

**Japan International Cooperation Agency (JICA)**

**Ministry of Natural Resources and Environment Protection  
Almaty City Government  
Republic of Kazakhstan**

**The Study on  
Solid Waste Management for  
Almaty City in the Republic of Kazakhstan**

**Final Report  
DATA BOOK**

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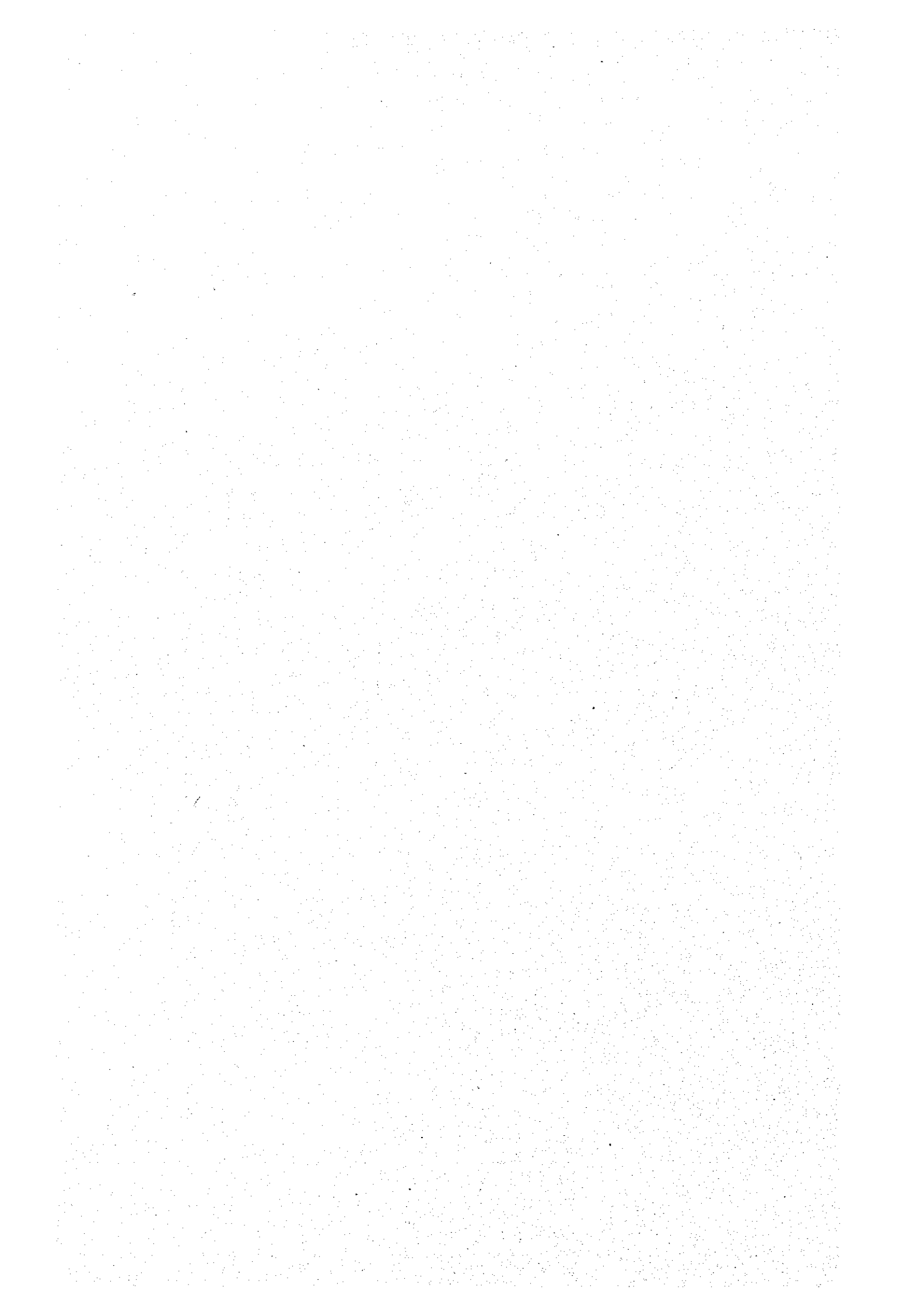
January 2000

**Yachiyo Engineering Co., Ltd.  
CTI Engineering International Co., Ltd.**

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1155537(2)

## **FINAL REPORT COMPOSITION**

**The Final Report is composed of the following reports:**

- 1. SUMMARY REPORT**
- 2. MAIN REPORT**
- 3. SUPPORTING REPORT**
- 4. DATA BOOK**
- 5. ENVIRONMENTAL IMPACT ASSESSMENT REPORT**

**This report is the DATA BOOK**

### **EXCHANGE RATE**

**US\$ 1.00 = KZT 115 (May 3, 1999)**

**US\$ 1.00 = Yen 121.10 (May 6, 1999)**



## Abbreviations

ACDEP	Almaty City Department of Environmental Protection
(Akim)	Head of Local Government, Mayor, Governor, or Head of District
(Akimate)	Local Government Office
(Maslikhat)	Parliament, Council of Local Government
(Oblast)	Province
AMC	Territorial Committee on Regulating Natural Monopoly and Protecting Competition – Anti Monopoly Committee
Alt.	Alternative
BH	Block housing
C/N	Carbon-Nitrogen factor
CIS	Commonwealth of Independent States
D/S, DS	Disposal site
EIA	Environmental Impact Assessment
EIU	Economic Intelligence Unit
EL	Elevation
FDI	Foreign Direct Investment
FSU	Former Soviet Union
GDP	Gross Domestic Product
GKI	Territorial Committee of State Property and Privatization
GRDP	Gross Regional Domestic Product
IC/P	Incineration Plant
IEE	Initial Environmental Examination
IH	Individual housing
JICA	Japan International Cooperation Agency
JSC	Joint Stock Company
KSD (PKSK)	Cooperatives for individual house community management
KSK (PKSK)	Cooperatives for block housing management
KZT, T	Kazakhstan Tenge (Exchange rate at May 3, 1999 US\$ 1.00 = KZT 115.0)
Kcal/kg	Kilo calorie per kilogram
Kg, kg	Kilogram
Kg/cap/d	Kilogram per capita per day
Km, km	Kilometer
NEAP/SD	National Environment Action Plan for Sustainable Development
NEC	National Environment Center of the Ministry
RMB	Road Management Board
SWM	Solid Waste Management
T/S, TS	Transfer station
The (Study) Team	The JICA Study Team of the Study
The Ministry	Ministry of Natural Resource and Environmental Protection

**The Study**

**USD**

**USSR**

**bn**

**m<sup>3</sup>**

**t/a**

**t/d**

**The Study on Solid Waste Management in Almaty City**

**United States Dollar**

**Union of Soviet Socialist Republics**

**Billion**

**Volume in cubic meters**

**Ton per annum**

**Ton per day**



**DATA BOOK**  
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<b>DATA BOOK 1</b>	<b>Collection and Transport</b>
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<b>DATA BOOK 3</b>	<b>Spasskaya Transfer Station</b>
<b>DATA BOOK 4</b>	<b>Final Disposal and Environmental Study</b>

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*DATA BOOK 1*  
*COLLECTION AND*  
*TRANSPORTATION*

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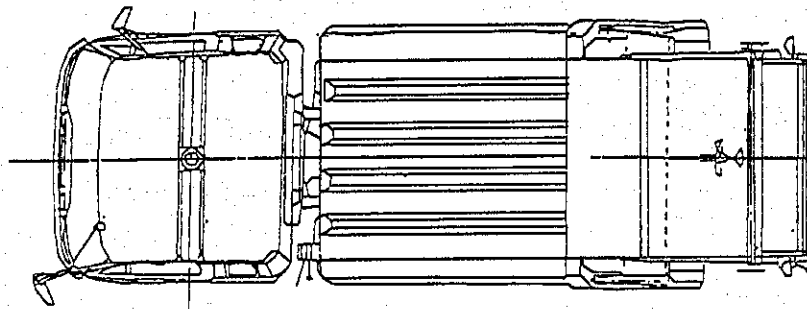
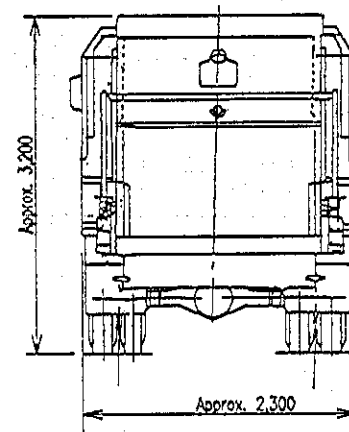
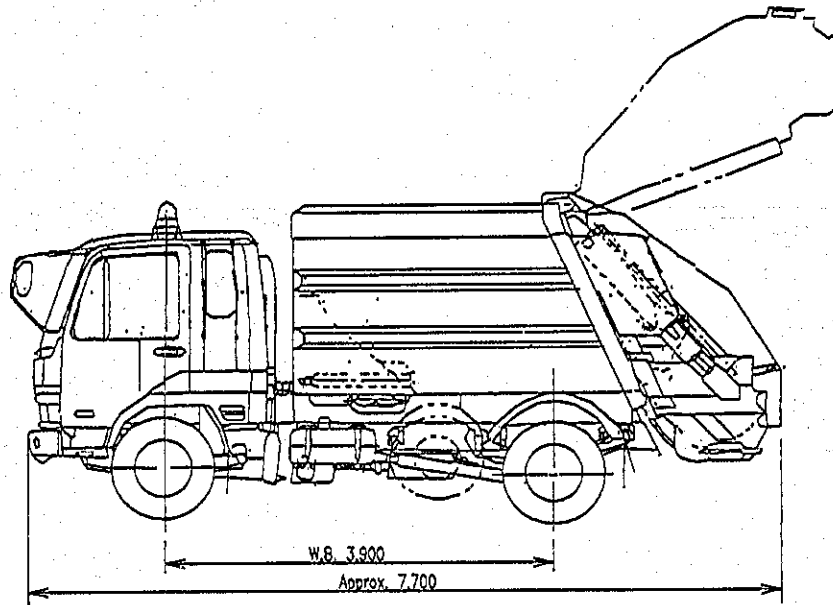
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## DATA BOOK 1

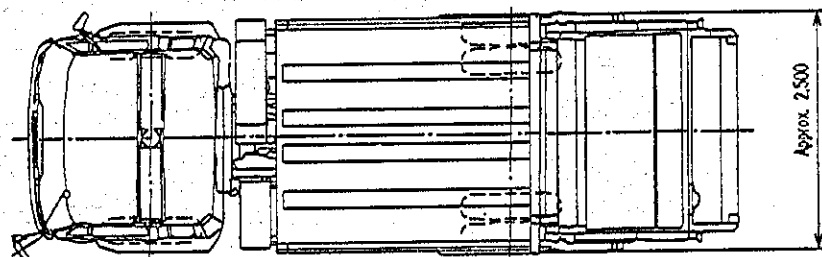
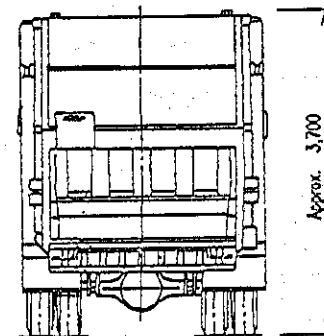
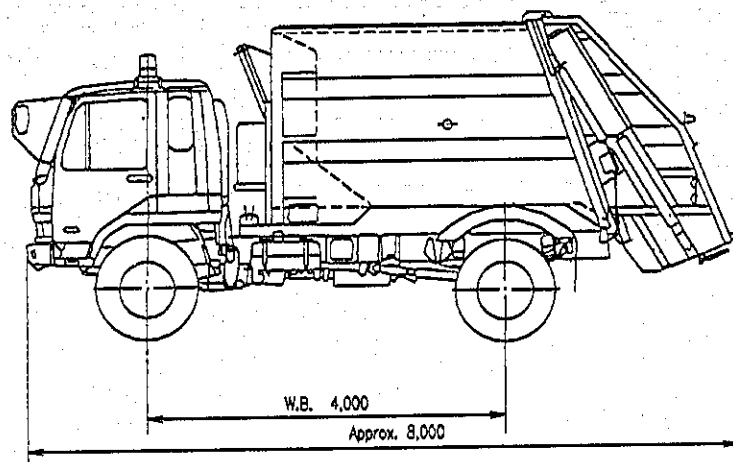
### COLLECTION AND TRANSPORTATION

Figure 1.1	Compactor Truck 8 m <sup>3</sup>
Figure 1.2	Compactor Truck 12 m <sup>3</sup>
Figure 1.3	Arm roll 6 m <sup>3</sup>
Figure 1.4	Container 6 m <sup>3</sup>
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<p>THE REPUBLIC OF KAZAKHSTAN MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT PROTECTION ALMATY CITY GOVERNMENT</p>	
<p>THE STUDY ON SOLID WASTE MANAGMENT FOR ALMATY CITY IN THE REPUBLIC OF KAZAKHSTAN</p>	
<p>Figure 1.1 Compacter 8m<sup>3</sup></p>	
SCALE	
<p>JAPAN INTERNATIONAL COOPERATION AGENCY</p>	



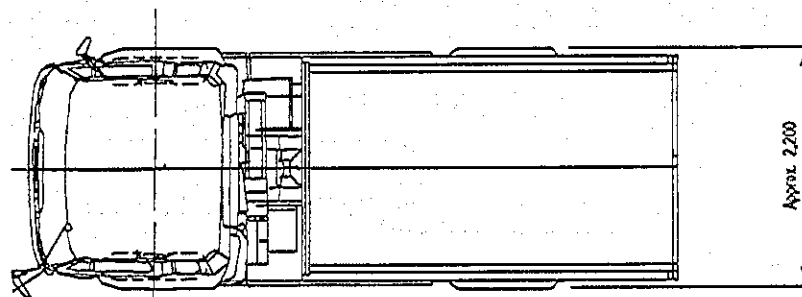
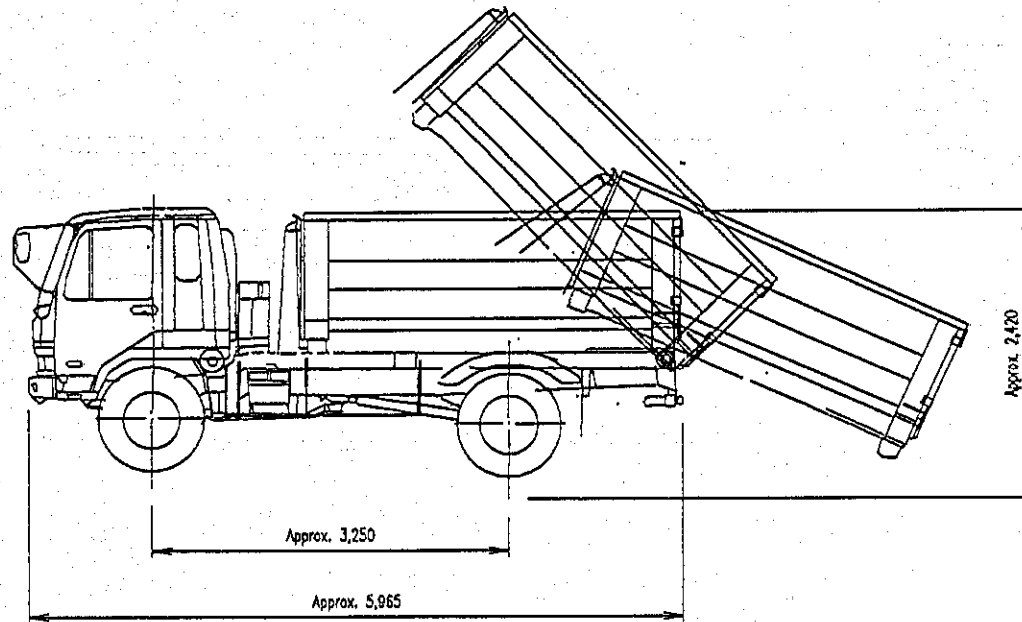
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Figure 1.2  
Compacter 12m<sup>3</sup>

SCALE

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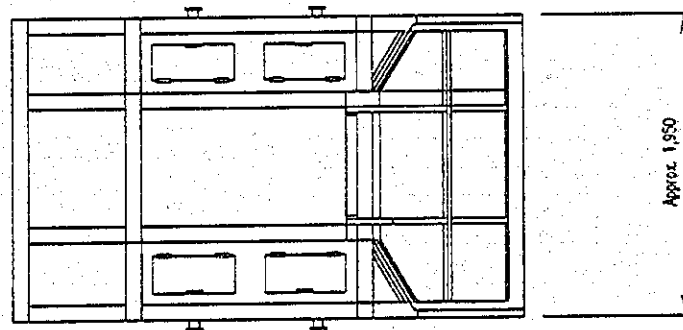
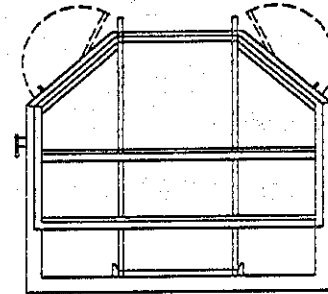
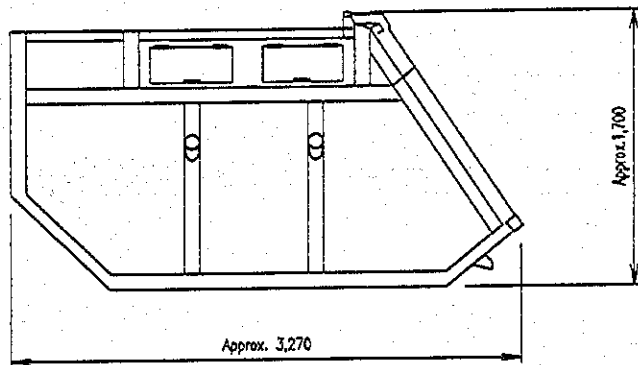
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Figure 1.3  
 Arm roll 6m<sup>3</sup>

SCALE

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THE REPUBLIC OF KAZAKHSTAN  
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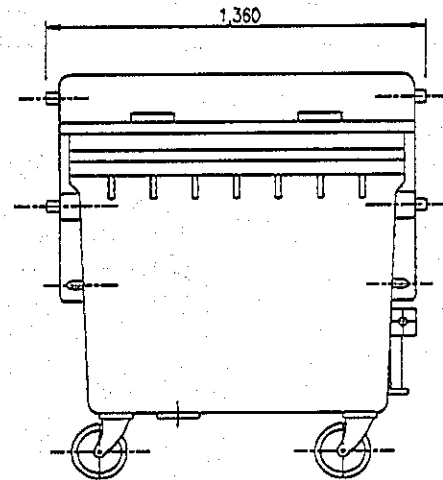
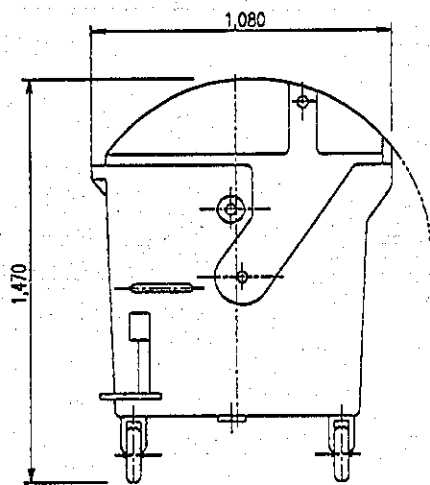
THE STUDY ON SOLID WASTE MANAGMENT FOR  
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**Figure 1.4**  
**Container 6m<sup>3</sup>**

SCALE

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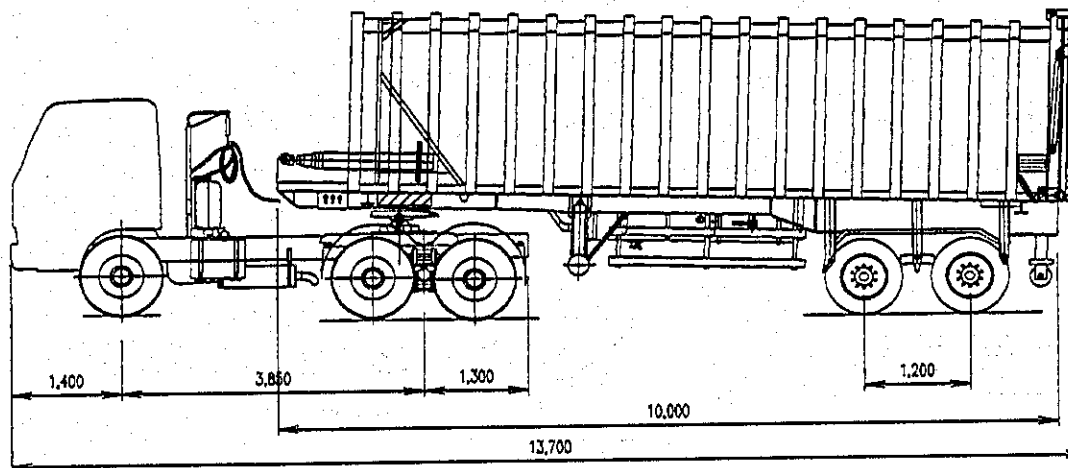
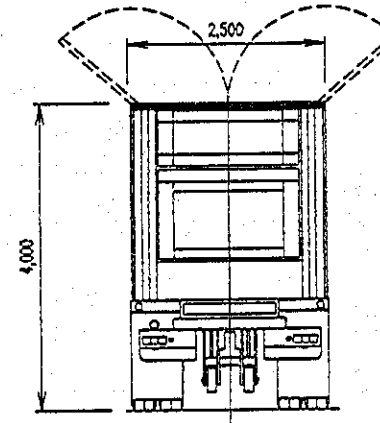
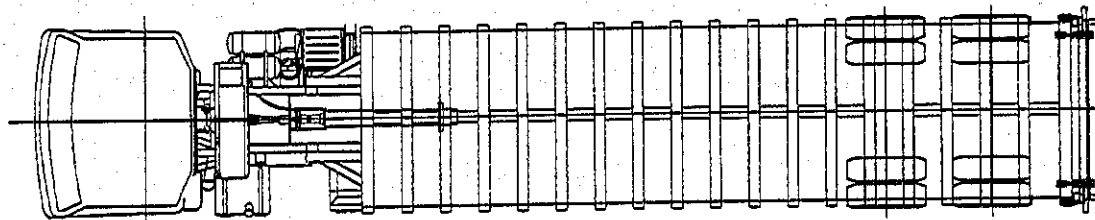
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 ALMATY CITY GOVERNMENT

THE STUDY ON SOLID WASTE MANAGEMENT FOR  
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**Figure 1.5**  
**Container 1.1m<sup>3</sup>**

SCALE

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THE REPUBLIC OF KAZAKHSTAN  
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Figure 1.6  
 Semi-trailer 40m<sup>3</sup>

SCALE

JAPAN INTERNATIONAL COOPERATION AGENCY

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***DATA BOOK 2***  
***WEST TRANSFER***  
***STATION***

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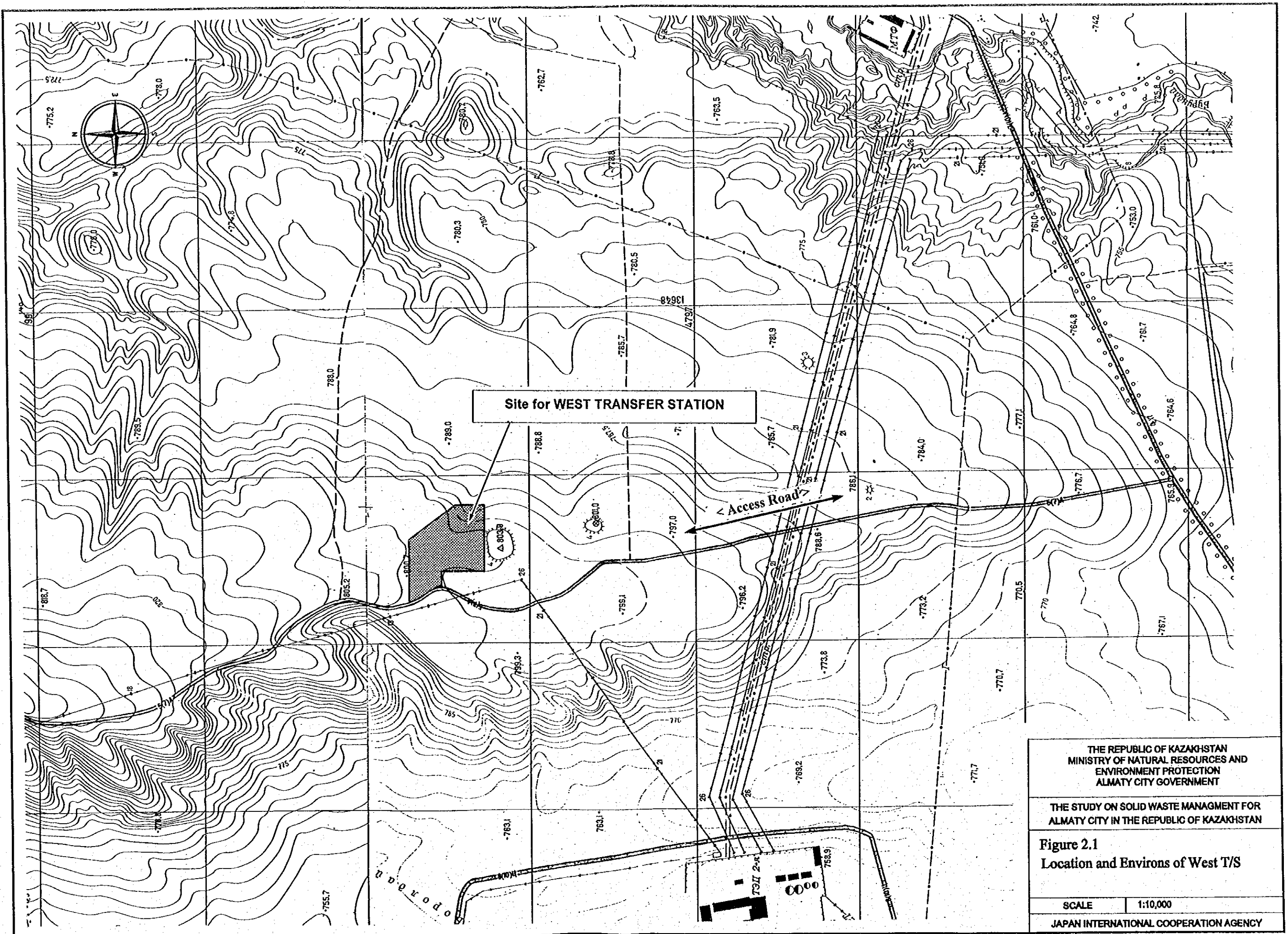
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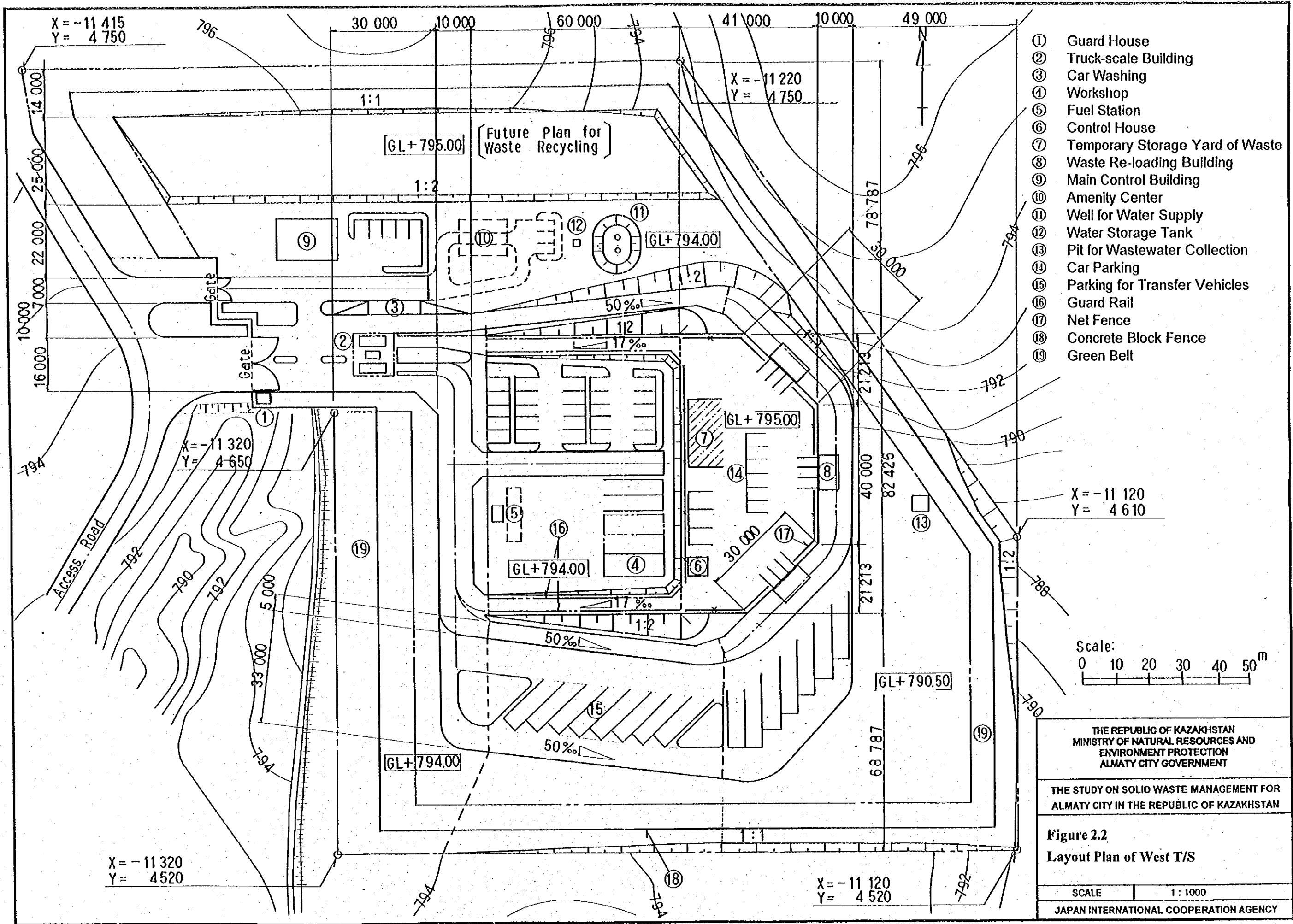
## DATA BOOK 2

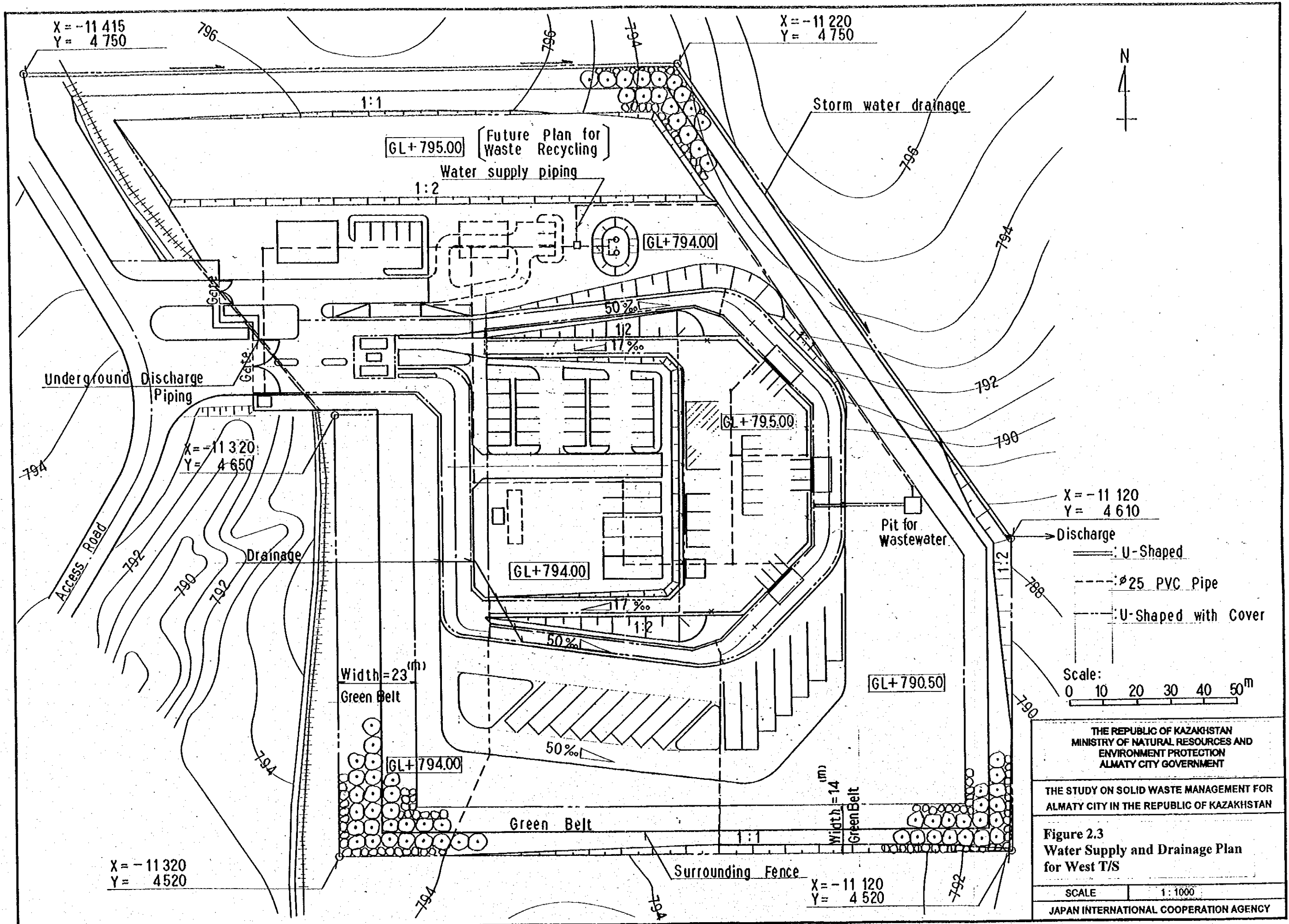
### WEST TRANSFER STATION

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Figure 2.4	Site Operation of West T/S
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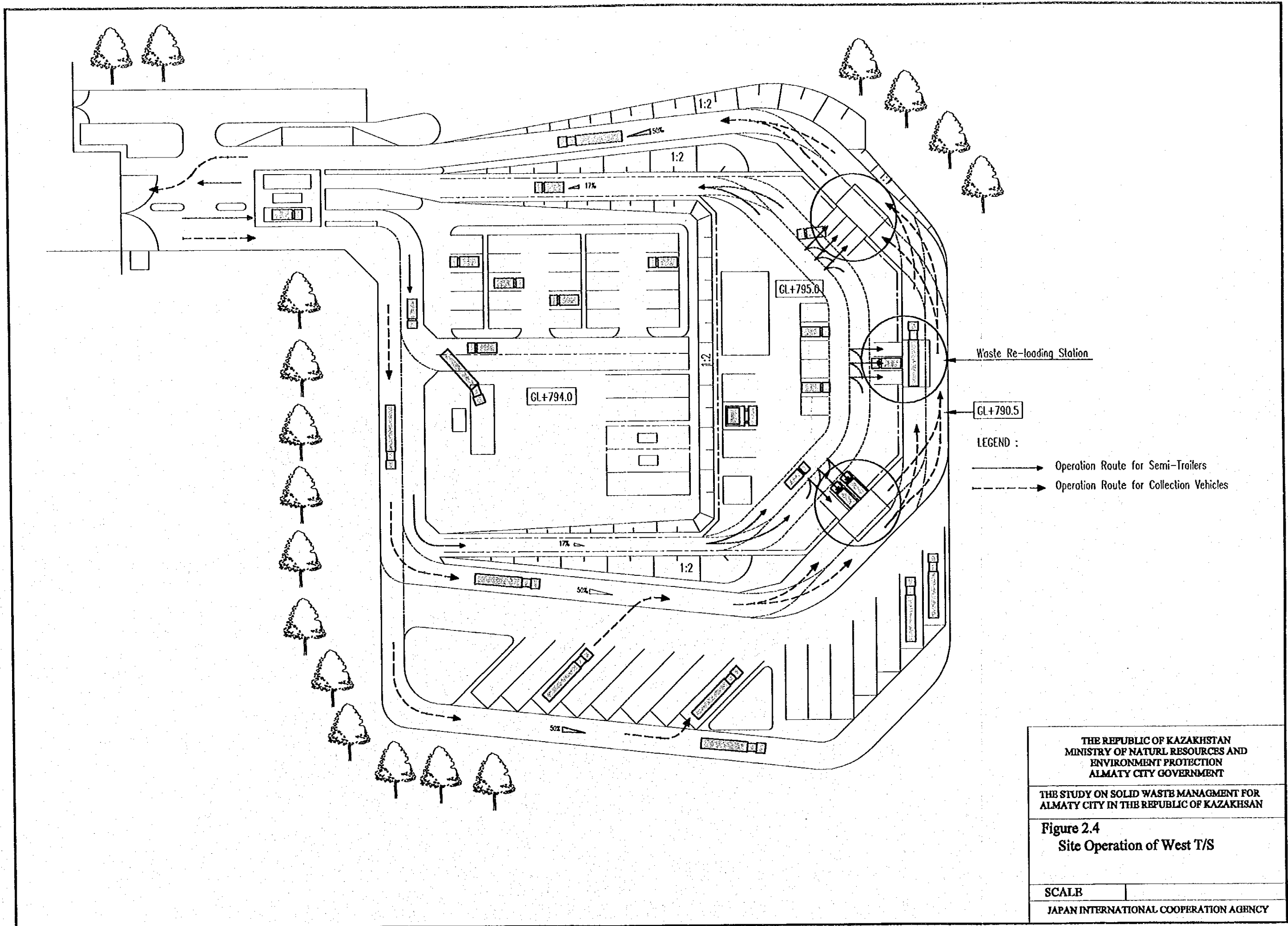












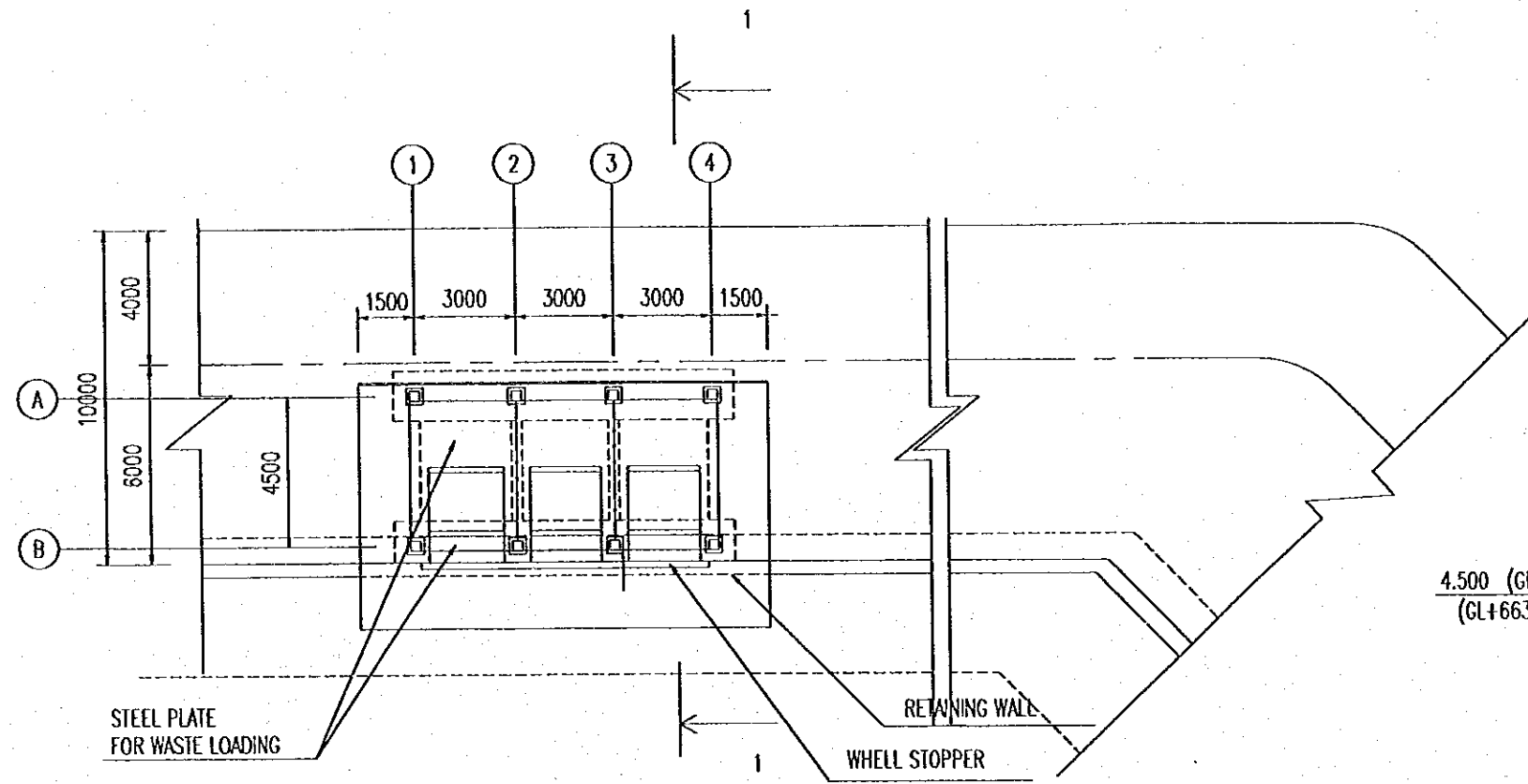
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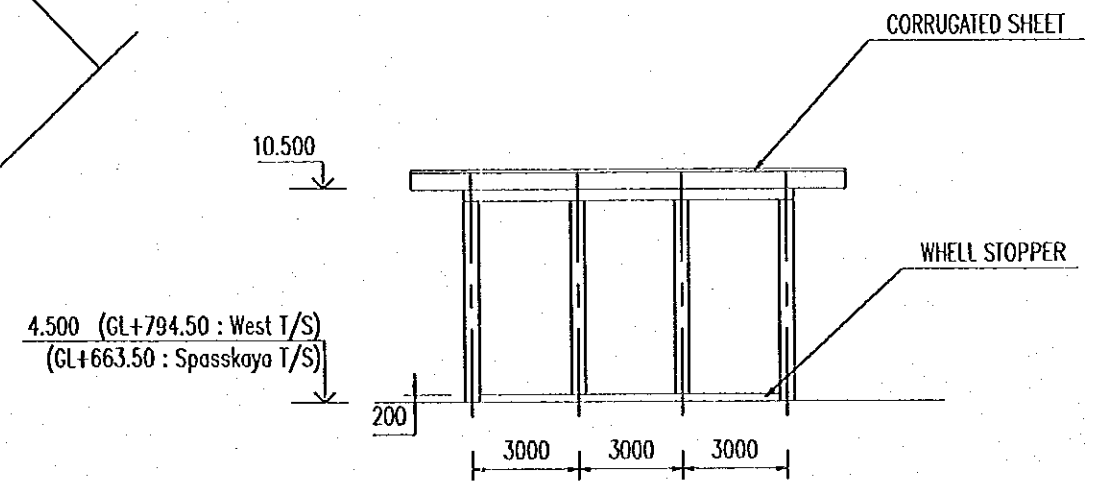
Figure 2.4  
 Site Operation of West T/S

SCALE

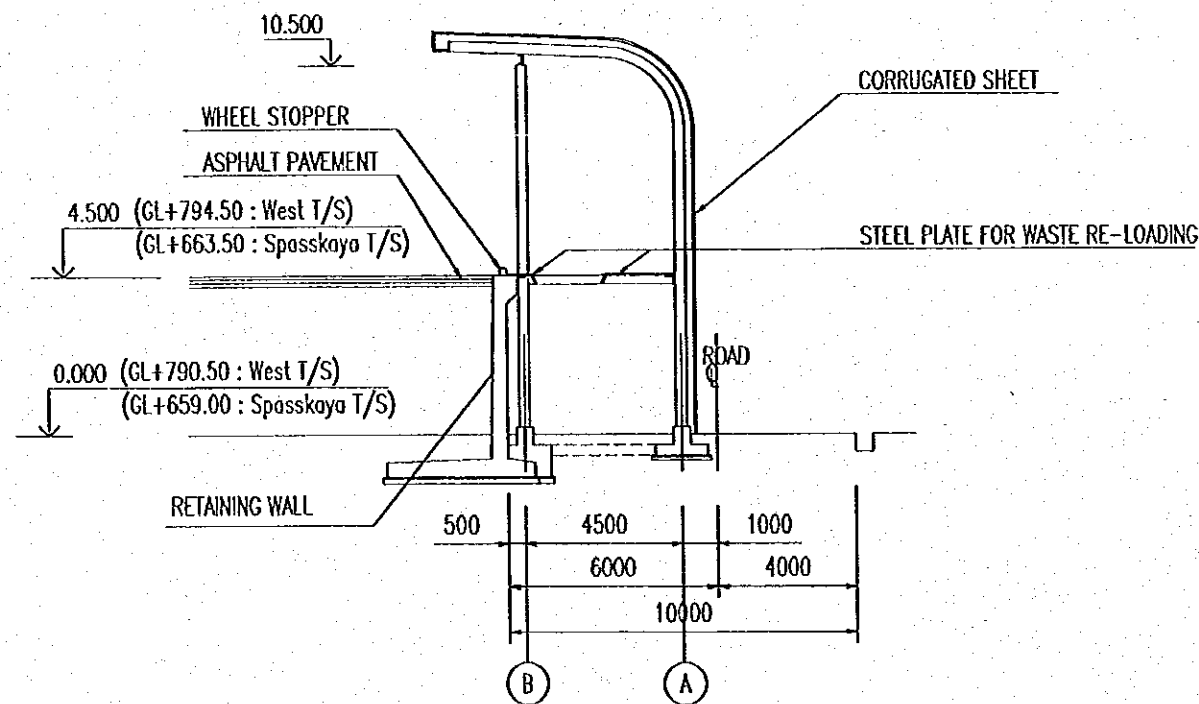
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PLAN



ELEVATION 1-4



SECTION 1-1

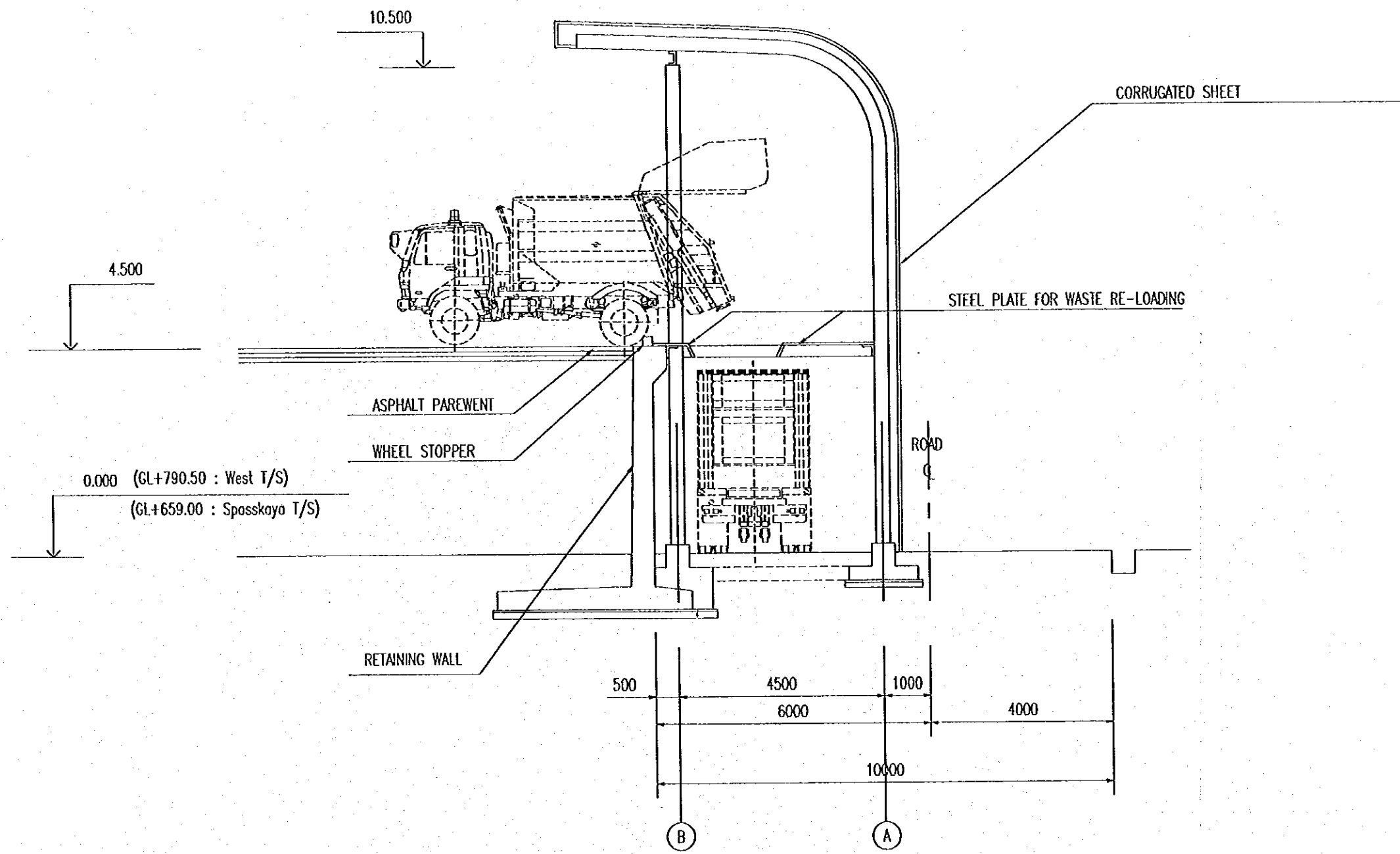
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Figure 2.5  
Waste Re-Loading Station of West &  
Spasskaya T/S

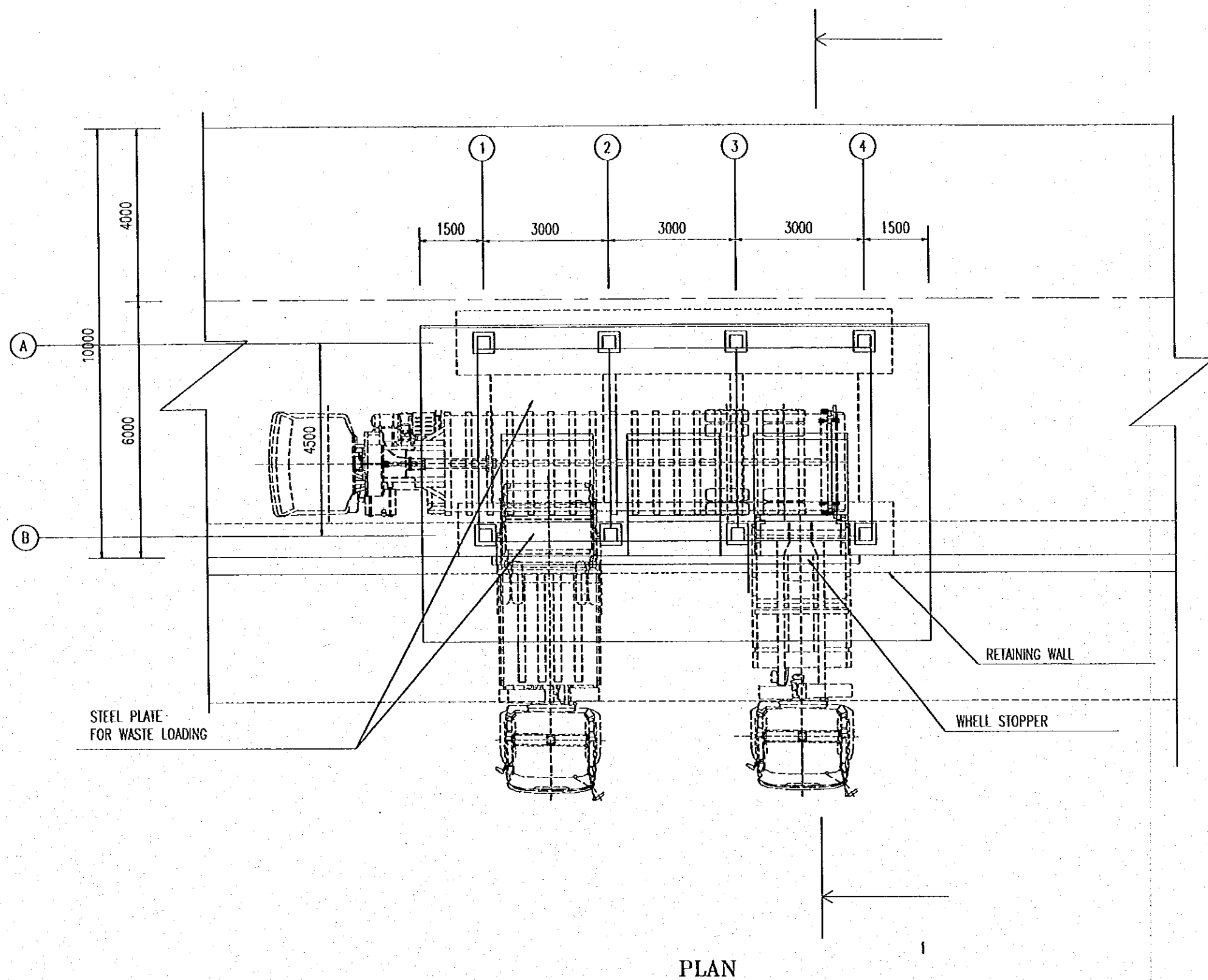
SCALE 1:200

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SECTION 1-1

THE REPUBLIC OF KAZAKHSTAN MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT PROTECTION ALMATY CITY GOVERNMENT	
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Figure 2.6 Waste Re-Loading (1/2) : Section	
SCALE	1 : 100
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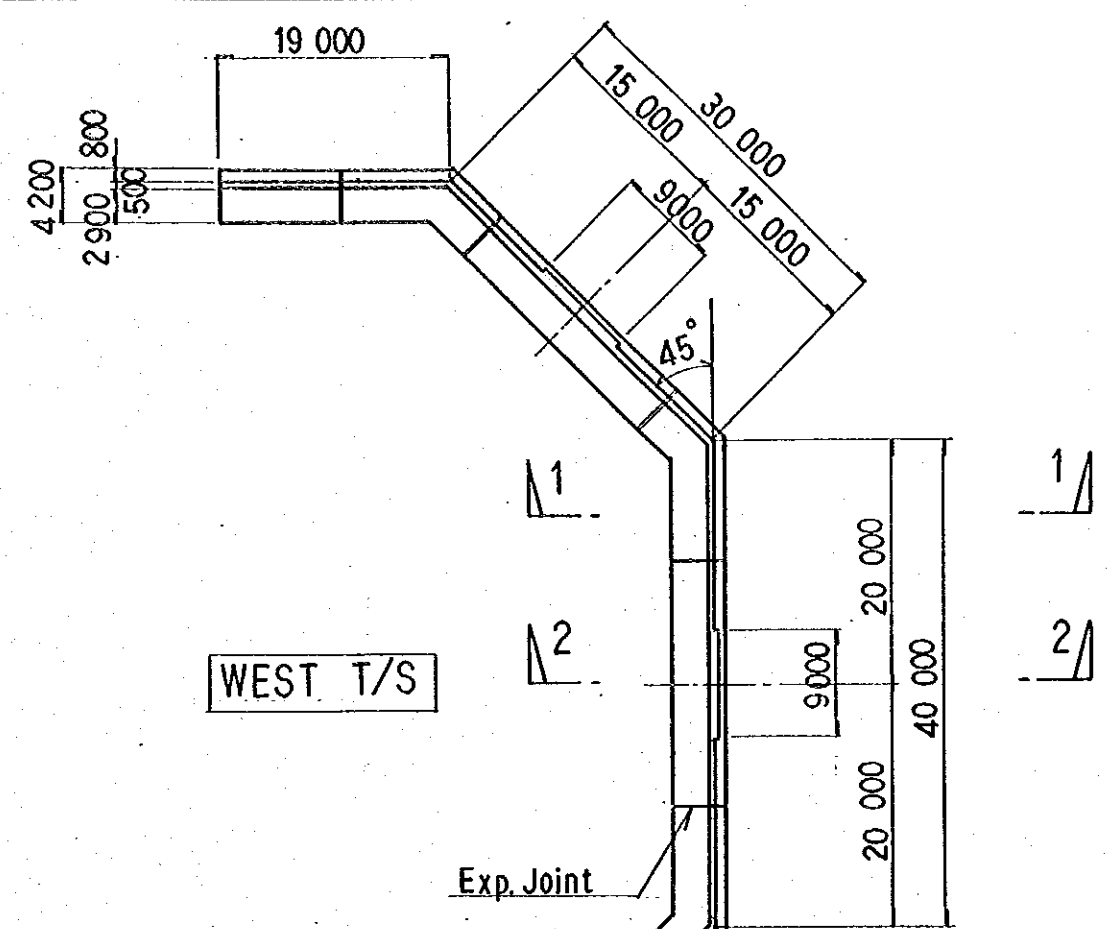
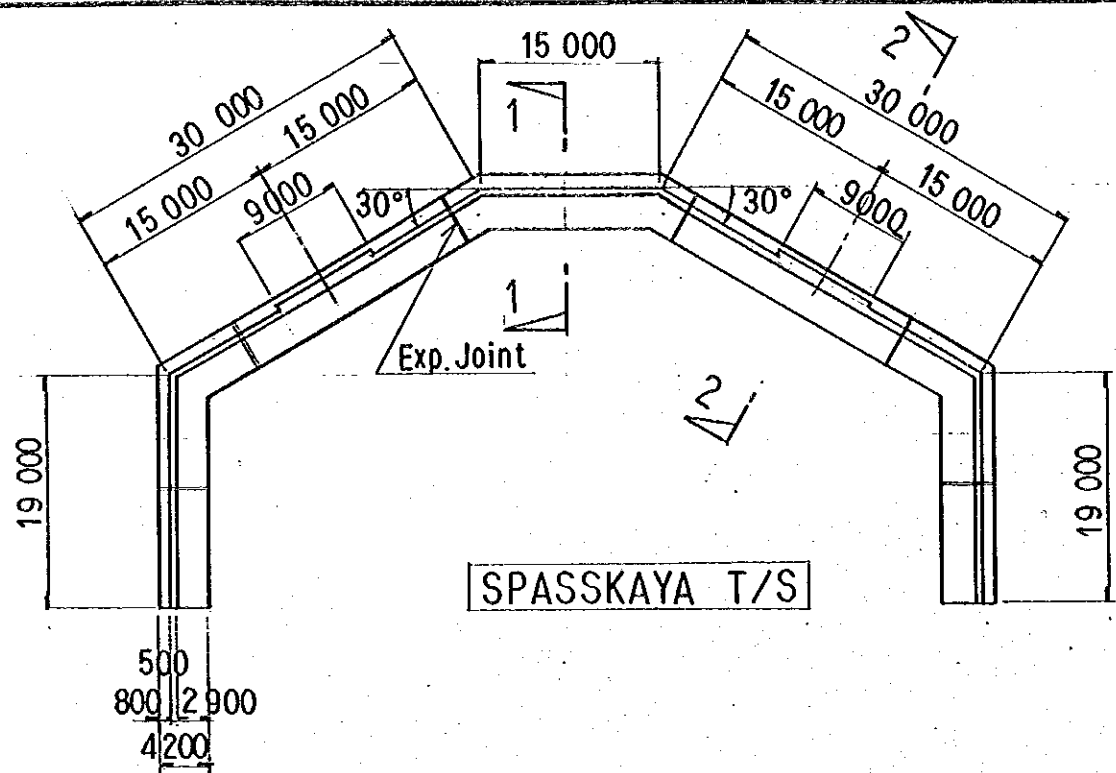
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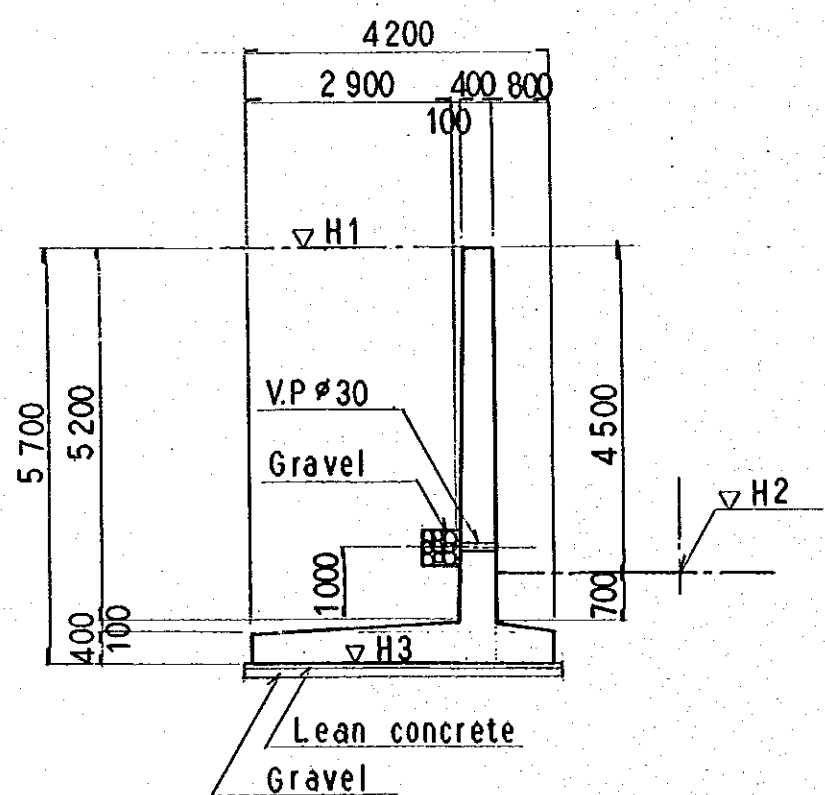
Figure 2.7  
 Waste Re-Loading (2/2) : Plan

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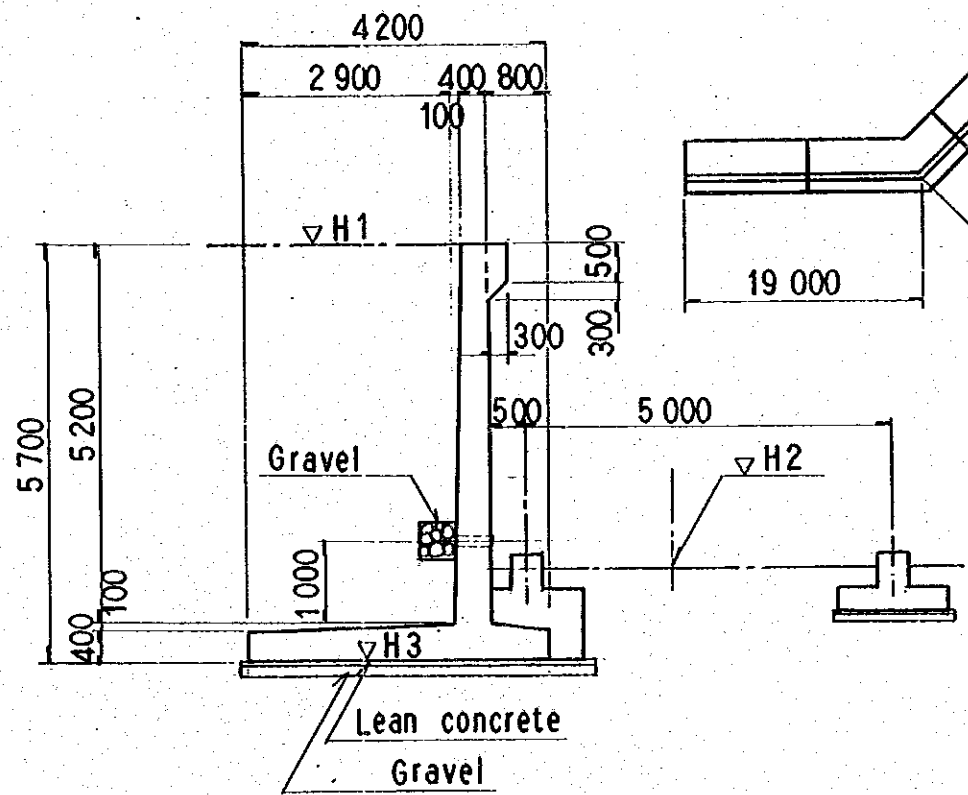
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PLAN 1/600



1 - 1 1/100



2 - 2 1/100

Level: (GL+H1~H3)

	H1	H2	H3
WEST T/S	795.00	790.50	789.30
SPASSKAYA T/S	663.50	659.00	657.80

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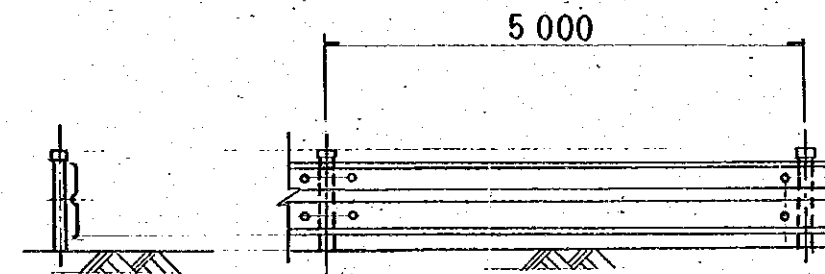
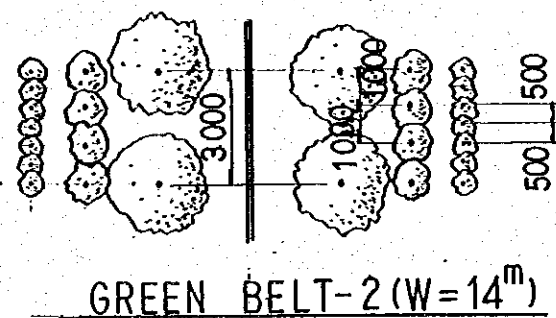
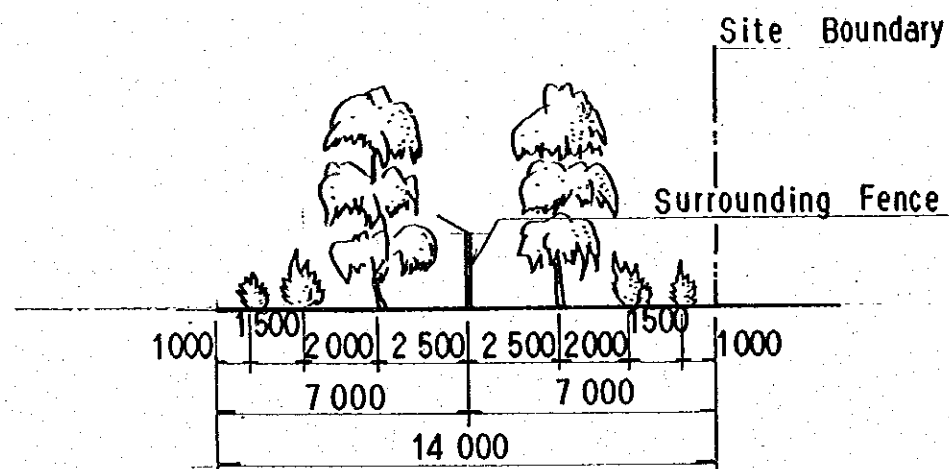
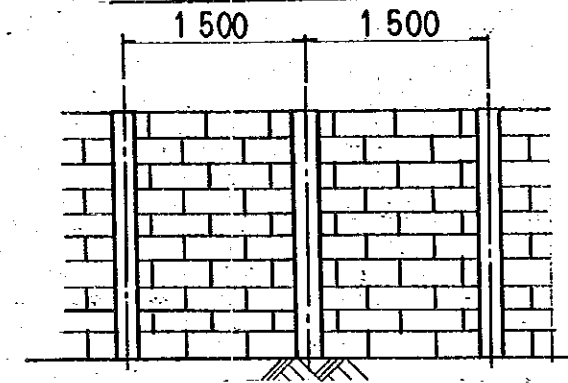
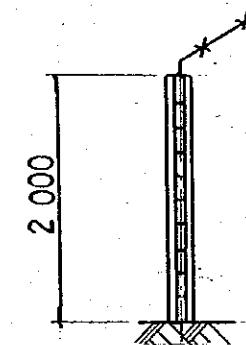
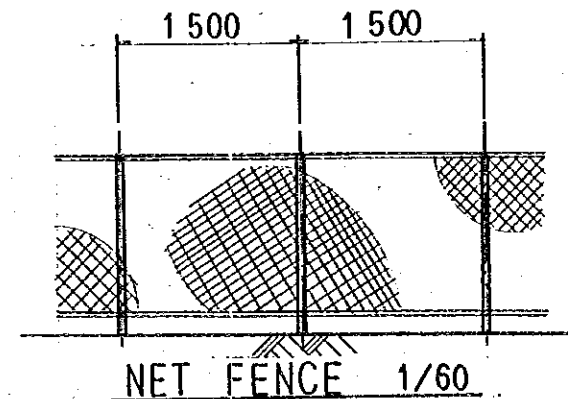
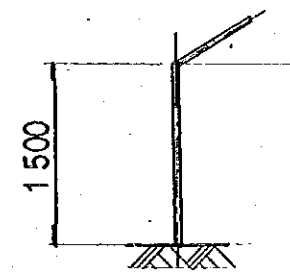
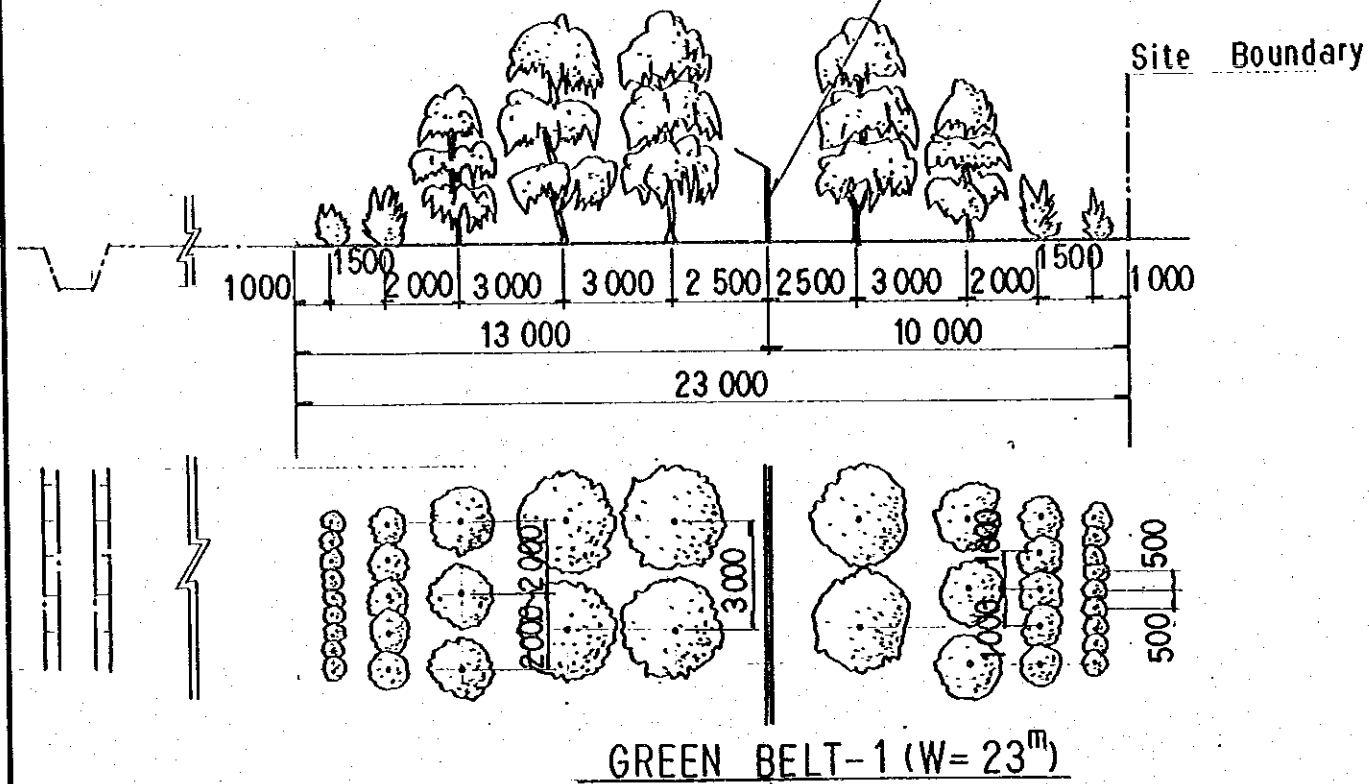
Figure 2.8  
 Details of Retaining Wall  
 for West & Spasskaya T/S

SCALE 1:100

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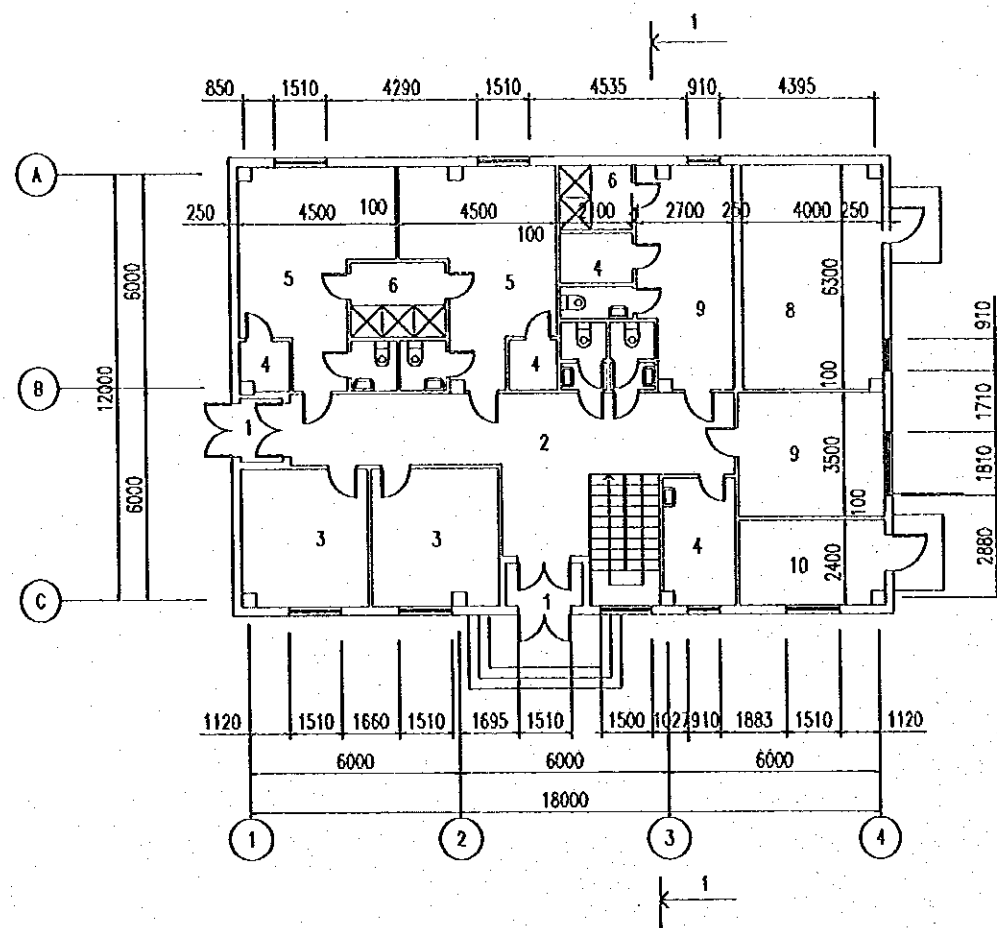
**GREEN BELT/BUFFER ZONE**

(Russian Standard of "Instruction for Sanitary Protection in Industrial Area Moscow 1984")  
Surrounding Fence

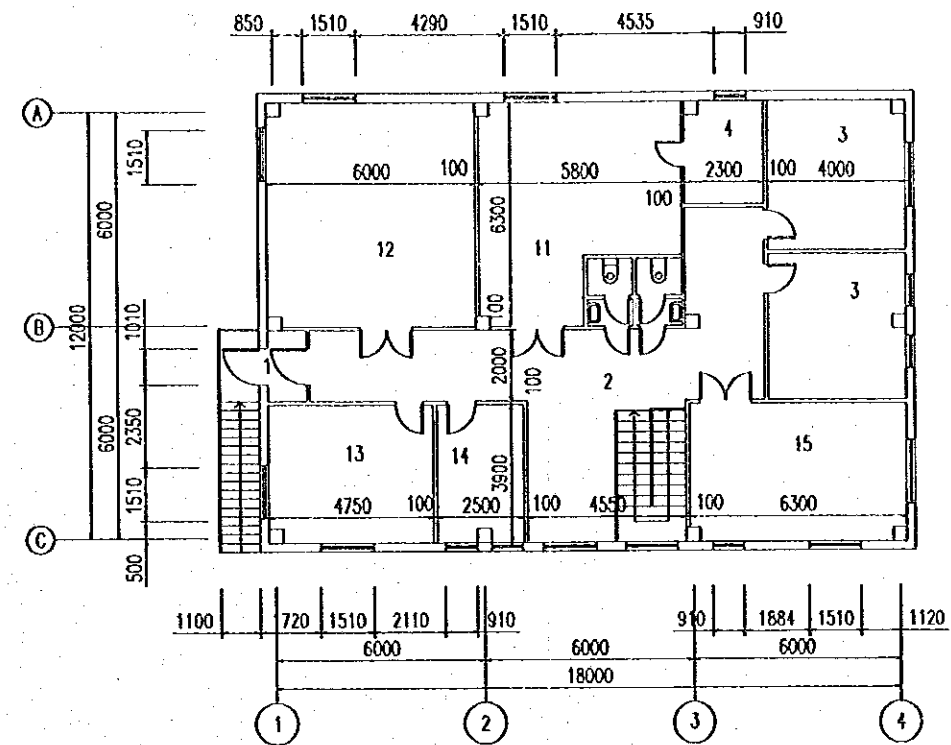


**GUARD RAIL 1/60**

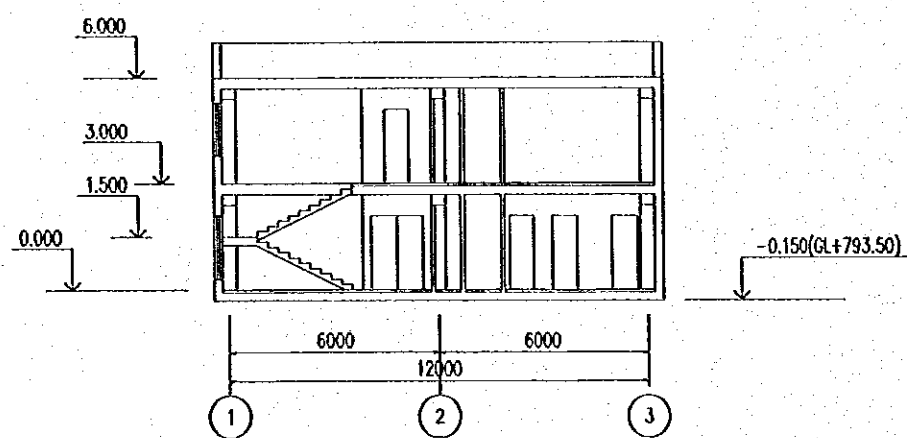
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Figure 2.9 Green Belt and Fences for West & Spasskaya T/S	
SCALE	
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1 ST FLOOR PLAN



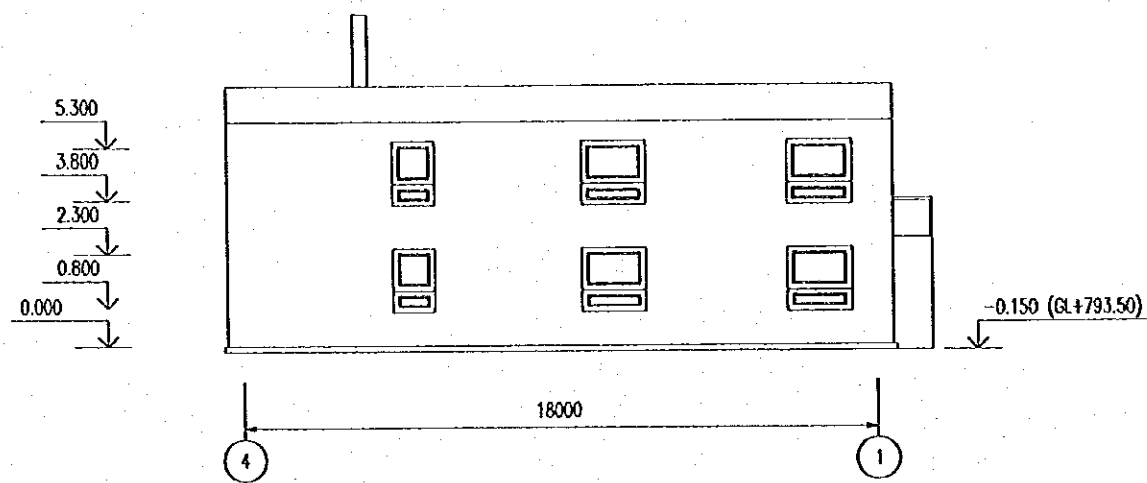
2 ND FLOOR PLAN



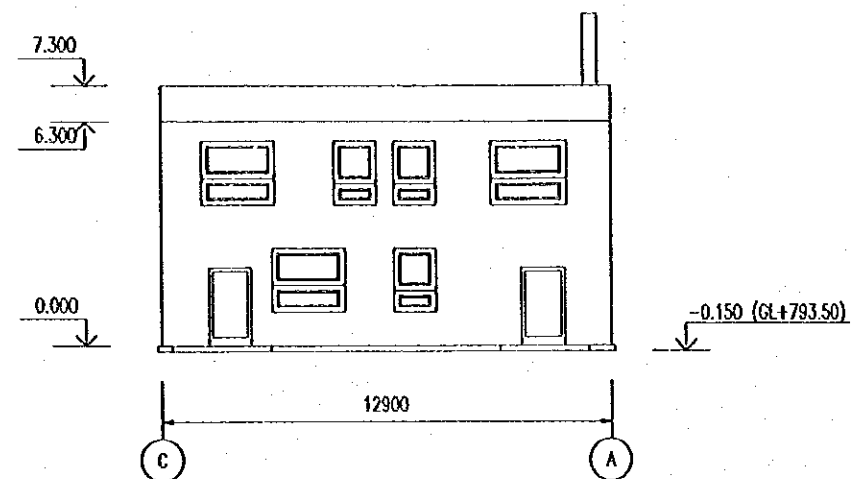
SECTION 1-1

- |   |                       |    |                      |
|---|-----------------------|----|----------------------|
| 1 | ENTRANCE              | 9  | SECURITY ROOM        |
| 2 | CORRIDOR              | 10 | FIRE EQUIPMENT STORE |
| 3 | OFFICE                | 11 | DINING ROOM          |
| 4 | STORE                 | 12 | MEETING ROOM         |
| 5 | LOCKER ROOM FOR MEN   | 13 | DIRECTOR OFFICE      |
| 6 | SHOWER                | 14 | SECRETARY            |
| 7 | LOCKER ROOM FOR WOMEN | 15 | STAFF ROOM           |
| 8 | BOILER ROOM           |    |                      |

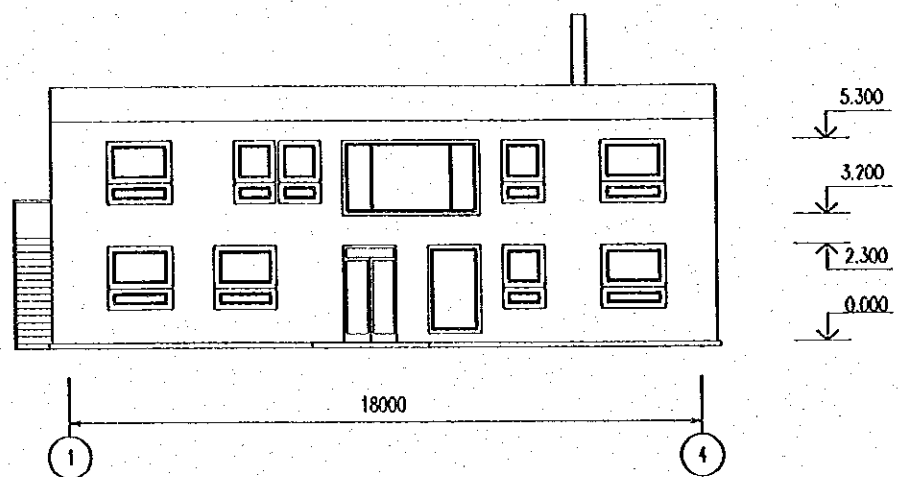
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Figure 2.10 Main Control Building of West T/S (1/2) : Elevation	
SCALE	1:200
JAPAN INTERNATIONAL COOPERATION AGENCY	



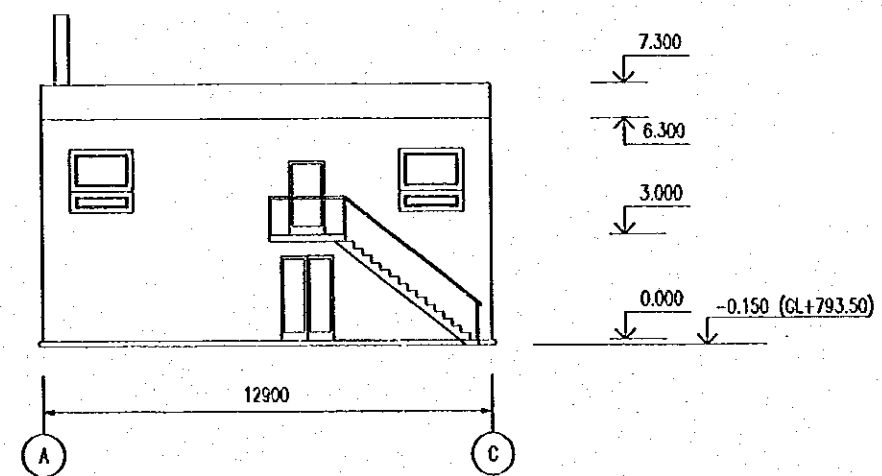
ELEVATION 4-1



ELEVATION C-A



ELEVATION 1-4



ELEVATION A-C

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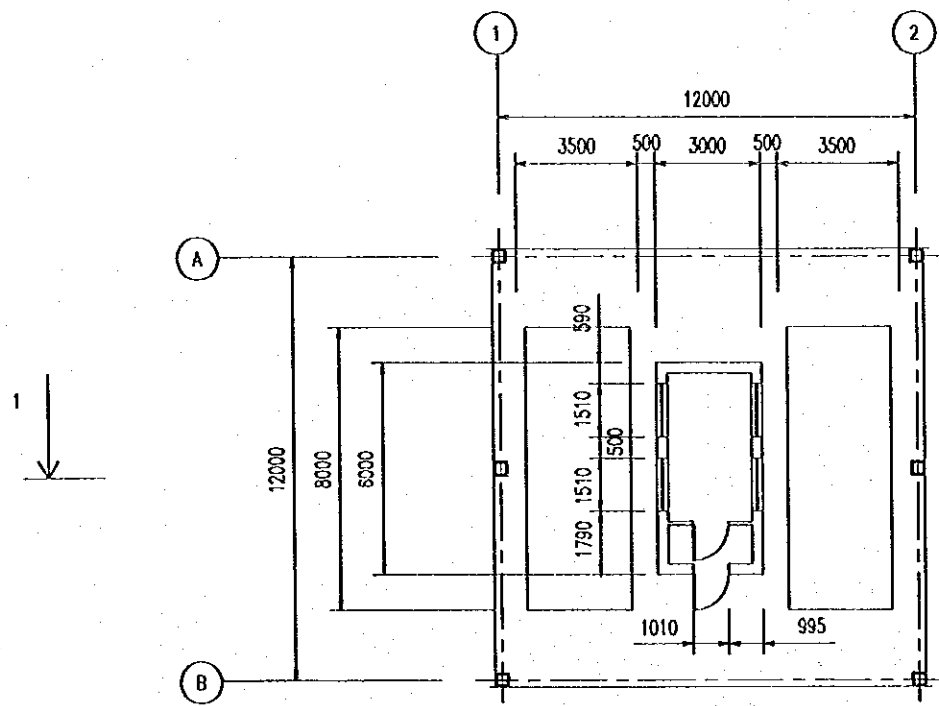
THE STUDY ON SOLID WASTE MANAGEMENT FOR  
 ALMATY CITY IN THE REPUBLIC OF KAZAKHSTAN

Figure 2.11  
 Main control building of  
 Weat T/S (2/2) : Elevation

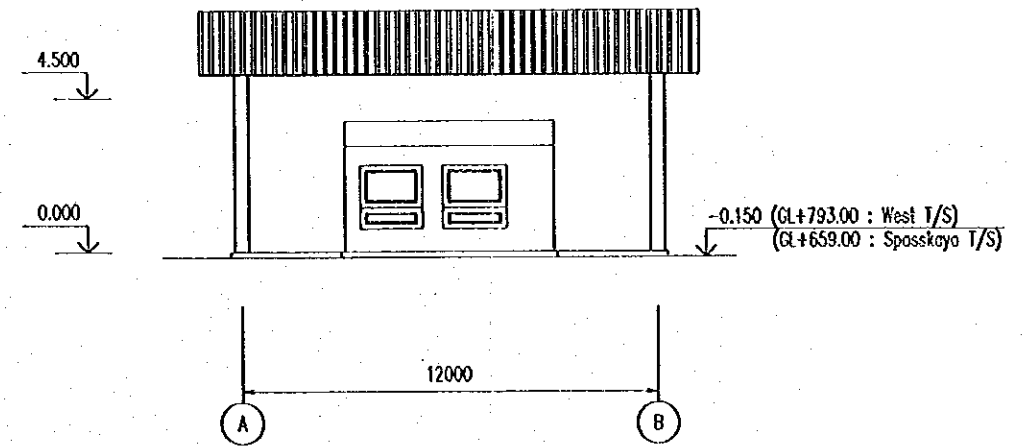
SCALE 1 : 200

JAPAN INTERNATIONAL COOPERATION AGENCY

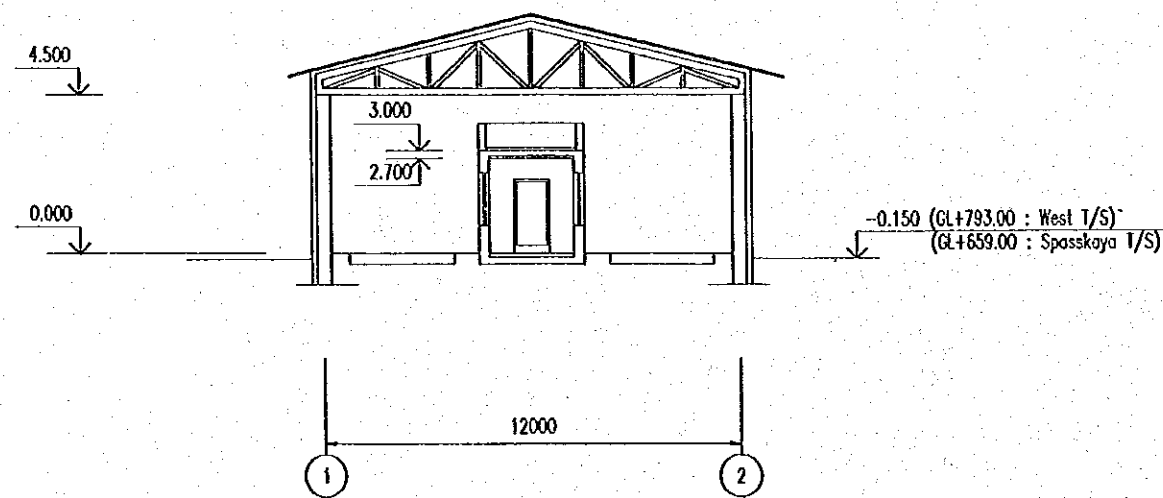




PLAN



ELEVATION A-B



SECTION 1-1

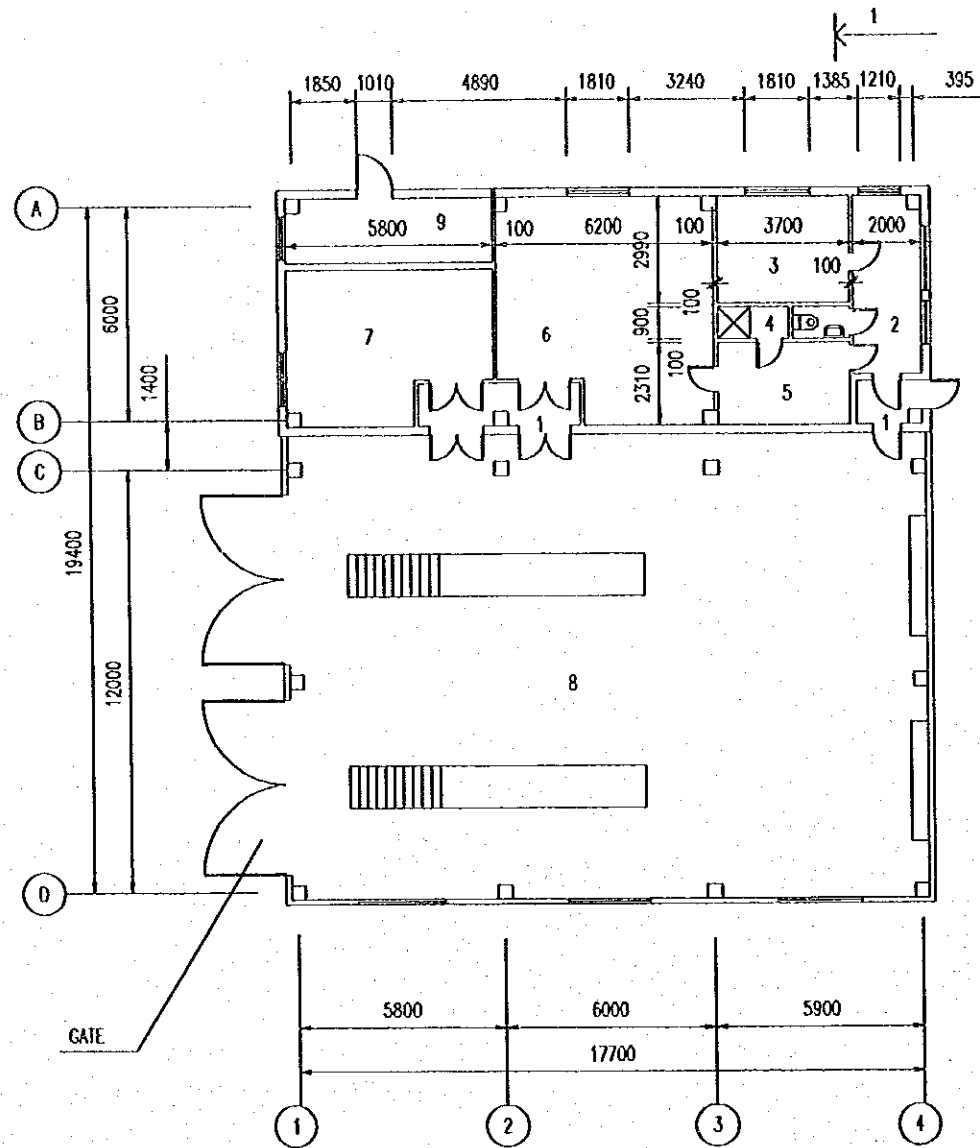
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Figure 2.12  
 Truck-scale Building of  
 West & Spasskaya T/S

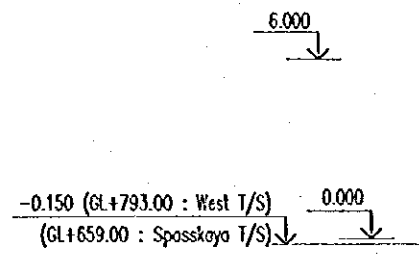
SCALE 1 : 200

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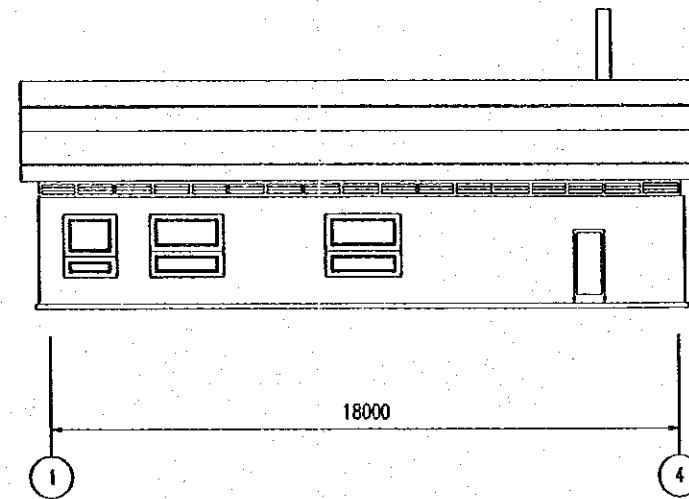


PLAN

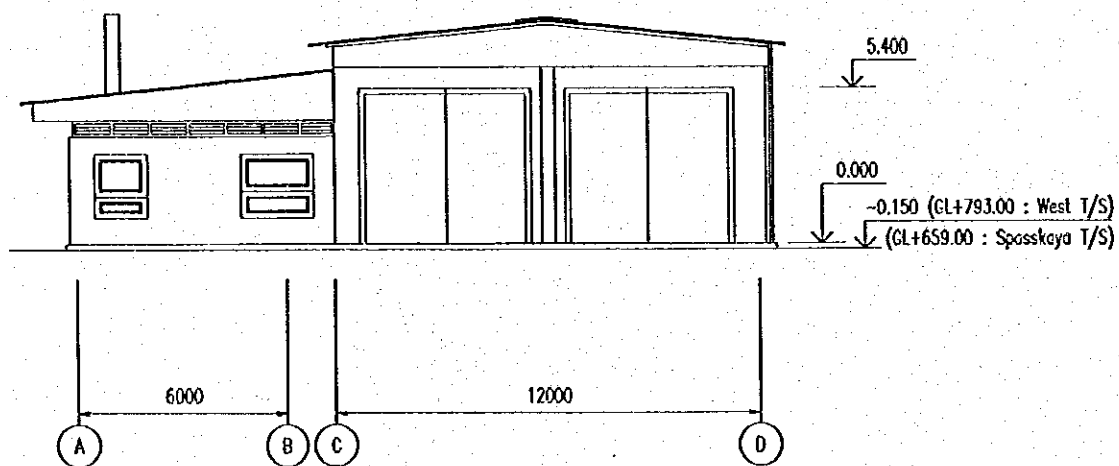
- 1 ENTRANCE
- 2 CORRIDOR
- 3 OFFICE
- 4 SHOWER
- 5 LOCKER ROOM
- 6 MAINTENANCE ROOM
- 7 STORE
- 8 WORKSHOP
- 9 BOILER



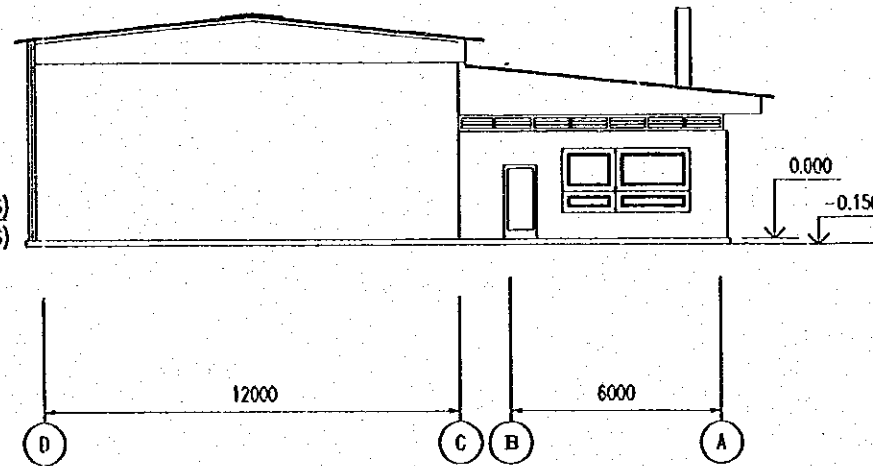
SECTION 1-1



ELEVATION 4-1

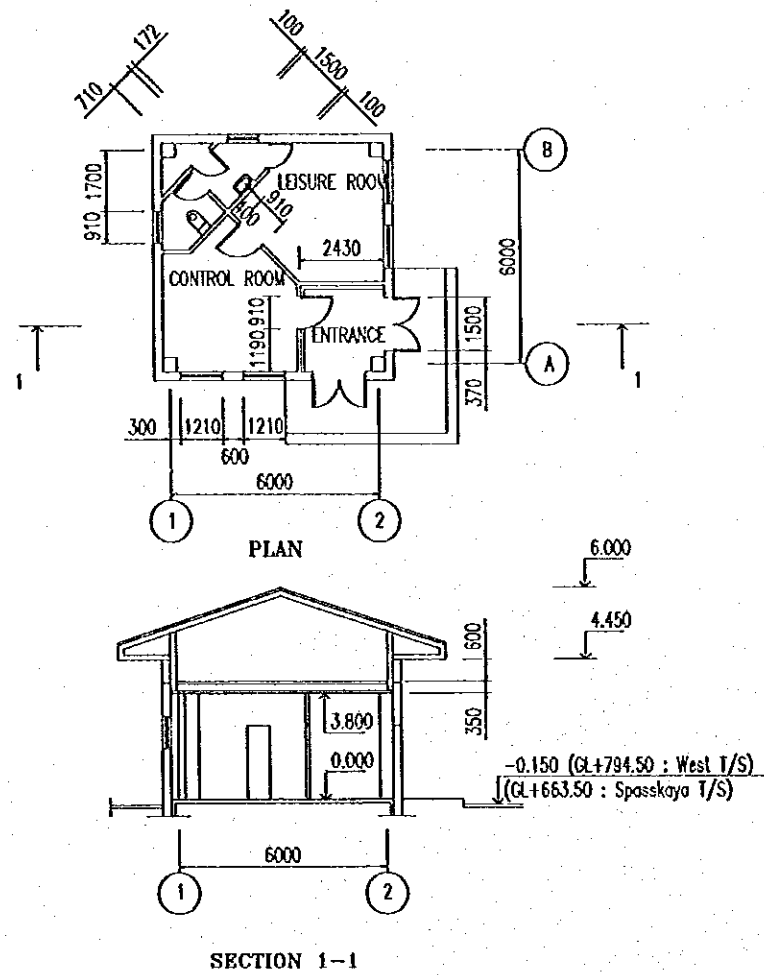


ELEVATION A-D

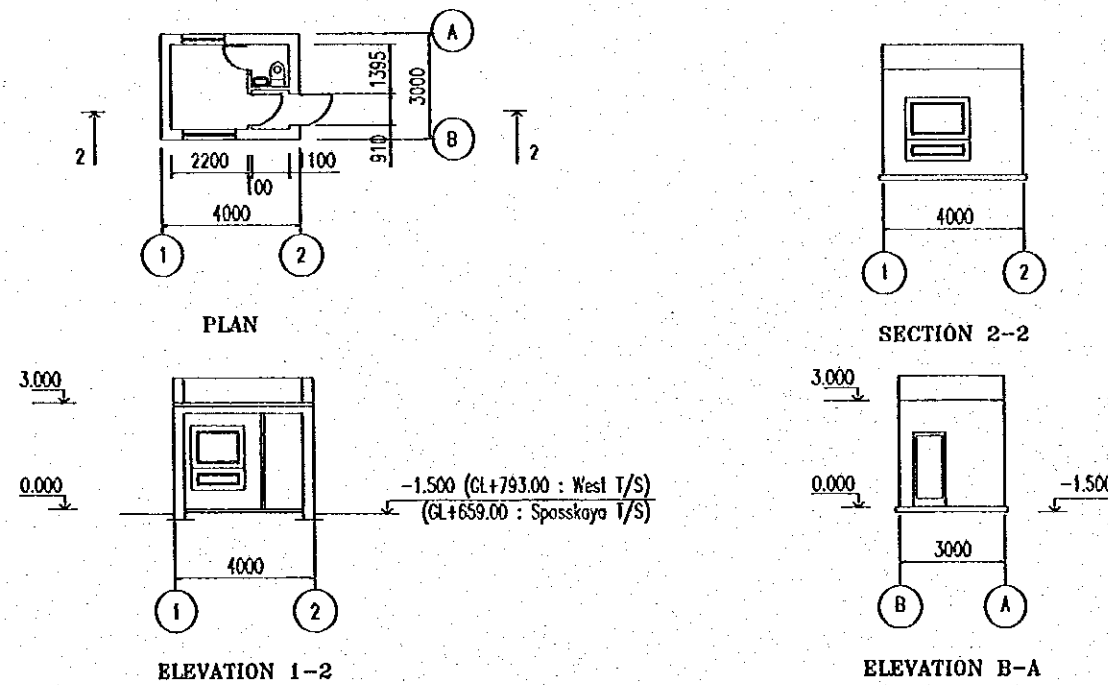


ELEVATION D-A

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THE STUDY ON SOLID WASTE MANAGMENT FOR ALMATY CITY IN THE REPUBLIC OF KAZAKHSAN	
Figure 2.13 Workshop Building of West & Spasskaya T/S	
SCALE	1 : 200
JAPAN INTERNATIONAL COOPERATION AGENCY	

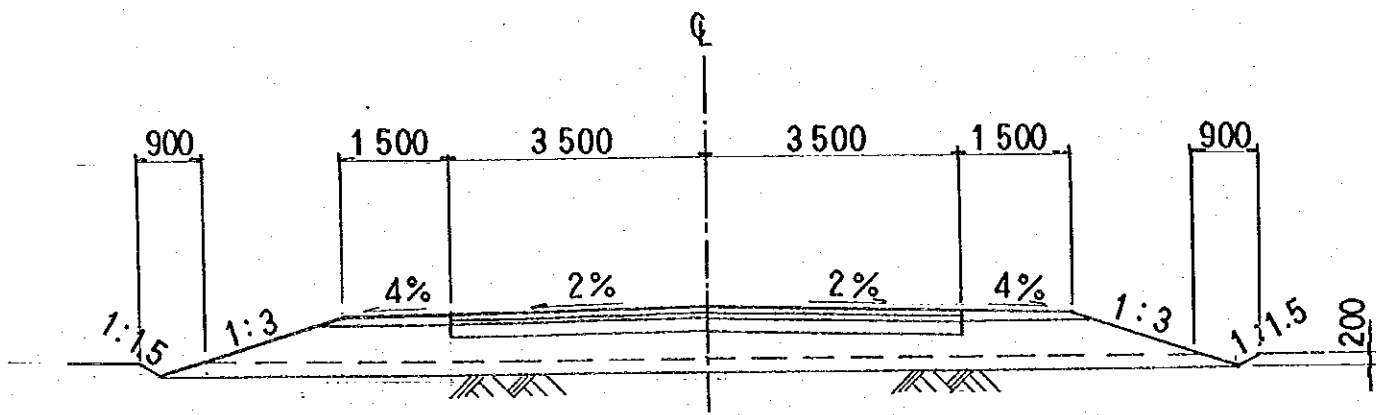


**CONTROL HOUSE**

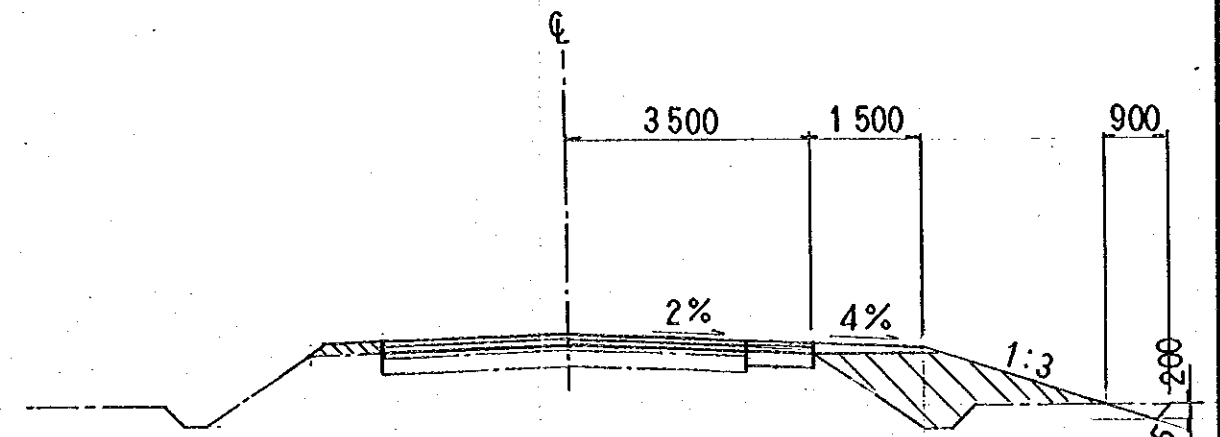


**GUARD HOUSE**

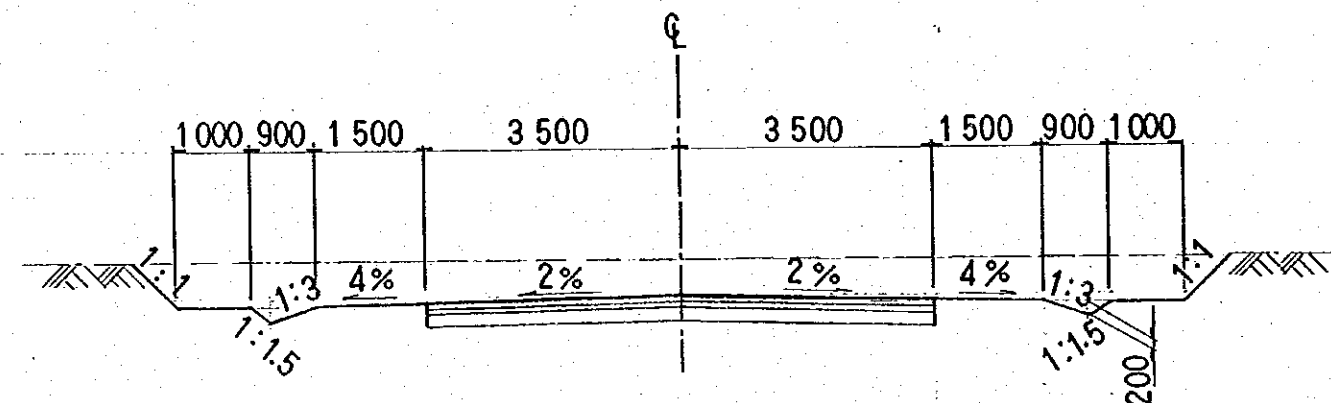
THE REPUBLIC OF KAZAKHSTAN MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT PROTECTION ALMATY CITY GOVERNMENT	
THE STUDY ON SOLID WASTE MANAGEMENT FOR ALMATY CITY IN THE REPUBLIC OF KAZAKHSTAN	
Figure 2.14 Control house & Guard House of West & Spasskaya T/S	
SCALE	1 : 200
JAPAN INTERNATIONAL COOPERATION AGENCY	



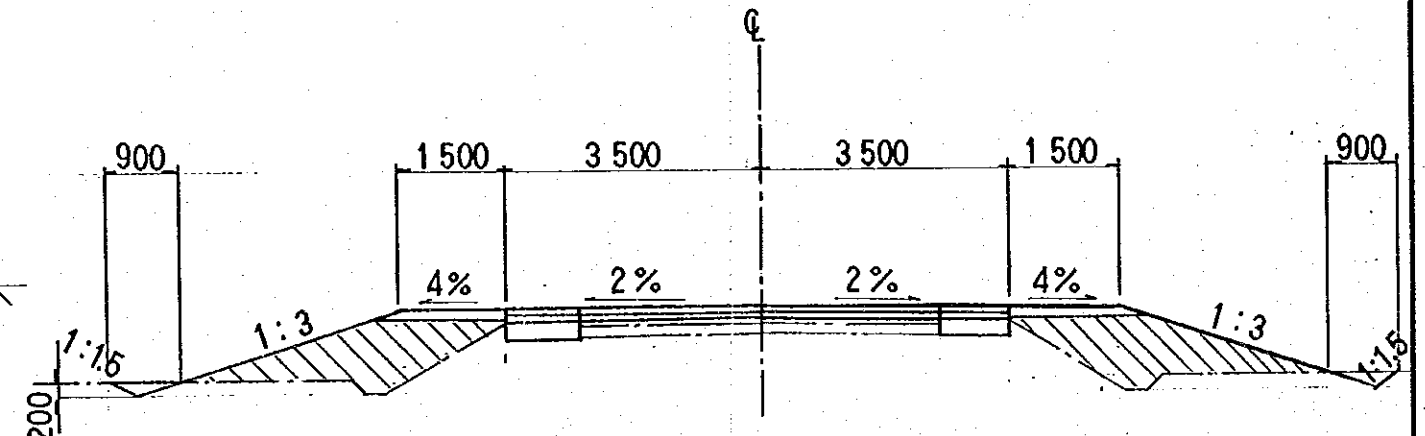
BANK



ONE SIDE WIDENING



CUT

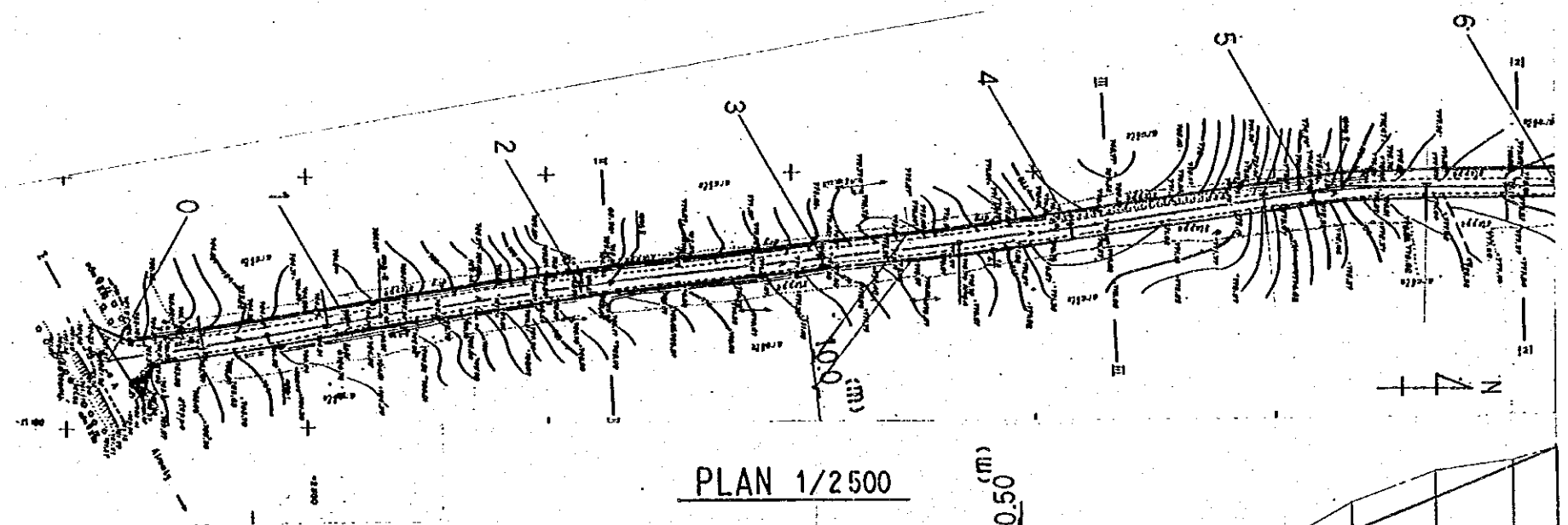


BOTH SIDE WIDENING

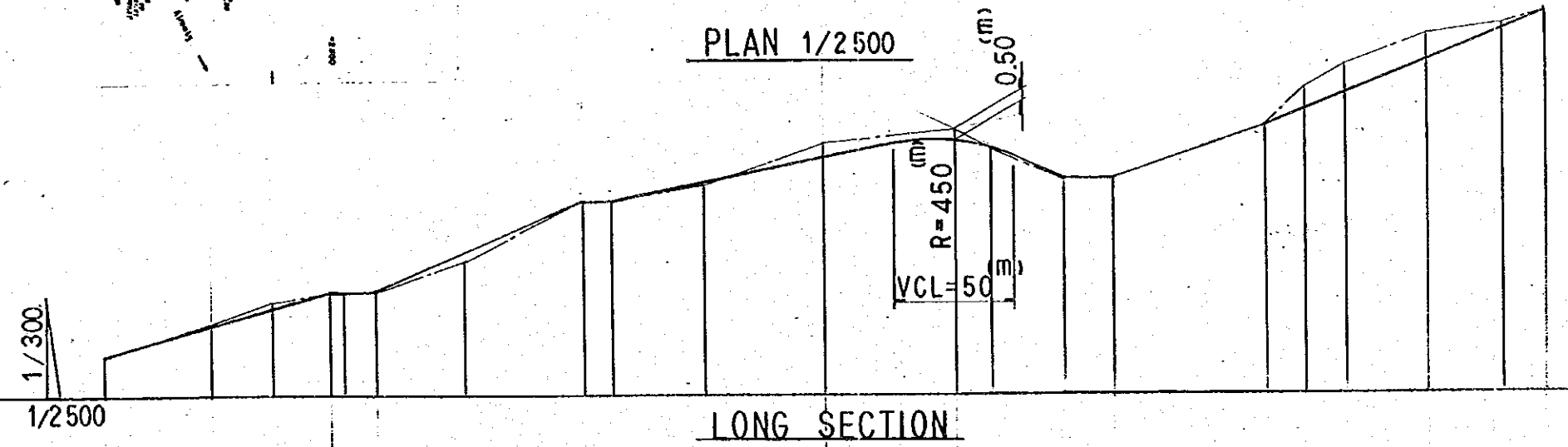
TYPICAL SECTION OF ACCESS ROAD 1/100  
(Russian Standard: SNIP 2.07.01-89)

IMPROVEMENT METHOD OF ACCESS ROAD 1/100  
(Russian Standard: VSN 46-72)

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THE STUDY ON SOLID WASTE MANAGEMENT FOR ALMATY CITY IN THE REPUBLIC OF KAZAKHSTAN	
Figure 2.15 Typical Section of Access Road for West & Spasskaya T/S	
SCALE	1:100
JAPAN INTERNATIONAL COOPERATION AGENCY	



Circular Curves			
ANG. 1	0+69.81	I(deg.) 2°56'	B.C = 0 + 44.21 E.C = 0 + 95.41 R(m) = 1000 TL(m) = 25.60 CL(m) = 51.20 SL(m) = 0.33
ANG. 5	5+16.98	I(deg.) 7°38'	B.C = 4 + 83.62 E.C = 5 + 50.34 R(m) = 500 TL(m) = 33.36 CL(m) = 68.61 SL(m) = 1.11
ANG. 6	6+29.88	I(deg.) 11°00'	B.C = 5 + 81.74 E.C = 6 + 78.02 R(m) = 500 TL(m) = 48.14 CL(m) = 95.99 SL(m) = 2.31



(%) GRADIENT		32.0(‰) 95(m)		0 18	51.7 87	0 12	24.5 143	4.5 5.6	0 20	42.2 64	47.4 116										
(m) ESTIMATED ELEVATION	761.96	763.37	764.20	765.00	765.00	766.91	769.50	769.50	770.43	771.65	773.00	772.00	770.50	770.50	773.20	773.96	774.76	776.33	777.85	778.70	
(m) ELEVATION	761.96	763.51	764.53	764.95	764.95	766.49	769.49	769.52	770.23	772.30	772.97	772.00	770.55	770.50	773.20	775.00	776.10	777.50	778.10	778.70	
(m) DISTANCE	0	44.0	26.0	25.0	5.0	13.0	37.0	50.0	12.0	38.0	50.0	55.0	15.0	30.0	20.0	64.0	16.0	17.0	33.0	32.0	18.0
NO.	0			1				2			3			4			5			6	
DIRECTS AND CURVES IN PLAN		ANG. 1 I=2°56'		ANG. 2 I=3°23'		ANG. 3 I=1°12'		ANG. 4 I=1°43'		ANG. 5 I=7°38'	ANG. 6 I=11°00'										

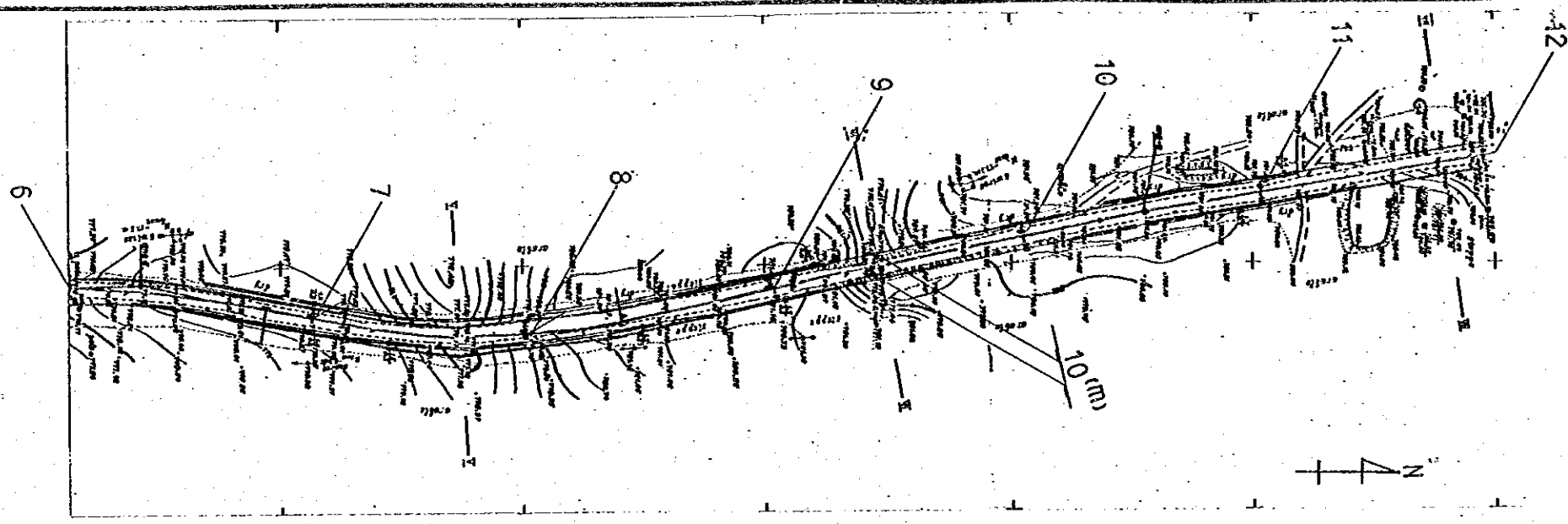
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ENVIRONMENT PROTECTION  
ALMATY CITY GOVERNMENT

THE STUDY ON SOLID WASTE MANAGEMENT FOR  
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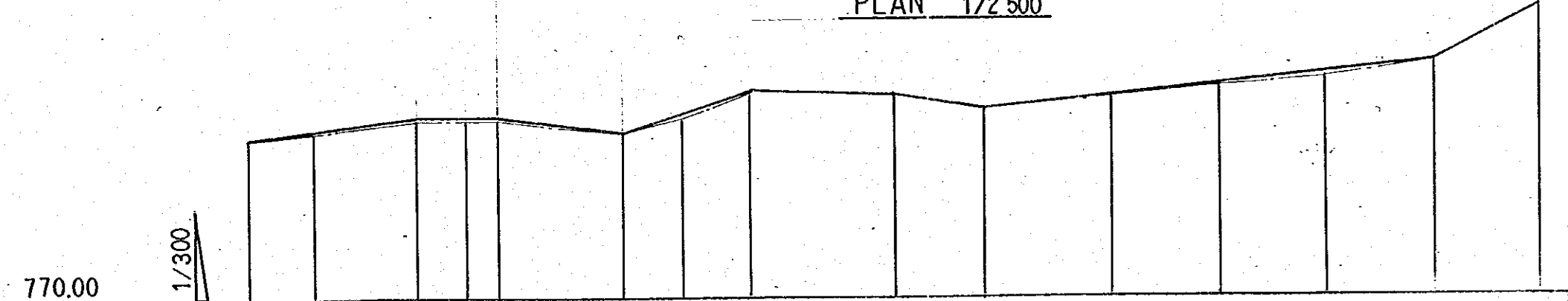
Figure 2.16  
Access Road Improvement Plan  
for West T/S (1/4)

SCALE

JAPAN INTERNATIONAL COOPERATION AGENCY



PLAN 1/2 500



LONG SECTION

Circular Curves				
ANG. 6	6+29.88	I(deg.)	11°00'	B.C = 5 + 81.74
				E.C = 6 + 78.02
				R(m) = 500
				TL(m) = 48.14
				CL(m) = 95.99
				SL(m) = 2.31
ANG. 7	7+73.22	I(deg.)	22°15'	B.C = 7 + 14.23
				E.C = 8 + 32.21
				R(m) = 300
				TL(m) = 58.99
				CL(m) = 116.50
				SL(m) = 5.75

(%) GRADIENT		15.4(‰) 78 (m)	0 36	15.3 59	39.7 58	2.9 99	17.5 40		11.4 210		58.0 50					
(m) ESTIMATED ELEVATION	778.70	779.16	779.90	779.90	779.90	779.00	780.08	781.30	781.10	780.40	781.08	781.66	782.22	782.80	785.70	
(m) ELEVATION	778.70	779.09	779.80	779.87	779.83	778.98	779.78	781.32	781.12	780.37	781.10	781.57	781.90	782.80	785.69	
(m) DISTANCE	18.0	30.0	48.0	22.0	14.0	59.0	27.0	31.0	69.0	40.0	60.0	51.0	49.0	50.0	50.0	
NO.	6			7				8		9			10		11	12
DIRECTS AND CURVES IN PLAN	ANG. 6 I = 11° 00'		ANG. 7 I = 22° 15'				ANG. 8 I = 3° 56'									

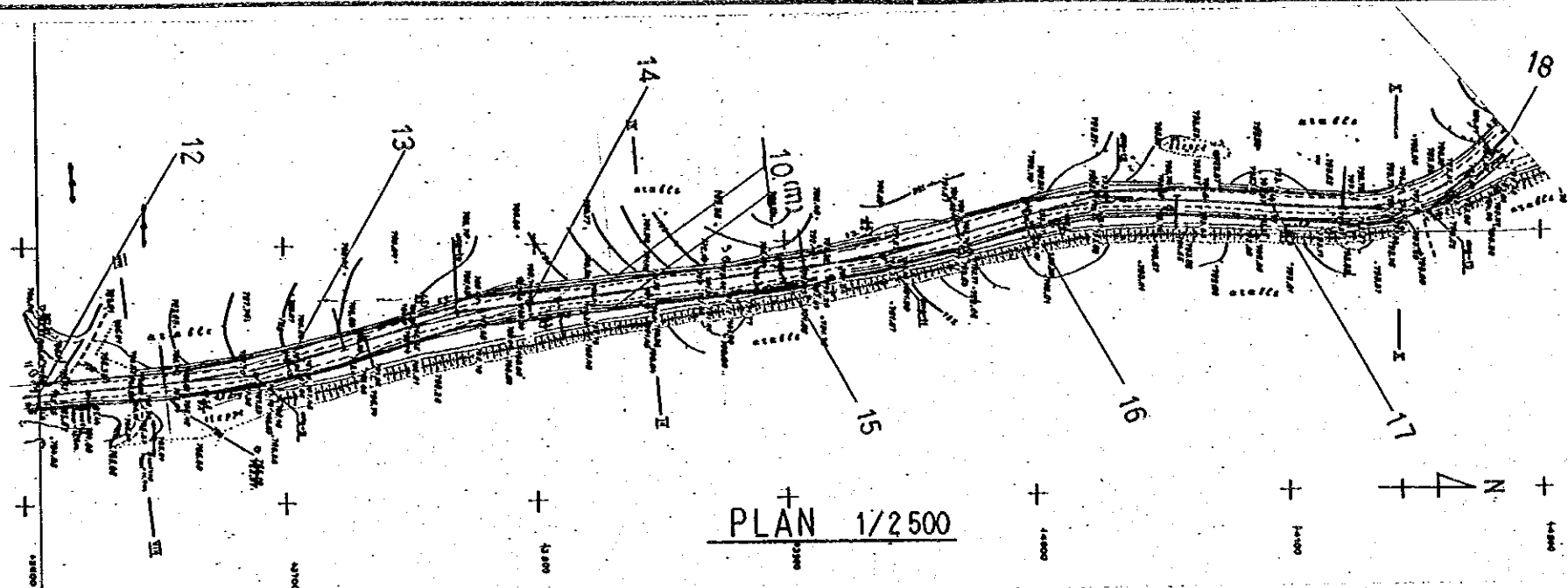
THE REPUBLIC OF KAZAKHSTAN  
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 ALMATY CITY GOVERNMENT

THE STUDY ON SOLID WASTE MANAGEMENT FOR  
 ALMATY CITY IN THE REPUBLIC OF KAZAKHSTAN

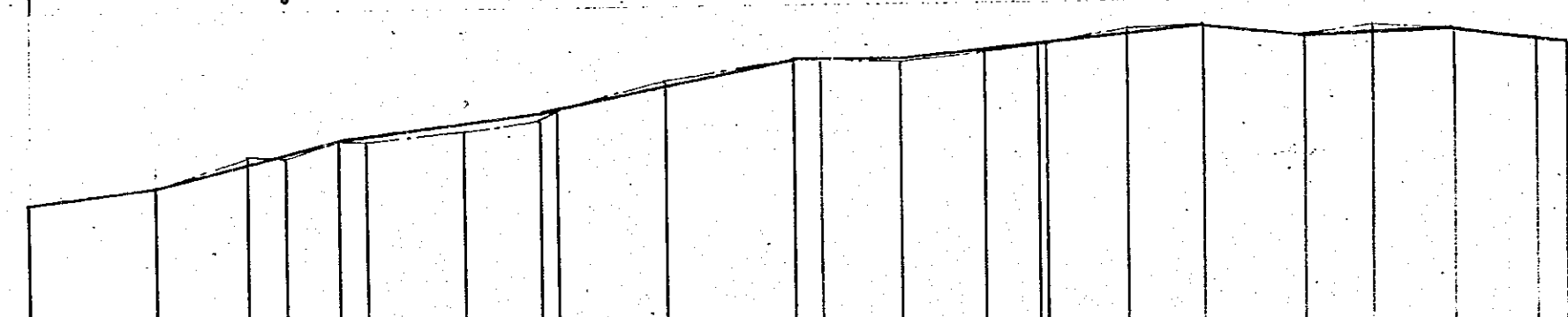
Figure 2.17  
 Access Road Improvement Plan  
 for West T/S (2/4)

SCALE

JAPAN INTERNATIONAL COOPERATION AGENCY



PLAN 1/2500



LONG SECTION

GRADIENT (%)	ESTIMATED ELEVATION (m)	ELEVATION (m)	DISTANCE (m)	NO.	DIRECTS AND CURVES IN PLAN
12.2 / 49 (m)	785.70	785.69	50.0	12	
33.3 / 72	786.30	786.30	49.0	13	ANG. 9 I = 8° 16'
14.0 / 86	787.50	787.78	36.0		
	788.00	787.90	15.0		
	788.70	788.71	21.0		
	788.85	788.57	11.0		
	789.39	789.12	38.0		
	789.81	789.60	30.0	14	
	789.90	789.90	7.0		
25.8 / 93	791.01	791.20	43.0	15	ANG. 10 I = 8° 30'
0 / 42	792.30	792.30	50.0		
	792.30	792.27	4.0		
	792.30	792.18	32.0		
	792.70	792.72	32.0		
12.4 / 117	793.01	793.05	25.0	16	ANG. 11 I = 7° 19'
	793.02	793.05	1.0		
	793.38	793.45	29.0		
	793.75	793.75	30.0		
13.4 / 41	793.20	793.18	41.0	17	ANG. 12 I = 17° 25'
6.1 / 57	793.35	793.78	25.0		
15.1 / 43	793.55	793.55	32.0		
	793.07	792.95	32.0	18	ANG. 13 I = 45° 38'
	792.90	792.87	11.0		

ANG.	Station	I (deg.)	B.C.	E.C.	R (m)	TL (m)	CL (m)	SL (m)
ANG. 9	12+84.70	8° 16'	12+48.57	13+20.83	500	36.13	72.14	1.30
ANG. 10	13+69.49	8° 39'	13+31.68	14+7.30	500	37.81	75.49	1.43
ANG. 11	15+41.61	7° 19'	15+9.64	16+73.58	500	31.97	63.85	1.02
ANG. 12	16+29.22	17° 25'	16+98.59	17+59.85	200	30.63	60.80	2.33
ANG. 13	17+58.95	45° 38'	17+25.29	17+92.61	80	33.66	63.72	6.79

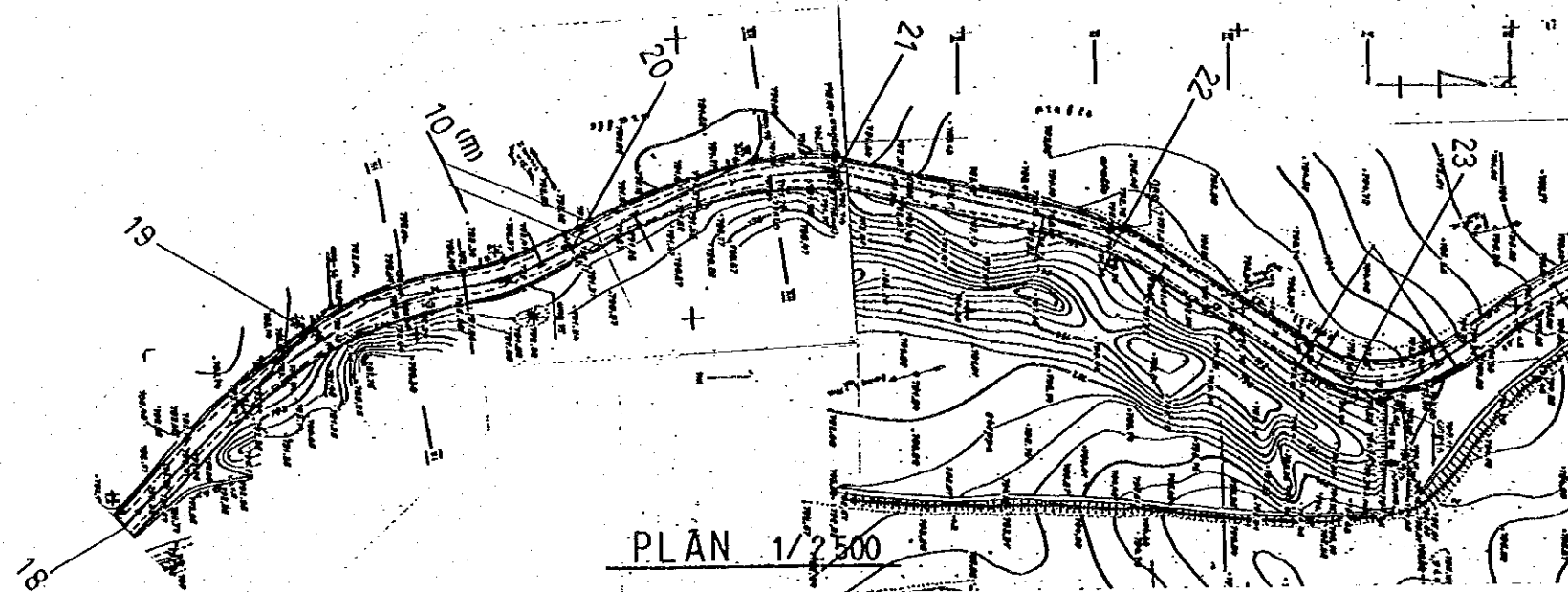
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 ALMATY CITY GOVERNMENT

THE STUDY ON SOLID WASTE MANAGEMENT FOR ALMATY CITY IN THE REPUBLIC OF KAZAKHSTAN

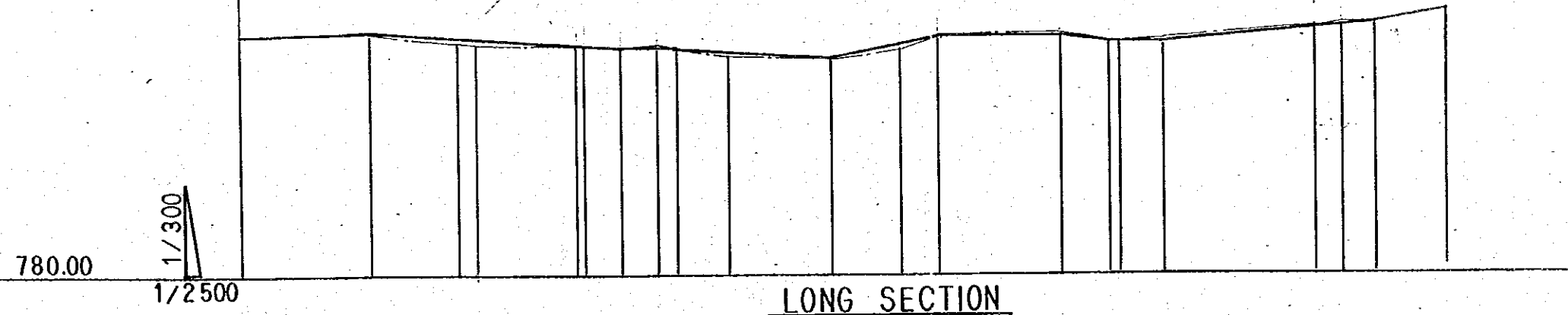
Figure 2.18  
 Access Road Improvement Plan for West T/S (3/4)

SCALE

JAPAN INTERNATIONAL COOPERATION AGENCY



Circular Curves			
ANG. 14	19+9.37	I(deg.) 38° 03'	B.C = 18 + 61.10 E.C = 19 + 57.64 R(m) = 140 TL(m) = 48.27 CL(m) = 92.97 SL(m) = 8.09
ANG. 15	19+73.40	I(deg.) 18° 28'	B.C = 19 + 57.14 E.C = 19 + 89.66 R(m) = 100 TL(m) = 16.26 CL(m) = 32.23 SL(m) = 1.31
ANG. 16	20+71.89	I(deg.) 35° 21'	B.C = 20 + 24.09 E.C = 21 + 19.69 R(m) = 150 TL(m) = 47.80 CL(m) = 92.56 SL(m) = 7.43
ANG. 17	19+95.82	I(deg.) 17° 58'	B.C = 21 + 72.11 E.C = 22 + 19.53 R(m) = 150 TL(m) = 23.71 CL(m) = 47.04 SL(m) = 1.86
ANG. 18	23+17.80	I(deg.) 65° 11'	B.C = 22 + 85.83 E.C = 23 + 49.77 R(m) = 50 TL(m) = 31.97 CL(m) = 66.88 SL(m) = 9.35



(%) GRADIENT	3.3(%) 61(m)		8.0 112		0 27		8.6 70		27.7 47		0 55		12.8 23		9.9 96		21.9 32				
(m) ESTIMATED ELEVATION	792.90	793.10	792.79	792.72	792.36	792.33	792.20	792.20	791.99	791.60	792.43	792.90	792.45	792.45	792.45	793.09	793.25	793.40	794.10		
(m) ELEVATION	792.87	793.11	792.60	792.45	792.33	792.32	792.17	792.20	791.87	791.60	792.27	792.92	792.90	792.45	792.48	792.55	793.18	793.36	793.40	794.11	
(m) DISTANCE	11.0	61.0	39.0	8.0	46.0	3.0	16.0	16.0	11.0	24.0	46.0	30.0	17.0	55.0	24.0	4.0	19.0	64.0	17.0	15.0	32.0
NO.	18	19	19	19	19	19	19	19	19	20	20	20	20	20	20	20	20	20	20	20	20
DIRECTS AND CURVES IN PLAN			ANG. 14 I=38° 03'			ANG. 15 I=18° 28'				ANG. 16 I=35° 21'				ANG. 17 I=17° 58'					ANG. 18 I=65° 11'		

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Figure 2.19  
 Access Road Improvement Plan  
 for West T/S (4/4)

SCALE

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***DATA BOOK 3***  
***SPASSKAYA TRANSFER***  
***STATION***

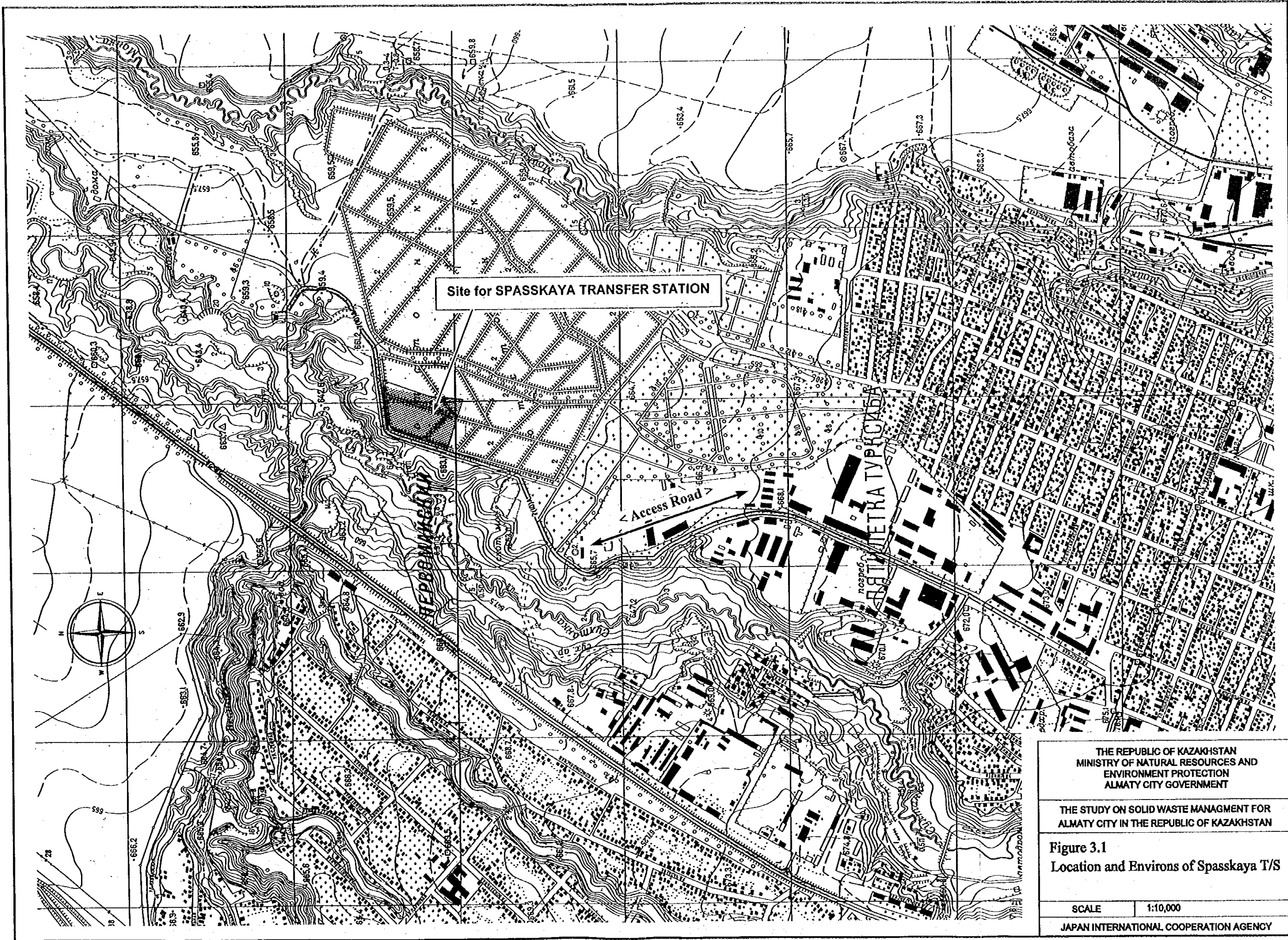
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## **DATA BOOK 3**

### **SPASSKAYA TRANSFER STATION**

<b>Figure 3.1</b>	<b>Location and Environs of Spasskaya T/S</b>
<b>Figure 3.2</b>	<b>Layout Plan of Spasskaya T/S</b>
<b>Figure 3.3</b>	<b>Water Supply and Drainage Plan for Spasskaya T/S</b>
<b>Figure 3.4</b>	<b>Site Operation of Spasskaya T/S</b>
<b>Figure 3.5</b>	<b>Main Control Building of Spasskaya T/S (1/2) : Plan</b>
<b>Figure 3.6</b>	<b>Main Control Building of Spasskaya T/S (2/2) : Elevation</b>
<b>Figure 3.7</b>	<b>Access Road Improvement Plan of Spasskaya T/S (1/4)</b>
<b>Figure 3.8</b>	<b>Access Road Improvement Plan of Spasskaya T/S (2/4)</b>
<b>Figure 3.9</b>	<b>Access Road Improvement Plan of Spasskaya T/S (3/4)</b>
<b>Figure 3.10</b>	<b>Access Road Improvement Plan of Spasskaya T/S (4/4)</b>



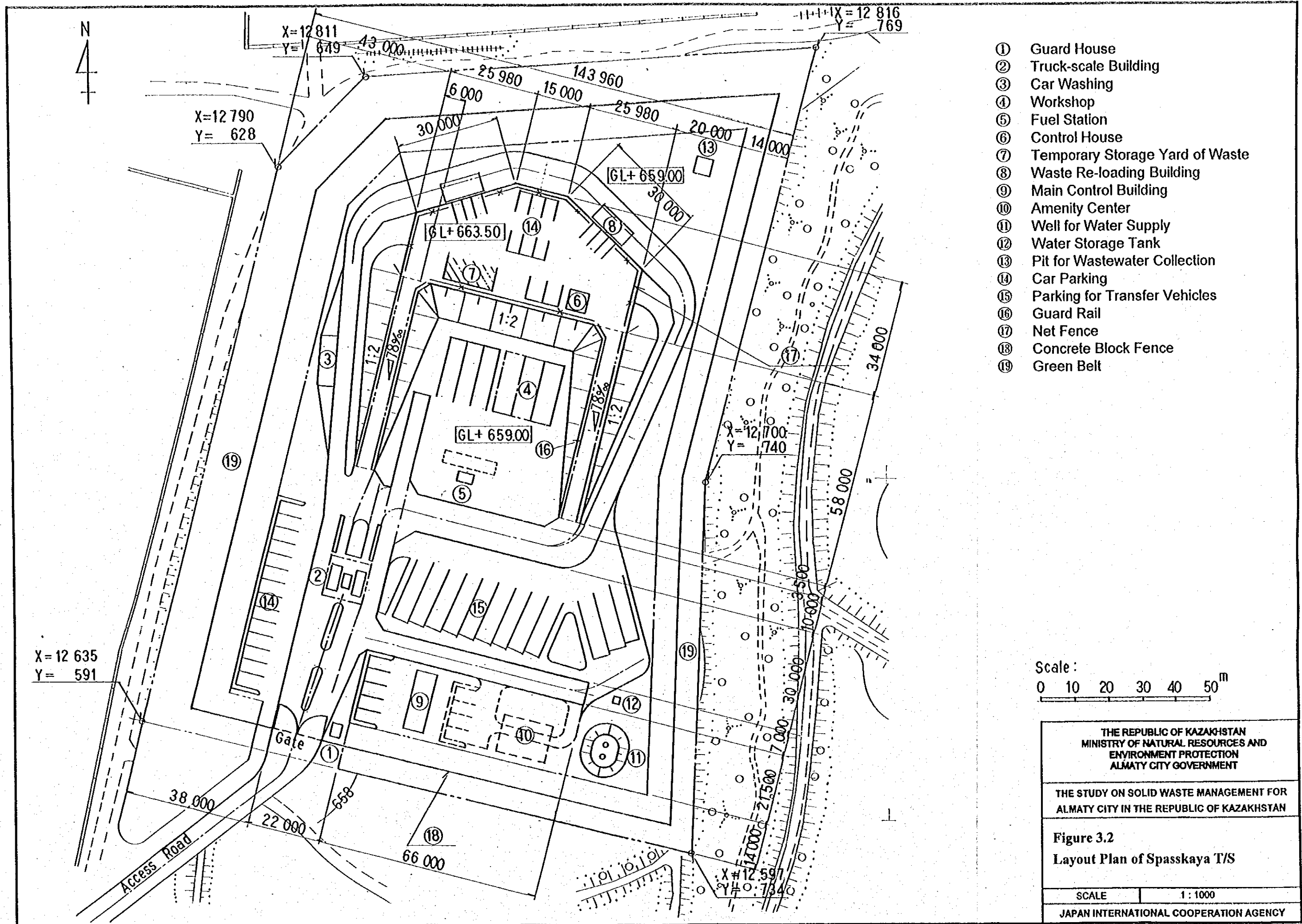
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 ALMATY CITY GOVERNMENT

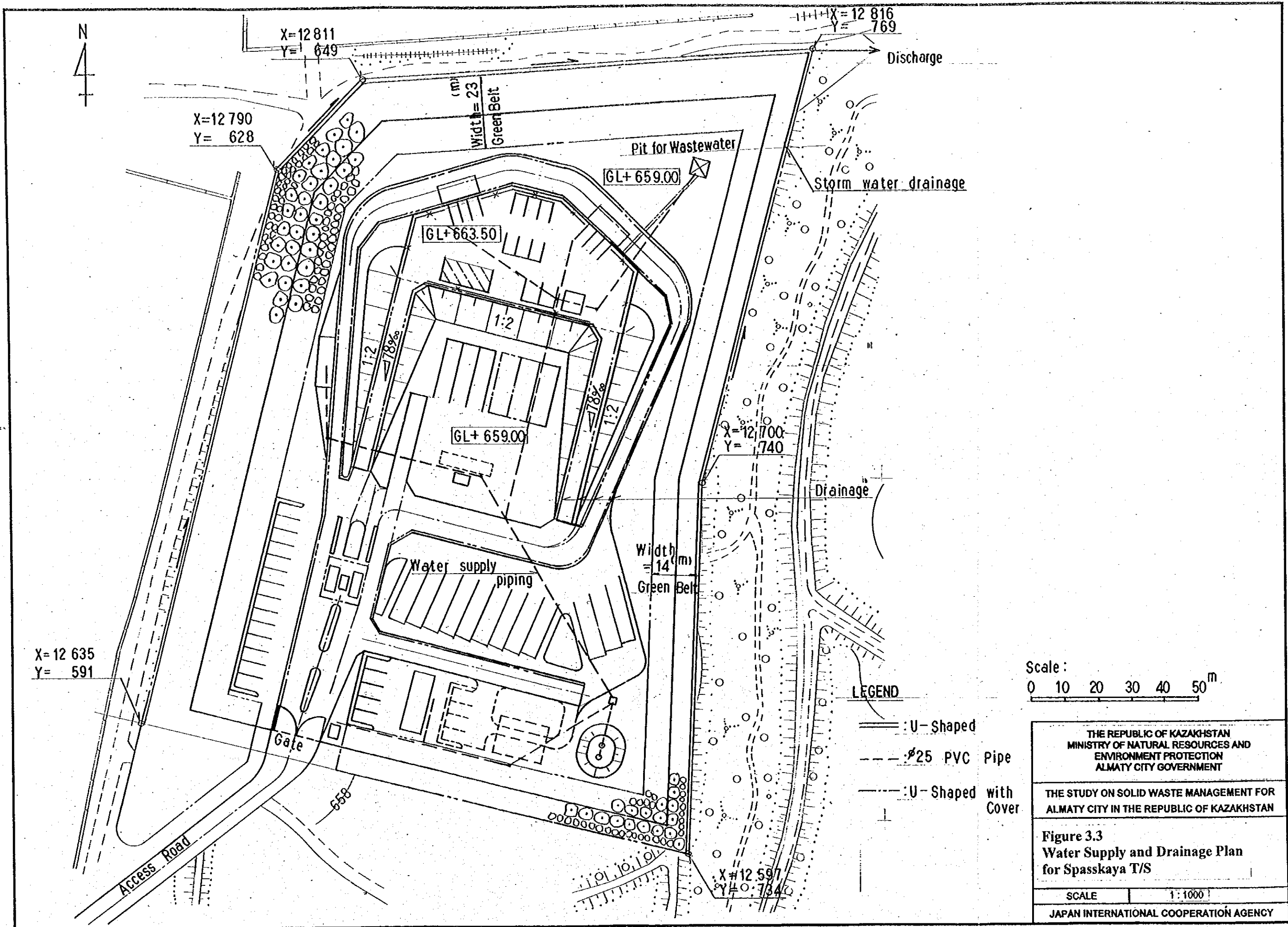
THE STUDY ON SOLID WASTE MANAGEMENT FOR  
 ALMATY CITY IN THE REPUBLIC OF KAZAKHSTAN

Figure 3.1  
 Location and Environs of Spasskaya T/S

SCALE 1:10,000

JAPAN INTERNATIONAL COOPERATION AGENCY

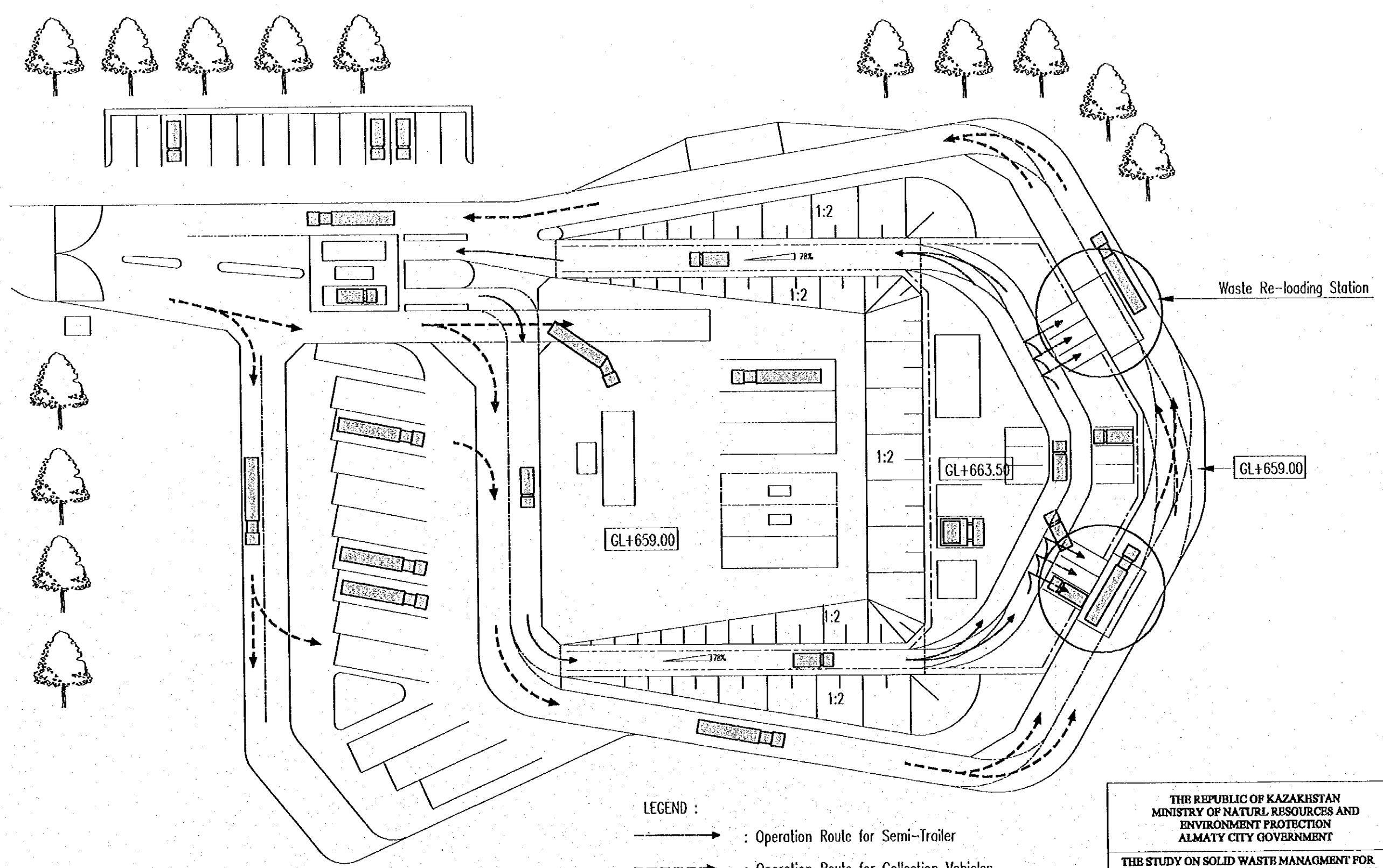




Scale: 0 10 20 30 40 50<sup>m</sup>

- LEGEND
- U-Shaped
  - - - 25 PVC Pipe
  - - - U-Shaped with Cover

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THE STUDY ON SOLID WASTE MANAGEMENT FOR ALMATY CITY IN THE REPUBLIC OF KAZAKHSTAN	
Figure 3.3 Water Supply and Drainage Plan for Spasskaya T/S	
SCALE	1:1000
JAPAN INTERNATIONAL COOPERATION AGENCY	

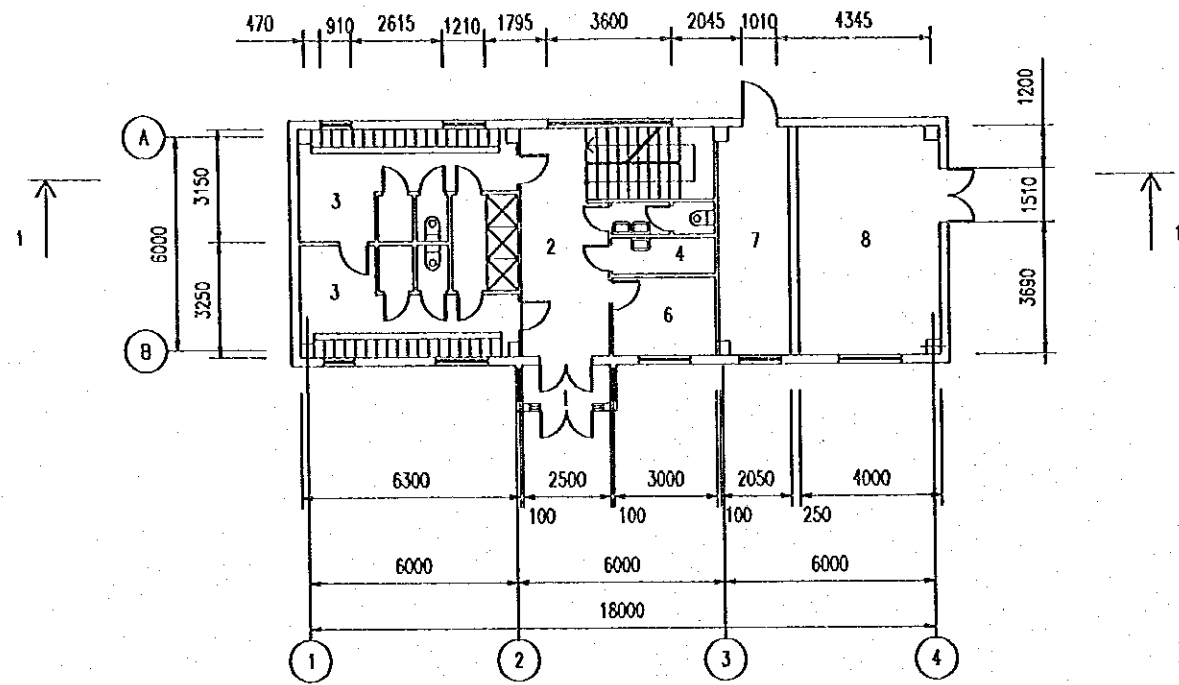


LEGEND :

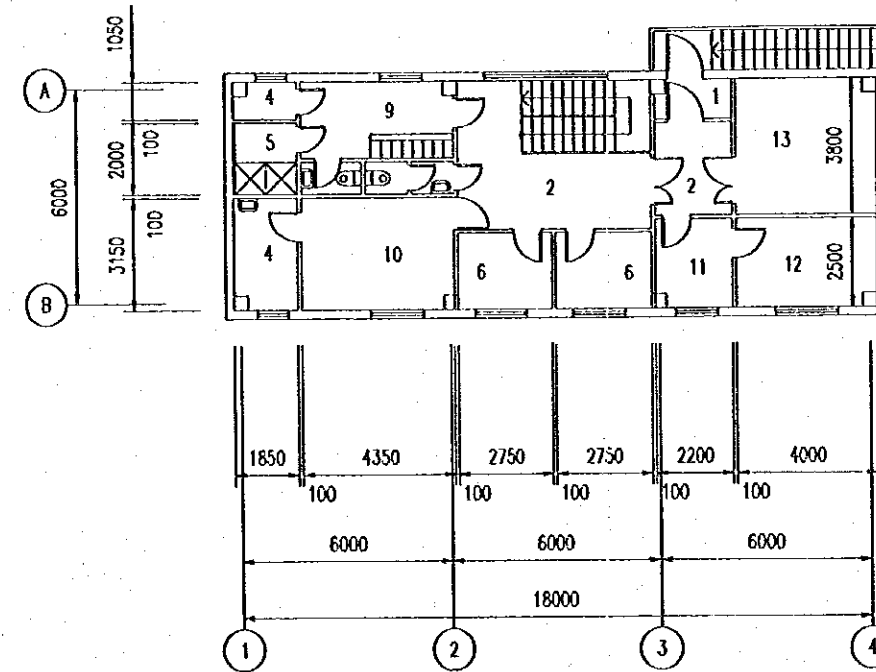
—————> : Operation Route for Semi-Trailer

- - - - -> : Operation Route for Collection Vehicles

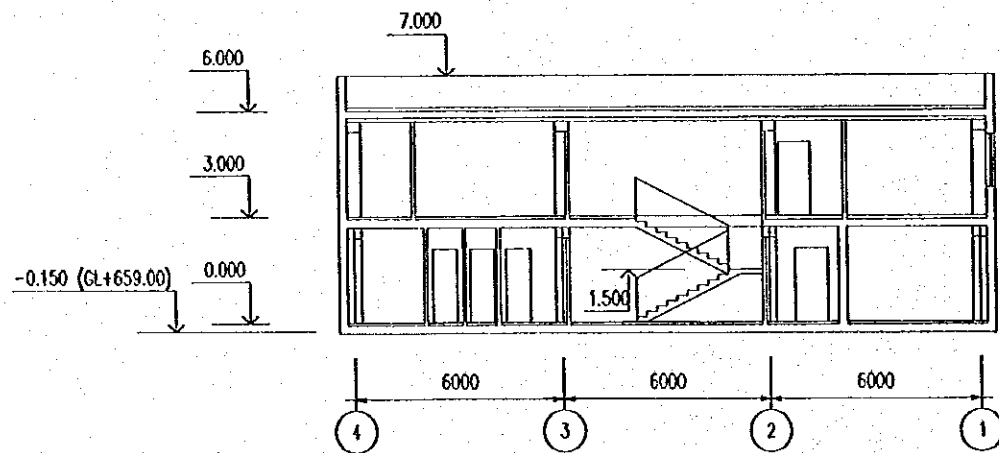
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THE STUDY ON SOLID WASTE MANAGEMENT FOR ALMATY CITY IN THE REPUBLIC OF KAZAKHSTAN	
Figure 3.4 Site Operation of Spasskaya T/S	
SCALE	
JAPAN INTERNATIONAL COOPERATION AGENCY	



1 ST FLOOR LAYOUT



2 ND FLOOR LAYOUT



SECTION 1-1

- |   |                      |    |                       |
|---|----------------------|----|-----------------------|
| 1 | ENTRANCE             | 8  | BOILER ROOM           |
| 2 | CORRIDOR             | 9  | LOCKER ROOM FOR WOMEN |
| 3 | LOCKER ROOM FOR MEN  | 10 | DINING ROOM           |
| 4 | STORE                | 11 | SECRETARY             |
| 5 | SHOWER               | 12 | DIRECTOR OFFICE       |
| 6 | OFFICE               | 13 | MEETING ROOM          |
| 7 | FIRE EQUIPMENT STORE |    |                       |

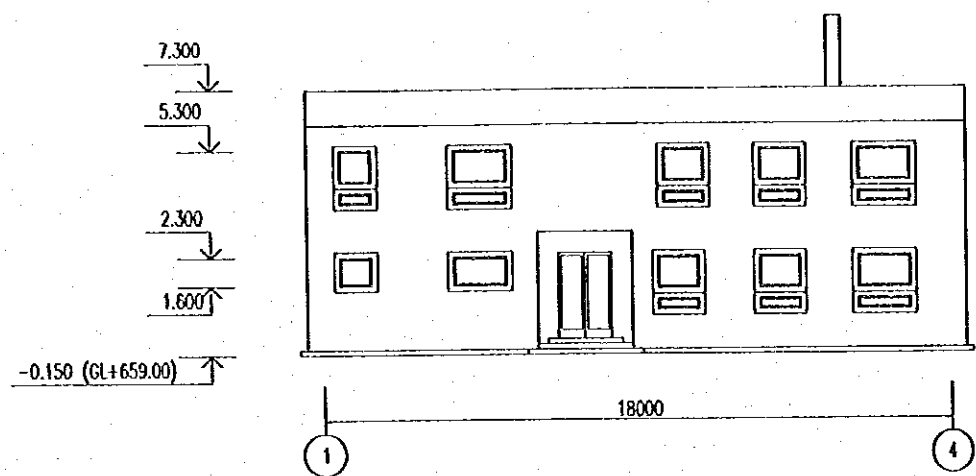
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 ALMATY CITY IN THE REPUBLIC OF KAZAKHSTAN

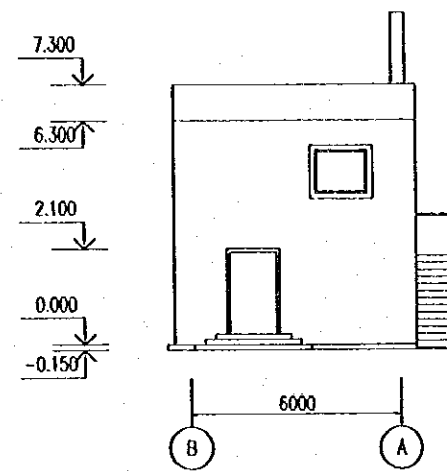
Figure 3.5  
 Main Control Building of  
 Spasskaya T/S (1/2) : Plan

SCALE 1:200

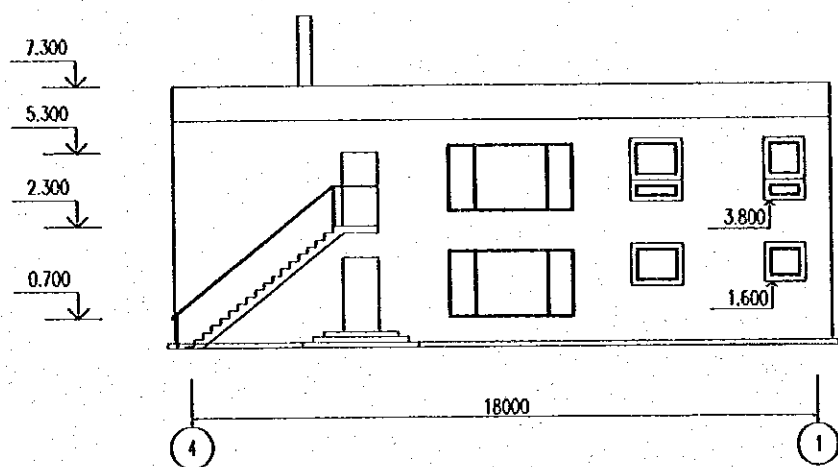
JAPAN INTERNATIONAL COOPERATION AGENCY



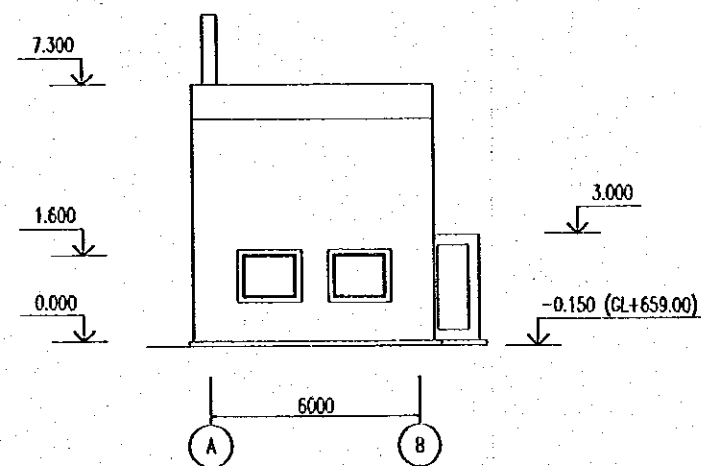
ELEVATION 1-4



ELEVATION B-A



ELEVATION 4-1



ELEVATION A-B

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 ALMATY CITY GOVERNMENT

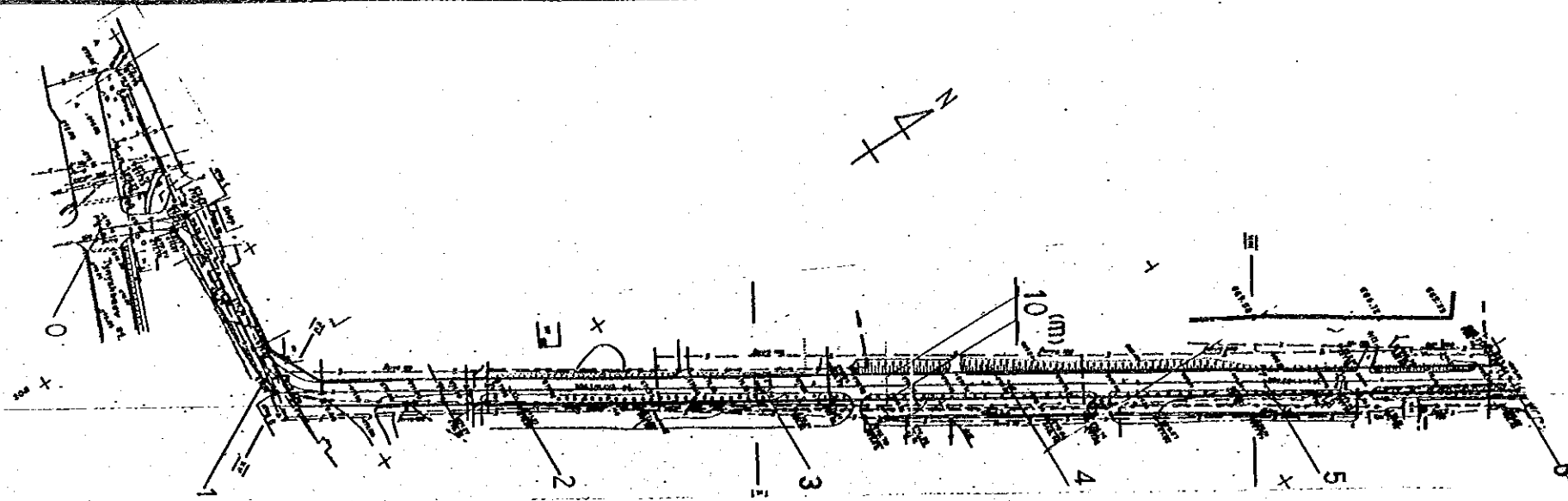
THE STUDY ON SOLID WASTE MANAGEMENT FOR  
 ALMATY CITY IN THE REPUBLIC OF KAZAKHSTAN

Figure 3.6  
 Main Control Building of  
 Spasskaya T/S (2/2) : Elevation

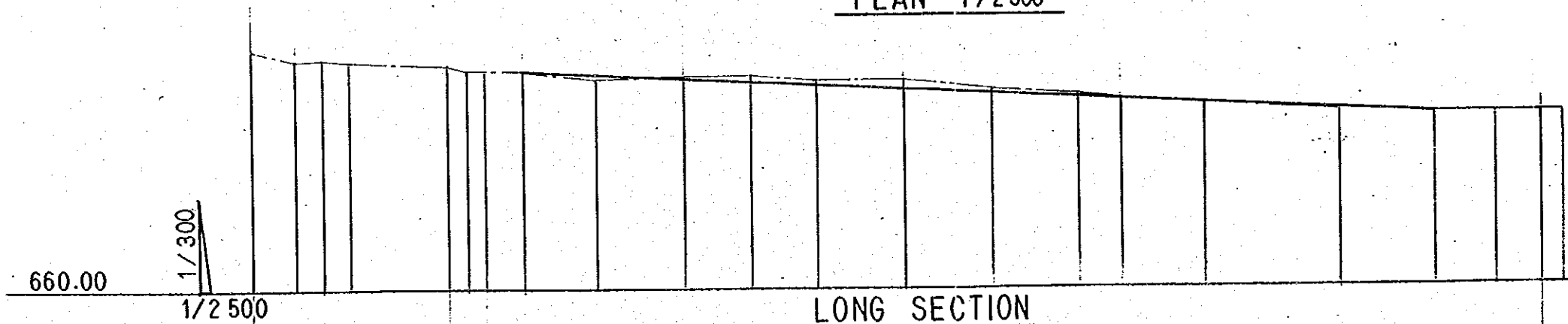
SCALE 1:200

JAPAN INTERNATIONAL COOPERATION AGENCY



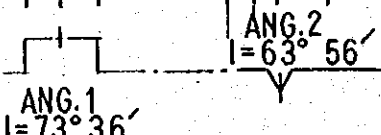


PLAN 1/2500



LONG SECTION

(%) GRADIENT	6.5 (%) 418 (m)																0 57						
(m) ESTIMATED ELEVATION																							
(m) ELEVATION	673.07	672.55	672.50	672.40	672.10	672.00	672.00	671.73	671.65	671.52	671.32	671.13	671.35	670.87	670.61	670.35	670.22	669.98	669.58	669.30	669.30	669.30	669.30
(m) DISTANCE	0	21.0	12.0	13.0	45.0	9.0	8.0	17.0	35.0	40.0	30.0	30.0	40.0	40.0	40.0	40.0	20.0	37.0	63.0	43.0	47.0	10.0	10.0
NO.	0									2				3			4			5			6
DIRECTS AND CURVES IN PLAN																							



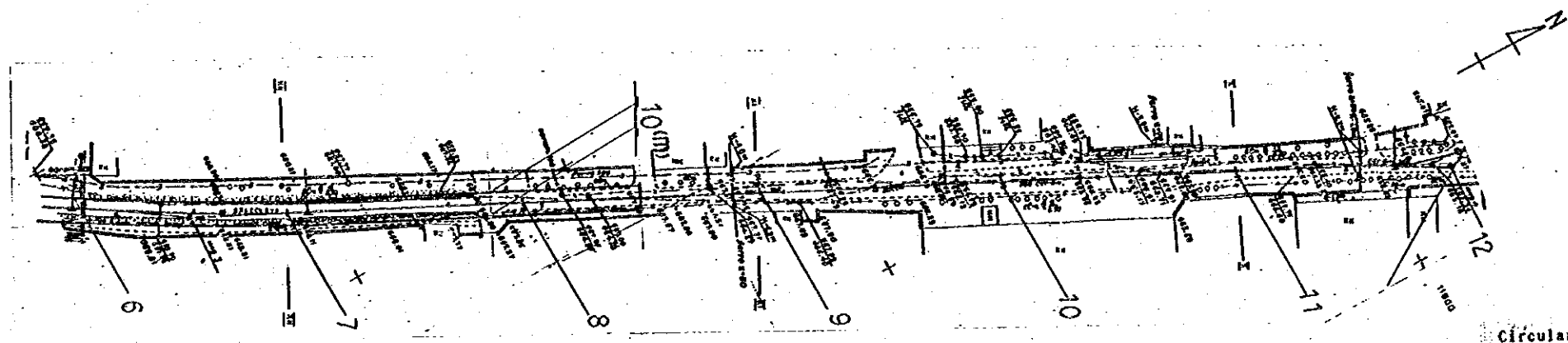
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Figure 3.7  
Access Road Improvement Plan  
for Spasskaya T/S (1/4)

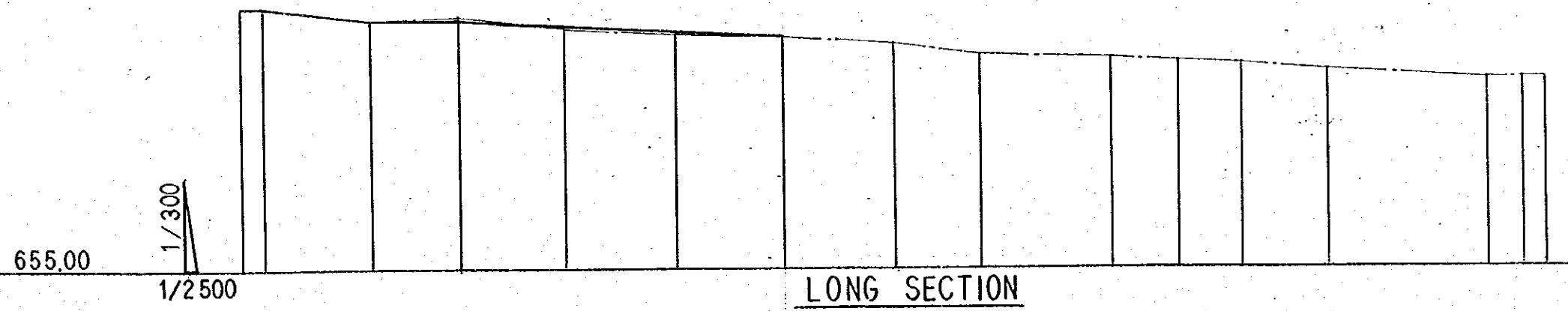
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PLAN 1/2500

Circular Curves			B.C = 6 + 11.43
ANG. 3	6+60.13	I(deg.) 6'58"	E.C = 7 + 8.83
			R(m) = 800
			TL(m) = 48.70
			CL(m) = 97.27
			SL(m) = 1.48



LONG SECTION

(%) GRADIENT	0/57	14.3 (1/49 (m))	0/40	6.0/150											
(m) ESTIMATED ELEVATION	669.30	669.30	668.60	668.60	668.55	668.30	668.00	667.70							
(m) ELEVATION	669.30	669.30	668.60	668.70	668.50	668.20	667.88	667.67	667.30	666.67	666.49	666.29	666.07	665.80	665.37
(m) DISTANCE	10.0	11.0	490	40.0	8.0	42.0	50.0	50.0	50.0	60.0	40.0	30.0	30.0	40.0	68.0
NO.	6			7			8		9		10		11		12
DIRECTS AND CURVES IN PLAN		ANG. 3 I = 6° 58'													ANG. 4 I = 26° 13'

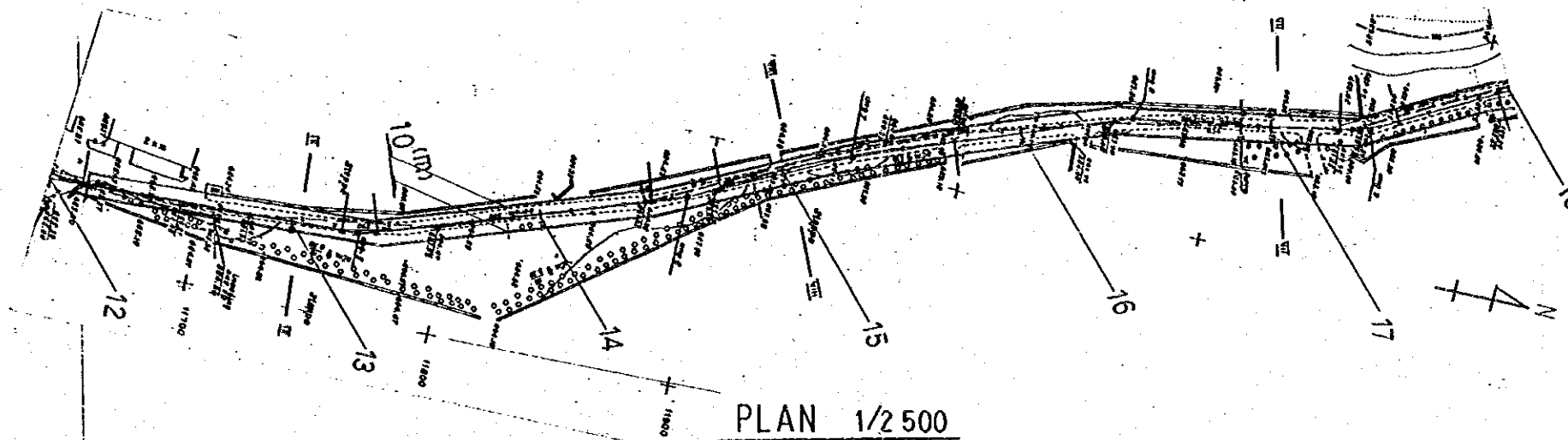
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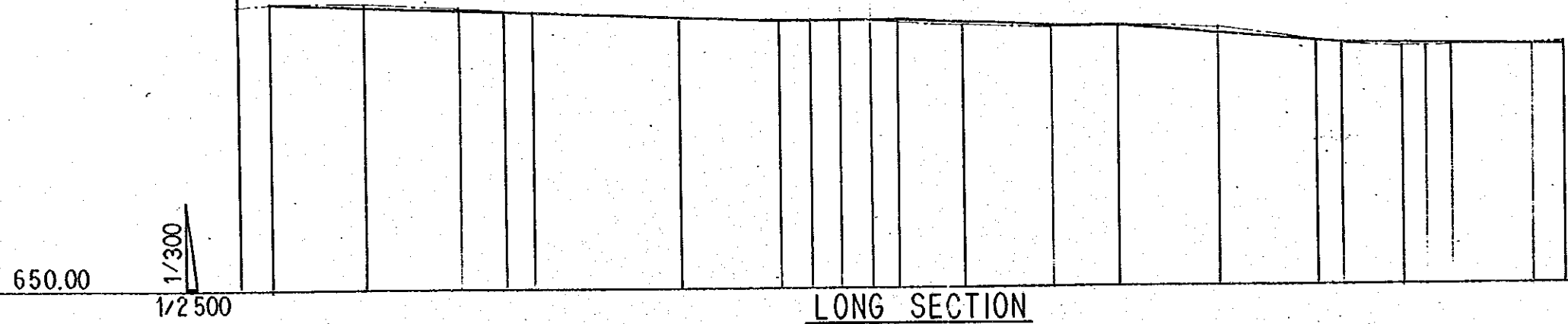
Figure 3.8  
 Access Road Improvement Plan for Spasskaya T/S (2/4)

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Circular Curves			
ANG. 5	13+26.27	I(deg.) 7°26'	B.C = 13 + 19.77 E.C = 13 + 32.77 R(m) = 100 TL(m) = 6.60 CL(m) = 12.97 SL(m) = 0.21
ANG. 6	14+60.34	I(deg.) 16°01'	B.C = 14 + 46.27 E.C = 14 + 74.41 R(m) = 100 TL(m) = 14.07 CL(m) = 27.95 SL(m) = 0.98
ANG. 7	15+29.50	I(deg.) 5°58'	B.C = 14 + 87.81 E.C = 15 + 71.19 R(m) = 300 TL(m) = 41.69 CL(m) = 83.31 SL(m) = 1.09
ANG. 8	16+44.54	I(deg.) 10°17'	B.C = 15 + 99.55 E.C = 16 + 89.63 R(m) = 500 TL(m) = 44.99 CL(m) = 89.74 SL(m) = 2.02
ANG. 9	17+39.34	I(deg.) 19°05'	B.C = 17 + 27.57 E.C = 17 + 51.11 R(m) = 70 TL(m) = 11.77 CL(m) = 23.31 SL(m) = 0.98
ANG. 10	18+16.95	I(deg.) 59°52'	B.C = 17 + 88.16 E.C = 18 + 45.74 R(m) = 50 TL(m) = 28.79 CL(m) = 52.24 SL(m) = 7.70



(%) GRADIENT	4.3 (%) 232 (m)		0 54	4.9 77	0 29	10.0 100	2.0 100																	
(m) ESTIMATED ELEVATION	665.35	665.15	664.98	664.89	664.84	664.55	664.35	664.35	664.35	664.35	664.20	664.00	664.00	663.55	663.11	663.00	662.94	662.92	662.90	662.83	662.80	662.87		
(m) ELEVATION	665.28	665.35	665.30	665.13	664.82	664.80	664.53	664.38	664.36	664.35	664.30	664.08	663.91	664.00	663.80	663.10	663.00	662.87	662.80	662.83	662.80	662.87	662.80	662.87
(m) DISTANCE	9.0	14.0	43.0	43.0	20.0	13.0	67.0	46.0	14.0	14.0	14.0	12.0	30.0	41.0	29.0	45.0	44.0	11.0	28.0	11.0	11.0	36.0	14.0	14.0
NO.	12		13		14		15		16		17		18											
DIRECTS AND CURVES IN PLAN	ANG. 4 I=26°13'		ANG. 5 I=7°26'		ANG. 6 I=16°01'		ANG. 7 I=5°58'		ANG. 8 I=10°17'		ANG. 9 I=19°05'		ANG. 10 I=59°52'											

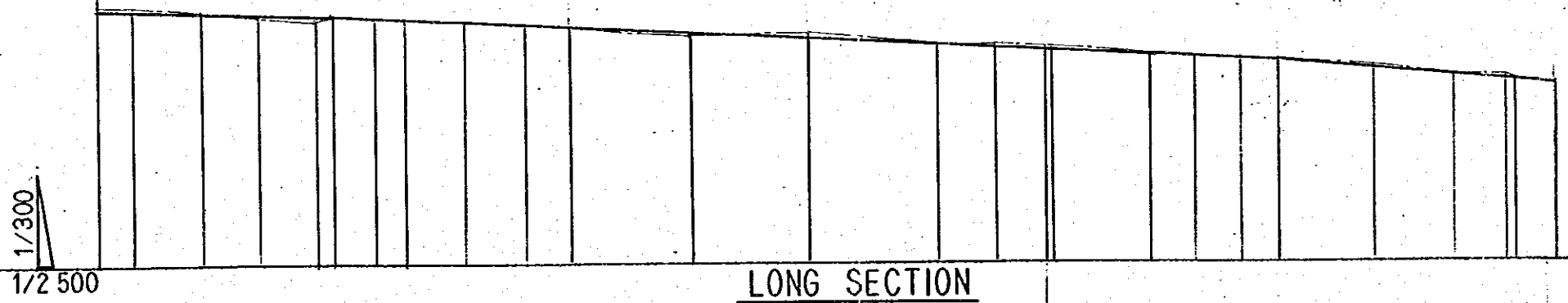
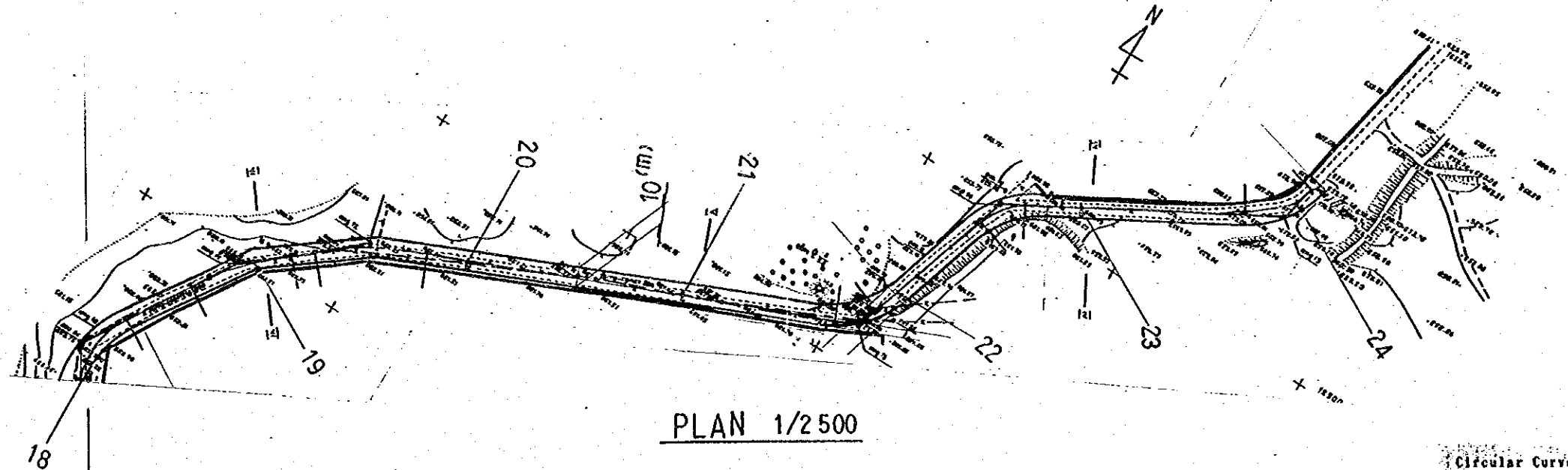
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Figure 3.9  
 Access Road Improvement Plan  
 for Spasskaya T/S (3/4)

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JAPAN INTERNATIONAL COOPERATION AGENCY



(%) GRADIENT	3.5 (%) 100 (m)		6.0 344										5.4 56		9.4 116.9											
(m) ESTIMATED ELEVATION	662.80	662.75	662.65	662.56	662.47	662.45	662.34	662.27	662.12	661.97	661.86	661.56	661.26	660.94	660.80	660.67	660.66	660.40	660.30	660.20	660.10	659.72	659.41	659.21	659.16	659.00
(m) ELEVATION	662.87	662.95	662.70	662.51	662.36	662.45	662.31	662.25	662.10	661.94	661.88	661.50	661.40	660.94	660.90	660.78	660.78	660.43	660.30	660.20	660.09	659.79	659.44	659.35	659.19	659.00
(m) DISTANCE	14.0	15.0	29.0	24.0	25.0	7.0	18.0	12.0	25.0	25.0	19.0	50.0	50.0	54.0	24.0	22.0	2.0	42.0	19.0	19.0	18.0	40.0	32.9	22.0	5.1	16.9
NO.	18				19						20		21			22					23				24	
DIRECTS AND CURVES IN PLAN	ANG.10 I=59°52'				ANG.11 I=18°48'				ANG.12 I=19°26'							ANG.13 I=50°51'			ANG.14 I=42°01'						ANG.15 I=47°15'	

Circular Curves			
ANG. 10	18+16.95	I(deg.) 59°52'	B.C = 17 + 88.16 E.C = 18 + 45.74 R(m) = 50 TL(m) = 28.79 CL(m) = 52.24 SL(m) = 7.70
ANG. 11	18+93.13	I(deg.) 18°48'	B.C = 18 + 68.30 E.C = 19 + 17.96 R(m) = 150 TL(m) = 24.83 CL(m) = 49.22 SL(m) = 2.04
ANG. 12	19+55.62	I(deg.) 19°26'	B.C = 19 + 29.94 E.C = 19 + 81.30 R(m) = 150 TL(m) = 25.68 CL(m) = 50.88 SL(m) = 2.18
ANG. 13	21+78.90	I(deg.) 50°51'	B.C = 21 + 55.13 E.C = 22 + 2.67 R(m) = 50 TL(m) = 23.77 CL(m) = 44.38 SL(m) = 5.36
ANG. 14	22+63.66	I(deg.) 42°01'	B.C = 22 + 44.46 E.C = 22 + 82.88 R(m) = 50 TL(m) = 19.20 CL(m) = 36.67 SL(m) = 3.66
ANG. 15	23+94.86	I(deg.) 47°15'	B.C = 23 + 72.99 E.C = 24 + 16.73 R(m) = 50 TL(m) = 21.87 CL(m) = 41.23 SL(m) = 4.67

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Figure 3.10  
 Access Road Improvement Plan  
 for Spasskaya T/S (4/4)

SCALE

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