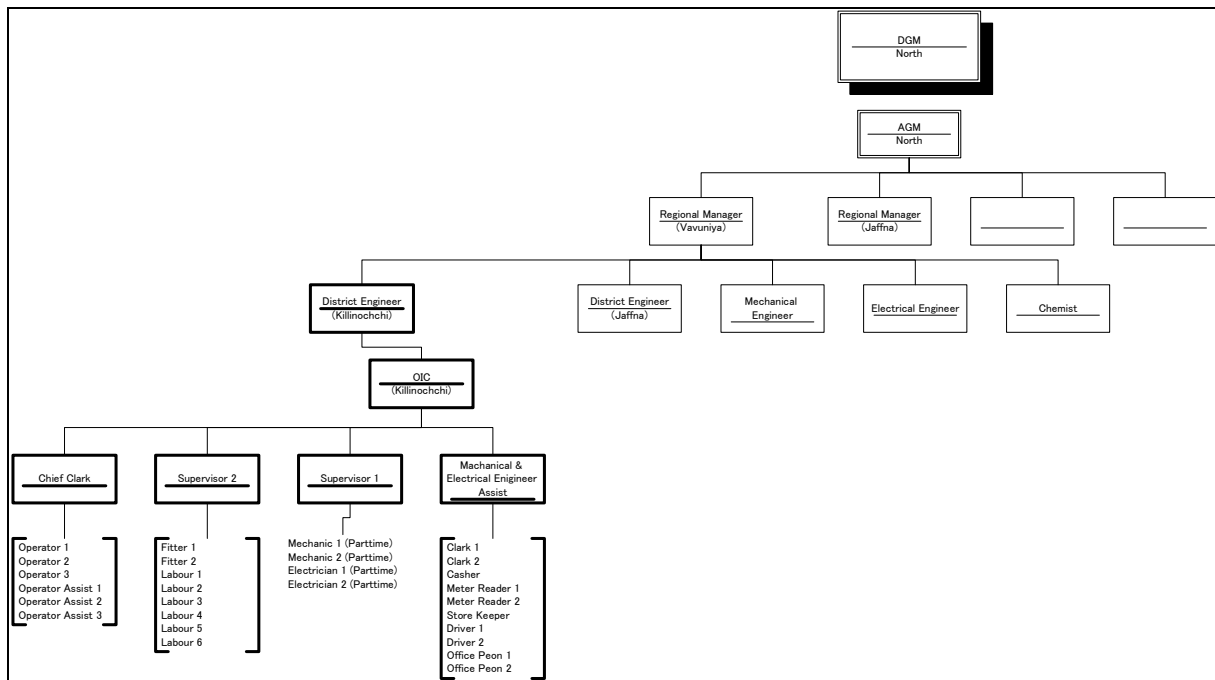


Figure 2-4-2 Draft of Proposed Organization for Killinochchi Water Supply System

(3) Annual Staff Increase from Completion of the Project

Following table shows the proposed staffs and their assignment for the Killinochchi water supply system. This indicates the need to recruit manager and key personals prior to the completion of the project, to coordinate and manage the project during the implementation phase. At latest, all technical and non-technical staff should be employed one month before to operate and maintain the new WTP and start water supply service in Killinochchi, and at that time soft components programs will start.

Table 2-4-1 Proposed Staffs in Killinochchi OIC Office

Assignment	Number	Remarks
District Engineer	1	
Officer-In-Charge	1	
Operator	3	
Operator Assistant	3	
Supervisor	2	
Fitter	2	
Labour	6	
Mechanical & Electrical	1	
Mechanic	(2)	Part-time
Electrician	(2)	Part-time
Meter Reader	2	
Casher	1	
Chief Clark	1	
Clark	2	
Store Keeper	1	
Driver	2	
Office Peon	2	
Total	30 (4)	

The water supply system in Jaffna has 117 staff for 7,465 connections (15.7 staff per 1,000 connections). Killinochchi water supply system will have 30 staffs excluding 4 part-time staffs for approximately 4,000 connections (7.5 staff per 1,000 connections). It is recommended not to increase number of staffs easily in Killinochchi water supply system but to keep efficient operation and maintenance performance.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

Among the overall project costs, Sri Lankan side shall bear the costs partially according to the work sharing between both governments. Followings are the project cost borne by Sri Lankan side.

(1) Project Cost Borne By Sri Lankan Side

The project cost borne by Sri Lankan side is estimated at approximately LKR 377 million (=JPY 295 million).

Table 2-5-1 Project Cost Borne by Sri Lankan Side

Item	Cost (JPY)	Equivalent (LKR)
- Miscellaneous Works in WTP site, in Killinochchi Central College Water Tower site, in Paranthan Water Tower site	38 million JPY	51million Rs
- Wastewater Treatment System for Killinochchi General Hospital & Army Camp	27 million JPY	36 million Rs
- Laying of Distribution Pipes	213 million JPY	285 million Rs
- House Connection Works	4 million JPY	5 million Rs
Total	282 million JPY	377 million Rs

(2) Assumption of Cost Estimation

- Estimation : As of June 2011
- Exchange Rate : 1 USD = 83.52JPY,
1 LKR = 0.749JPY

2-5-2 Operation and Maintenance Cost

(1) Operation and Maintenance Cost

The direct operation and maintenance costs is estimated by using planned water supply facilities in Killinochchi referring the current operation and maintenance cost in Jaffna in 2011.

Table 2-5-2 Operation and Maintenance Costs of the Project

Items	Calculation	O&M Cost (Rs/year)
Employment Cost	Total 30 Staff in Killinochchi 647,500 Rs/year/staff×30 staff = 19,425,000 Rs/year (Reference : Regional Office - Jaffna in 2011 - 117 employees) 75,756,098 thousand Rs/year / 117 = 647,500 Rs/year/staff	19,425,000
Chemicals	Chlorine (average injection rate : 3 mg/l) 212 Rs/kg×3,000m ³ /day×0.003 kg/day×365day = 696,420 Rs/year	696,000

Items	Calculation	O&M Cost (Rs/year)
Power Consumption	Max. demand : 90 kVA, Ave. demand : 72 kVA Energy charge : 10.45 Rs/kWh x 51,840 kWh = 541,728 Rs Fixed charge : 3,000 Rs Max. demand charge : 850 Rs/kVA x 90 kVA = 76,500 Monthly 621, 228 Rs/month x 12 = 7,454,736 Rs	7,455,000
Materials	Materials : 1,000,000 Rs/year (Reference : Regional Office - Jaffna in 2011 – 2,000,000 Rs)	1,000,000
Repairs	Repairs : 2,100,000 Rs/year (Reference : Regional Office - Jaffna in 2011 – 4,263,000 Rs)	2,100,000
O&M Cost Total in 2015		30,676,000

Total expenditure of water supply system in Jaffna is estimated Rs 112,537,000 in 2011 with billing flow of 149,000 m³/day, while that in Killinochchi will be Rs 30,676,000 (27 %) with billing flow of 90,000 m³/day (60 %). It indicates the Killinochchi system will be more cost effective than the Jaffna system.

(2) Estimation of Tariff Collection

In order to estimate tariff collection in Killinochchi water supply system, the following assumptions are applied.

- a. average number of house member: 4.18 (2,142/512 = 4.18 from “Socio-Economic Study Report”)
- b. Domestic water demand: 1,981 m³/d in 2020
- c. Non-domestic water demand: 497 m³/d in 2020
- d. School and Institution (Large): 1 location with 50 m³/d
- e. School and Institution (Small) : 10 locations with 10 m³/d
- f. Commercial (Large) : 10 locations with 10 m³/d
- g. Commercial (Small) : 50 locations with 5 m³/d

Table 2-5-3 Assumption of Water Tariff Collection

Items	Calculation	O&M Costs (Rs/year)
Domestic	1,981 m ³ /d / (0.12 m ³ /d/capita x 4.18) = 3,949 connections 0.12 x 4.18 x 30 = 15 m ³ /month (3 Rs x 5 m ³ + 7 Rs x 5 m ³ + 15 Rs x 5 m ³) + 70Rs = 195 Rs/connection 3,949 connections x 195 Rs/connection x 12 months = 9,240,660 Rs	9,241,000
School and Institution (Large) - 1	50 m ³ /d x 30 = 1,500 m ³ /month (6 Rs x 40 m ³ + 16 Rs x 1,460 m ³) + 1,600 Rs = 25,200 Rs	25,000
School and Institution (Small) - 10	10 m ³ /d x 30 = 300 m ³ /month (6 Rs x 40 m ³ + 16 Rs x 260 m ³) + 1,600 Rs = 6,000 Rs 10 connections x 6,000 Rs/connection = 60,000 Rs	60,000
Commercial (Large) - 10	10 m ³ /d x 30 = 300 m ³ /month (65 Rs x 300 m ³) + 2,500 Rs = 22,000 Rs 10 connections x 22,000 Rs/connection = 220,000 Rs	220,000

Items	Calculation	O&M Costs (Rs/year)
Commercial (Small) - 50	$5 \text{ m}^3/\text{d} \times 30 = 150 \text{ m}^3/\text{month}$ $(65 \text{ Rs} \times 150 \text{ m}^3) + 1,600 \text{ Rs} = 11,350 \text{ Rs}$ $50 \text{ connections} \times 11,350 \text{ Rs/connection} = 567,500 \text{ Rs}$	568,000
Water Tariff Total in 2015		10,114,000

Water tariff for typical households with average house members of 4.18 can be estimated as follows.

Water consumption per month:

$$0.12 \text{ m}^3/\text{day/capita} \times 4.18 \times 30 \text{ days} = 15 \text{ m}^3/\text{month}$$

Water tariff per month:

$$(3 \text{ Rs} \times 5 \text{ m}^3 + 7 \text{ Rs} \times 5 \text{ m}^3 + 15 \text{ Rs} \times 5 \text{ m}^3) + 70 \text{ Rs} = 195 \text{ Rs/house}$$

Willingness to pay for water in Socio-economic Study shows the majority of households (71 %) can pay more than Rs 100 per month, and 53 % of households can pay Rs 100-250. The typical water tariff of Rs 195 seems to be an acceptable level for the most of householders in Killinochchi.

In Jaffna it is planned to collect water tariff of Rs 60,969,000/year with monthly billing flow 149,000 m³/month. While the system in Killinochchi is estimated to collect Rs 10,114,000/year (17 %) for 90,000 m³/month (60 %) supply in 2020 with maximum production capacity.

The less tariff collection in Killinochchi may be due to type of the consumers. In Killinochchi, non-domestic users are schools/institutions along with A-9 Road, and limited numbers of shops/restaurants with their small water consumption. However, in Jaffna there are more hotels, restaurants and shops which will be applied higher commercial water tariffs.

Chapter 3 Project Evaluation

Chapter 3 Project Evaluation

3-1 Preconditions

Preconditions for the Project are as follows.

- ① Landmines /UXOs shall be removed completely prior to the Project
- ② Security shall be maintained in the project area
- ③ Necessary land acquisition procedures shall be completed
- ④ Necessary budget allocation shall be determined by GoSL
- ⑤ PIU in NWSDB shall be set up properly
- ⑥ A-9 Road improvement works shall be carried out on schedule by RDA prior to the Project

3-2 Necessary Inputs by Recipient Country

To achieve the objectives of the project and on the basis of the scope of works covered by GOJ, the following obligations shall be undertaken by GoSL.

- ① Complete clearance of landmines/UXOs in the project area
- ② Set up of PIU and proper assignment of staffs in Vavuniya Northern Office, Jaffna Regional Office and Killinochchi OIC Office by NWSDB
- ③ Sustainable budget allocation to the following project components borne by GoSL
 - To secure the sites
 - To construct gates and fences in and around the site
 - The electricity drop distributing line to the sites
 - To construct stormwater drainage outside the sites
 - The telephone trunk line to the main distribution frame/panel of the building
 - To provide general furniture
 - To construct distribution lines about 40 km
 - To install house connections (1,500nos)
 - To construct a wastewater treatment plant for Killinochchi Central Collage and Army Camp
- ④ To set proper water tariff and collect efficiently

3-3 Important Assumptions

External conditions for the Project are as follows.

- ① Pre approval of the Ministry of Defence had been required to go into the Northern Province for foreigners. Even though from July 2011 this rule has been eased, the project area is still under strict control. Foreigners traffic, transportation of procurer materials and equipment, etc. will be suffered by regulatory procedures and time for clearance. Those obstructive conditions shall be taken into account in the project management.

- ② Even though LTTE diaped, careful security management is still required.
- ③ Prior to the project removal of landmines and UXOs has to be confirmed and if any accidental issues happen the procedures for site clearance has to be clarified..

3-4 Project Evaluation

3-4-1 Relevance

The purpose of the project will be aligned with the objects of the upper plans of GoSL and the policy of the Grant Aid Program. Above all things, the project will benefit an improvement in water supply through providing water supply facilities, which is urgently required by Killinochchi people.

3-4-2 Effectiveness

Indicators to express quantitative effectiveness and qualitative effectiveness will be raised as below:

(1) Quantitative Effectiveness

Parameters which show quantitative effectiveness are as follows.

Table 3-4-1 Quantitative Effectiveness

Indicators	2011	2016	2020
Water Supply Rate(%)	14.2 ^{*)}	45.1	54.4
Water Supply Flow (m ³ /day)	130	2,300(Daily Average)	2,980(Daily Average)
Supplied Population	2,600	8,900	11,400

^{*)} Currently drinking water from wells is supplied by bowsers.

(2) Qualitative Effectiveness

The project will contribute to reduce the number of water disease not produce any negative impacts on environment during construction period as well as facility operation and maintenance period after construction. To carry out the soft component programs which focus on operation and maintenance and house connection installation will also contribute to improve the service reliability of water management quantitatively and qualitatively.

Qualitative effectiveness will be raised as below.

- ① Insufficient water quantity and pressure at faucets will be improved by maintaining water pressure in distribution pipes properly.
- ② NRW ratio will be decreased by reducing water leakage, which will contribute to improvement of management of respective waterworks.

Based on the above, it is evaluated that the adequacy of the project is highly evaluated and effectiveness of the project will be expected.