

ZOBA DEBUB ADMINISTRATION

MAELEWYA WATER SUPPLY PROJECT

FINAL DESIGN REPORT

**PROJECT FUNDED BY SENAI FOUNDATION
(MAELEWYA WATER DEVELOPMENT PROJECT)**

**Asmara Eritrea
January, 2009**

ALEM A. TEFAMARIAM - WATER RESOURCES ENGINEERING CONSULTANTS
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MAELEWYA, EMBACHILAY AND TEGEREN WATER SUPPLY SCHEME.

1. Background

The villages of Maelewya, Embachilay and Tegeren are found in Zoba Debub Administrative Region and in Adi-keyih Sub-region Administration .Maelewya is located at about N 0539849, E1638195 and lies at the Elevation of about 2476m above sea level.

Embachilay is located at about N 0539850, E 1638196 and at elevation of 2434 a.s.l. Degren is located at N 0539848, E 1638194 and at elevation of 2458m above sea level. The combined population of the three villages is 764 House holds making up 3732 people. The people of these villages have no access to pure and nearby water. There fore they had to go to far off sources to fetch water. The physical difficulty of the terrain and the distance from the villages had made water fetching activity very hard especially for the women and children who mostly are the water bearers of the communities.

2. Water Demand

The daily average consumption rate of 20 liters per person is the normal rate used water supplies in the highlands of rural Eritrea. For seasonal variation the maximum day consumption will be 1.2 the average day consumption rate. For the future population projection the growth rate of 3% is normally used for rural areas. Besides the village people's water requirement the live stock water demand is also considered.

Table 1. Water requirement of the villages.

Year	population	Daily average Consumption l/c/d	Daily demand m ³	Max.day demand m ³	Annual demand m ³	Remark
2009	3732	20	74.64	89.57	32,693.05	
2019	5015	25	125.36	150.43	54,906.95	
2029	6740	30	202.20	242.64	88,563.60	

For the scheme design the 10-year water demand will be used. The livestock water requirement will be added to the domestic water demand and thus the total water requirement of the villages for the design year 2019 will be $188.04\text{m}^3/\text{day}$.

(Using 10 hours operation period for day this water demand will be $18.80\text{m}^3/\text{hr}$ or $5.21/\text{s}$).

3. Details of The Components of The Proposed Water Supply Scheme for The Villages of Maelewya, Embachilay and Tegeren.

3.1 Available Water Source

The water source for the villages of Maelewya, Embachilay and Tegeren is from the two main reservoirs of 500m^3 and 700m^3 Adi-keyih Town. It is proposed to pump water from these reservoirs to an ground level tank located at a higher elevation in the village of Maelewya. From the ground level water tank at Maelewya the water will flow by gravity to the public fountains of Maelewya, Embachilay and Tegeren.

3.2 Water Pumping Facility

Due to the low elevation of the source of water from the village grounds it is proposed to use motorized pumping to deliver the water from the source to an elevated tank in the village of Maelewya. An electrical driven centrifugal pump with a discharge capacity of $51/\text{s}$ and total manometric head of 80 meters will be selected. A pump house of $3\text{m} \times 3\text{m}$ will be constructed to enclose the pump. Dwg of the pump house is attached.

3.3. Water Storage Tank

A standard water tank suitable for construction in rural areas is designed. It will have to accommodate $1/3$ of the daily water demand of the year 2029, thus resulting in a reservoir holding capacity holding capacity of 100m^3 . It will be built of mostly local materials of stone masonry and concrete and slabs with circular shape. The details of the drawings are attached.

3.4 *Water Delivery mains and Distribution System*

The main transmission system that delivers water from the reservoir at Adi-keyih to the reservoir in Maelewya will be uPVC pipe of DN100. After the water is collected in the reservoir of Maelewya the water is then distributed to the public fountains of the villages through uPVC pipe of DN80 by gravity flow. There are three public fountains in Maelewya village, One public fountain in Embachilay village and Two public fountains for the village of Tegern. The details of the drawings of the public fountain is and the detail drawings of the pipe line lay out and profiles are also attached.

4.0 *Engineering Cost Estimate*

The bill of Quantities for Maelewya, Embachilay and Tegren Water Supply Scheme has been prepared in adequate detail for the project works and presented in a tabulated form at the end of this document. Cost Estimates has been prepared based on recent price quotations of water supply project.

MAELEWYA WATER SUPPLY PROJECT
BILL OF QUANTITIES AND SPECIFICATIONS

SUMMARY

Item		Total Price
No	Description	
1	Pump House	89,807.08
2	Pipe laying and Earth work	4,381,070.00
3	Booster Pump	150,000.00
4	100m ³ Ground Masonary Reservoir	261,652.11
5	Public Fountain	61,493.00
6	Connection Box	8,111.23
		4,952,133.42

Item No	Description	Unit	QTY	Unit Price	Total Price
1. Pump House					
1.1	<u>Sub-Structure</u>				
1.1.1	Excavation in wall & floor area	m ³	4.2	72.00	302.40
1.1.2	Stone masonry wall, upto ground level	m ³	2.8	1,154.00	3,231.20
1.1.3	Grade beam C25 concrete 40cmx20cm	m ³	1.12	2,340.00	2,620.80
1.1.4	Hard core of Basaltic stone, 20cm thick	m ²	9.6	92.00	883.20
1.1.5	Concrete floor slab, 10cm thick	m ³	0.96	2,340.00	2,246.40
	TOTAL OF BILL NO. 1.1				9,284.00
1.2	<u>Super-Structure</u>				
1.2.1	Stone masonry wall 40cm thick, in cement mortar with 1:3 mix (cement:sand)	m ³	18.96	1,288.00	24,420.48
1.2.2	C25 Concrete for lintels and beams	m ³	1	2,340.00	2,340.00
1.2.3	plastering Internal Wall surfaces, 3cm thick in cement mortar	m ²	47.4	110.00	5,214.00
1.2.4	Pointing external wall surfaces in cement mortar	m ²	52.4	60.00	3,144.00
1.2.5	Plastic paint in two coats for internal wall surfaces.	m ²	47.4	55.00	2,607.00
	TOTAL OF BILL NO. 1.2				37,725.48
1.3	<u>Re-inforcement</u>				
	Re-inforcement steel bar according to structural drawing price includes cutting, bending, placing in position and tying wires.				
1.3.1	a) Dia 8	kg	145	43.00	6,235.00
	b) Dia 12	kg	58	43.00	2,494.00
	TOTAL OF BILL NO. 1.3				8,729.00
1.4	<u>Form Work</u>				
	Provide cut and fix in position Sawn Zigba wood form work to concrete works				
1.4.1	For Bottom Slab	m ²	1.52	355.00	539.60
1.4.2	For Grade beam and lintels	m ²	9.4	355.00	3,337.00
	TOTAL OF BILL NO. 1.4				3,876.60
1.5	<u>Roof Works</u>				
1.5.1	Eucalyptus poles dia 8 cm for rafter	lm	20	40.00	800.00
1.5.2	Purlin wood 7cmx5cm	lm	26	30.00	780.00
1.5.3	Corrugated iron sheet, gauge 28	m ²	28	554.00	15,512.00
	TOTAL OF BILL NO. 1.5				17,092.00

Item No	Description	Unit	QTY	Unit Price	Total Price
1.6	<u>Metal Works</u>				
1.6.1	Metal window 100cmx120cm	pcs	1	5,800.00	5,800.00
1.6.2	Metal Door 200cmx120cm	pcs	1	6,800.00	6,800.00
1.6.3	Galvanized steel wire mesh 2cmx2cm opening and 3mm thick for covering the ventilation openings.	m ²	2	250.00	500.00
	TOTAL OF BILL NO. 1.6				13,100.00
	TOTAL OF BILL NO. 1				89,807.08
	2. Pipe laying and Earth Work				
2.1	<u>Earth work</u>				
2.1.1	Excavation in ordinary soil of trenches for pipes to a depth not exceeding 1m and a minimum width of 0.7m	m ³	5250	72.00	378,000.00
2.1.2	Excavation in soft rock of trenches for pipes to a depth not exceeding 1m and a minimum width of 0.7m	m ³	1050	372.00	390,600.00
2.1.3	Excavation in hard rock of trenches for pipes to a depth not exceeding 1m and a minimum width of 0.7m	m ³	700	800.00	560,000.00
2.1.4	Supply and spread of sand bedding on bottom of pipe trench to a depth of 10cm	m ³	700	1,100.00	770,000.00
2.1.5	Backfill pipe trenches with excavated material and compact in successive layers not exceeding 200mm.	m ³	6300	98.00	617,400.00
	TOTAL OF BILL NO. 2.1				2,716,000.00
2.2	<u>Pipe laying from Adi Keyih Reservoir to Maelewya Reservoir</u>				
2.2.1	Supply and lay uPVC pressure pipes complying with DIN 8061/8062 of PN10, push fit type, joints complying with DIN standards.				
	a) DN 100	lm	4800	160.00	768,000.00
2.2.2	Supply and install socket and spigot uPVC fittings in accordance to DIN 8061/8062				
	a) Bends, DN 100, PN-10				
	i) 22 1/2 degree	pcs	3	350.00	1,050.00
	ii) 90 degree	pcs	4	450.00	1,800.00
	TOTAL OF BILL NO. 2.2				770,850.00

Item No	Description	Unit	QTY	Unit Price	Total Price
2.3	<u>Pipe laying from Maelewya Reservoir to Embachilay public fountain</u>				
2.3.1	Supply and lay uPVC pressure pipes complying with DIN 8061/8062 of PN10, push fit type, joints complying with DIN standards.				
	a) DN 80	lm	2400	120.00	288,000.00
2.3.2	Supply and install Socket and spigot uPVC fittings in accordance to DIN 8061/8062				
	a) Bends, DN 80, PN-10				
	i) 22 1/2 degree	pcs	10	300.00	3,000.00
	ii) 90 degree	pcs	15	400.00	6,000.00
2.3.3	Air Release valves				
	i) DN 25	pcs	3	2,000.00	6,000.00
	TOTAL OF BILL NO. 2.3				303,000.00
2.4	<u>Pipe laying from Maelewya to Tegeren public fountain</u>				
2.4.1	Supply and lay uPVC pressure pipes complying with DIN 8061/8062 of PN10, push fit type, joints complying with DIN standards.				
	a) DN 80	lm	2800	120.00	336,000.00
2.4.2	Supply and install Socket and spigot uPVC fittings in accordance to DIN 8061/8062				
	a) Bends, DN 80, PN-10				
	i) 22 1/2 degree	pcs	2	300.00	600.00
	ii) 90 degree	pcs	2	400.00	800.00
	TOTAL OF BILL NO. 2.4				337,400.00
2.5	Branches to Public fountains				
2.5.1	Supply and lay uPVC pressure pipes complying with DIN 8061/8062 of PN10, push fit type, joints complying with DIN standards.				
	a) DN 50	lm	300	62.00	18,600.00
	TOTAL OF BILL NO. 2.5				18,600.00

Item No	Description	Unit	QTY	Unit Price	Total Price
2.6	<u>Fittings at the pump house in Adi-keyih</u>				
2.6.1	Supply and install DCI Tees (T-pieces) according to DIN EN 545, T-pieces double flanged pieces with flanged branch.				
	DN 80x80, PN 10	pcs	2	1,600.00	3,200.00
2.6.2	Supply and install DCI adaptors socket flange system according to DIN EN 545 (Flange for DCI Socket for uPVC).				
	i) DN 80, PN 10	pcs	4	700.00	2,800.00
	ii) DN 100, PN 10	pcs	2	850.00	1,700.00
2.6.3	Supply and install double flanged gate valves, and installing valve units in accordance to DIN EN 545.				
	i) DN 80, PN 10	pcs	2	2,500.00	5,000.00
2.6.4	Supply and install double flanged DCI fittings in accordance to DIN EN-545				
	i) DN 80, 90 degree bends Q-pieces	pcs	3	1,200.00	3,600.00
2.6.5	Supply and install socket and spigot uPVC fittings in accordance to DIN 8061/8062				
	i) DN 80, 90 degree bends Q-pieces	pcs	3	400.00	1,200.00
2.6.6	Supply and install double flanged tapers (Reducers) FFR piece according to DIN EN 545				
	i) DN 80x50, PN 10	pcs	3	1,700.00	5,100.00
	ii) DN 100x80, PN 10	pcs	2	2,000.00	4,000.00
2.6.7	Supply and install double flanged water meter in accordance to DIN EN-545				
	i) DN 80, PN 10	pcs	1	8,000.00	8,000.00
2.6.8	Supply and install pressure gauge				
	i) DN 25	pcs	1	3,500.00	3,500.00
2.6.9	Supply and install double flange check valve in accordance to DIN EN -545				
	i) DN 80, PN 10	pcs	1	5,000.00	5,000.00
2.6.10	Supply and install short double flanged GI pipes 2m long				
	i) DN 80, PN 10	pcs	3	2,500.00	7,500.00
2.6.11	Supply and lay GI pipe				
	i) DN 80, PN 10	lm	15	700.00	10,500.00
2.6.12	Supply and install Flanges				
	i) DN 80, PN 10	pcs	6	400.00	2,400.00
	TOTAL OF BILL NO. 2.6				63,500.00

Item No	Description	Unit	QTY	Unit Price	Total Price
2.7	Fittings at the Reservoir of Maeleweya				
2.7.1	Supply and install DCI Tees (T-pieces) according to DIN EN 545, T-pieces double flanged pieces with flanged branch.				
	DN 80x80, PN 10	pcs	2	1,600.00	3,200.00
2.7.2	Supply and install DCI adaptors socket flange system according to DIN EN 545 (Flange for DCI Socket for uPVC).				
	i) DN 80, PN 10	pcs	4	700.00	2,800.00
	ii) DN 100, PN 10	pcs	2	850.00	1,700.00
2.7.3	Supply and install double flanged gate valves, and installing valve units in accordance to DIN EN 545.				
	i) DN 80, PN 10	pcs	2	2,500.00	5,000.00
	ii) DN 100, PN 10	pcs	1	3,500.00	3,500.00
2.7.4	Supply and install double flanged DCI fittings in accordance to DIN EN-545				
	i) DN 100, 90 degree bends Q-pieces	pcs	3	1,500.00	4,500.00
2.7.5	Supply and install double flanged tapers (Reducers) FFR piece according to DIN EN 545				
	i) DN 100x80, PN 10	pcs	1	2,000.00	2,000.00
2.7.6	Supply and install double flanged water meter in accordance to DIN EN-545				
	i) DN 100, PN 10	pcs	1	10,000.00	10,000.00
2.7.7	Supply and install short double flanged GI pipes 2m long				
	i) DN 100, PN 10	pcs	3	3,000.00	9,000.00
	ii) DN 80, PN 10	pcs	2	2,500.00	5,000.00
2.7.8	Supply and lay GI pipe				
	i) DN 100, PN 10	lm	30	900.00	27,000.00
2.7.9	Supply and install flanges				
	i) DN 80, PN 10	pcs	2	400.00	800.00
	ii) DN 100, PN 10	pcs	2	600.00	1,200.00
2.7.10	Supply and install flange socket elbow in accordance to DIN EN 545				
	i) DN 100	pcs	3	1,500.00	4,500.00
2.7.11	Supply and install Air Release valves				
	i) DN 25	pcs	1	2,000.00	2,000.00
	TOTAL OF BILL NO. 2.7				82,200.00

Item No	Description	Unit	QTY	Unit Price	Total Price
2.8	<u>Fittings at the Junction Boxes</u>				
2.8.1	Supply and install DCI Tees (T-pieces) according to DIN EN 545, T-pieces double flanged pieces with flanged branch.				
	i) DN 100x100	pcs	1	1,800.00	1,800.00
	i) DN 80x50,PN10	pcs	6	1,200.00	7,200.00
2.8.2	Supply and install DCI adaptors socket flange system according to DIN EN 545 (Flange for DCI Socket for uPVC).				
	i) DN 100, PN 10	pcs	2	850.00	1,700.00
	ii) DN 80, PN 10	pcs	14	700.00	9,800.00
	iii) DN 50, PN 10	pcs	6	500.00	3,000.00
2.8.3	Supply and install double flanged tapers (Reducers) FFR piece according to DIN EN 545				
	i) DN 100x80, PN 10	pcs	1	2,000.00	2,000.00
	TOTAL OF BILL NO. 2.8				25,500.00
2.9	<u>Supply and install pipes and Fittings at the public fountains</u>				
2.9.1	1" GI pipe	lm	42	300.00	12,600.00
2.9.2	3/4 " GI pipe	lm	42	200.00	8,400.00
2.9.3	Water Meter 1" GI	pcs	7	400.00	2,800.00
2.9.4	Gate valve 1" GI	pcs	7	200.00	1,400.00
2.9.5	Union 1" GI	pcs	40	90.00	3,600.00
2.9.6	Union 3/4" GI	pcs	42	60.00	2,520.00
2.9.7	Faucets 3/4" GI	pcs	42	120.00	5,040.00
2.9.8	Elbow 1" GI	pcs	14	100.00	1,400.00
2.9.9	Tee 1"x3/4" GI	pcs	42	120.00	5,040.00
2.9.10	Nipples 1" GI	pcs	10	90.00	900.00
2.9.11	Nipples 3/4" GI	pcs	10	60.00	600.00
2.9.12	uPVC Endcap DN 50	pcs	8	90.00	720.00
2.9.13	uPVC Saddle DN 50x1"	pcs	10	110.00	1,100.00
2.9.14	uPVC Adaptor socket bronze system 1"	pcs	20	100.00	2,000.00
2.9.15	uPVC double socket Elbow 1"	pcs	15	60.00	900.00
2.9.16	uPVC pipe 1" push fit type	lm	300	50.00	15,000.00
	TOTAL OF BILL NO. 2.9				64,020.00
	TOTAL OF BILL NO. 2				4,381,070.00

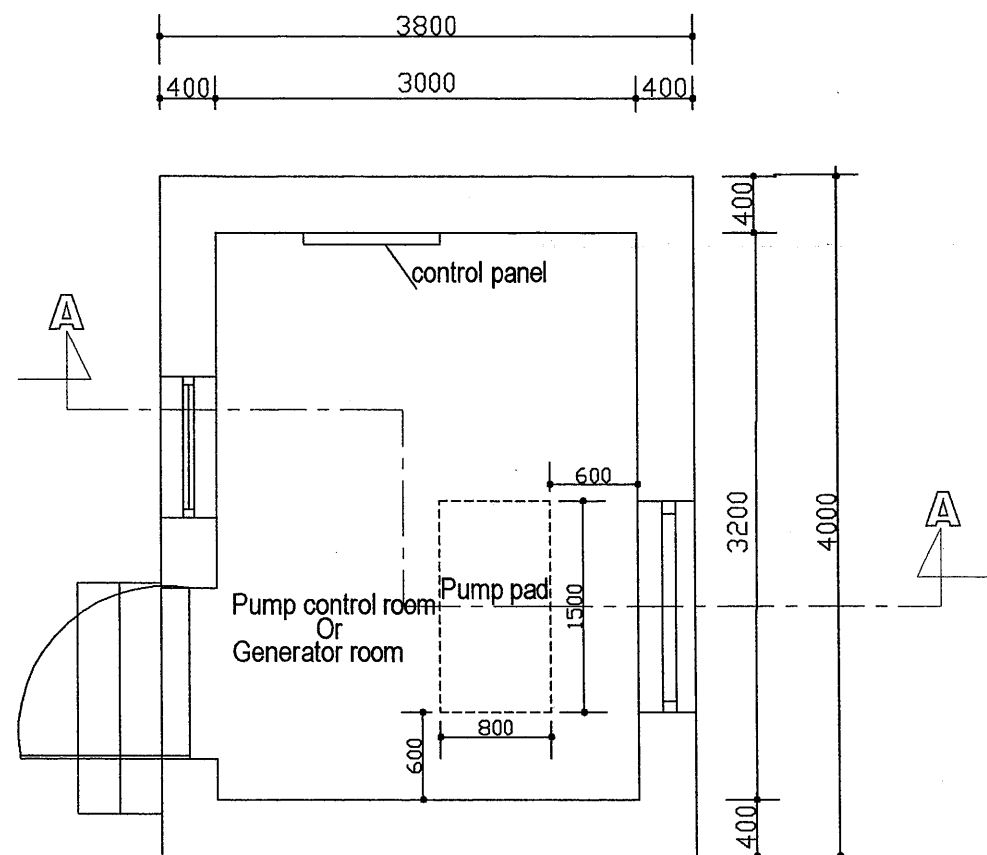
Item No	Description	Unit	QTY	Unit Price	Total Price
	3. Booster Pump				
3.1	Pump at the Booster Station in Adi-keyih				
3.1.1	Grundfos type Electrical driven centrifugal pump	set	1	150,000.00	150,000.00
	CR 16-80				
	with				
	a) Complete set of control panel				
	b) proper size cable				
	c) Base plate fabricated of structural steel and anchor bolts				
	d) Manual pump starter				
	e) Necessary spare parts				
	f) Complete with all accessories to make the pump a whole set of working unit.				
	TOTAL OF BILL NO. 3.1				150,000.00
	TOTAL OF BILLNO. 3				150,000.00
	4. 100m³ GROUND MASONRY RESERVOIR				
4.1	Earth work				
4.1.1	Site preparation, clear up and removal of top soil up to 30cm depth	m ²	78.54	30.00	2,356.20
4.1.2	Bulk excavation in ordinary soil for foundation to a depth of 70cm.	m ³	54.98	72.00	3,958.56
4.1.3	Backfill to 40cm depth with well compacted granular material. Compact with layers of each 20cm thick.	m ³	41.63	98.00	4,079.74
4.1.4	Cart away surplus excavated material and deposit at an appropriate tip	m ³	36.91	36.00	1,328.76
4.1.5	25cm thick basaltic or equivalent stone hard core well rolled, consolidated and blinded with crushed stone	m ²	38.49	92.00	3,541.08
	TOTAL OF BILL NO 4.1				15,264.34
4.2	MASONRY WORK				
4.2.1	50cm thick foundation wall in basaltic stone or equivalent bedded in cement mortar 1:3 (cement sand).	m ³	6.68	1,154.00	7,708.72
4.2.2	Ditto but 50cm thick above ground level.	m ³	32.4	1,288.00	41,731.20
	TOTAL OF BILL NO 4.2				49,439.92

Item No	Description	Unit	QTY	Unit Price	Total Price
4.3	<u>Bottom slab</u>				
4.3.1	7.5cm thick lean concrete class C-10 with minimum cement content of 240 kg/m ³ under reservoir slab	m ²	38.49	250.00	9,622.50
4.3.2	Water tight concrete class C-25 with minimum cement content of 360 kg/m ³ filled into form work and vibrated around rod reinforcement (steel and form work measured separately).				0.00
a)	Bottom slab	m ³	5.94	2,340.00	13,899.60
b)	Top slab	m ³	10.05	2,340.00	23,517.00
4.3.3	Construct pavement around the reservoir in 100mm thick and 500mm wide concrete slab (C-25) as shown in the drawings.	m ²	13.35	250.00	3,337.50
	TOTAL OF BILL NO 4.3				50,376.60
4.4	<u>Form work</u>				
	Provide cut and fix in position sawn zigba wood form work to concrete works				
4.4.1	Top slab	m ²	43.51	355.00	15,446.05
4.4.2	Bottom slab	m ²	3.35	355.00	1,189.25
	TOTAL OF BILL NO 4.4				16,635.30
4.5	<u>Reinforcement</u>				
	Reinforcement steel bar according to St. drawing, price includes cutting, bending, placing in position and tying wires				
4.5.1	Dia 8 mm deformed bars	kg	726.68	43.00	31,247.24
4.5.2	Dia 10mm deformed bars	kg	393.83	43.00	16,934.69
4.5.3	Dia 16mm deformed bars	kg	20.84	43.00	896.12
	TOTAL OF BILL NO 4.5				49,078.05

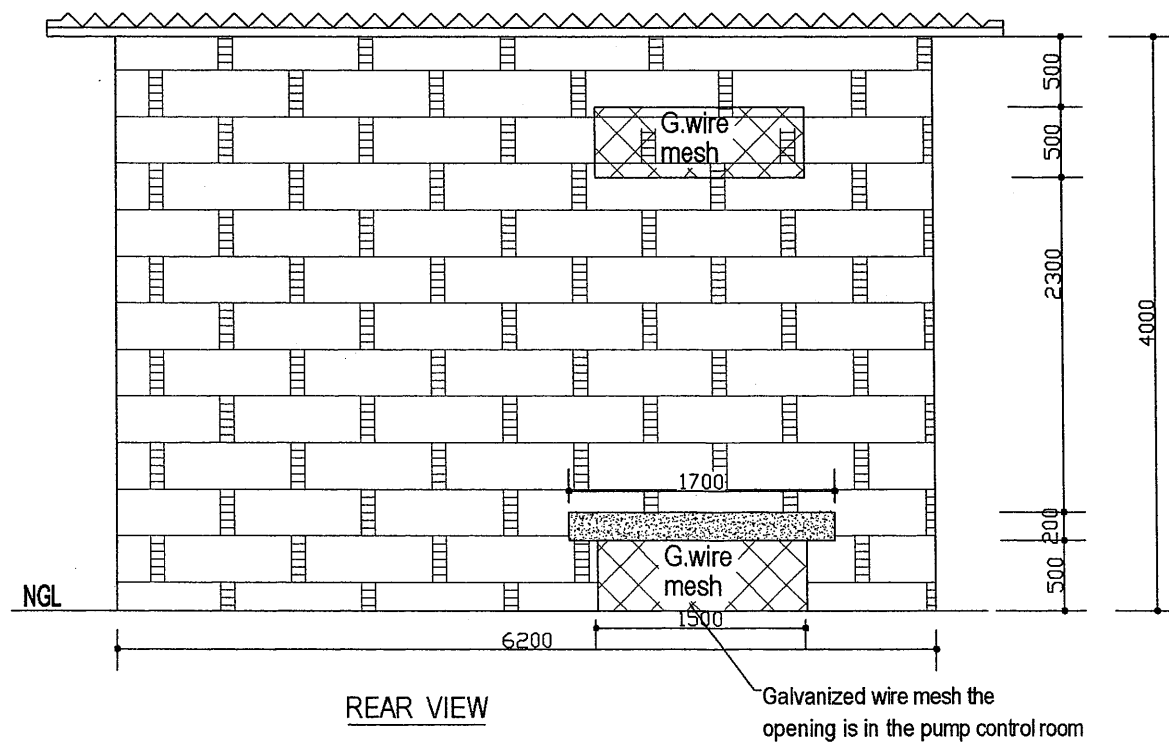
Item No	Description	Unit	QTY	Unit Price	Total Price
4.6	<u>Plastering</u>				
4.6.1	Apply one coat of plaster (3mm thick) in cement mortar (1:2) to the internal wall surfaces of the reservoir then place steel wire mesh on plaster layer on the wall making sure that the wire mesh also spreads to part of the floor for a length of at least 50cm from the base of the wall. The wire mesh is of size 2mm steel wire and with mesh opening of 2cmx2cm. Cover the wire mesh by the second layer of plaster (about 3mm thick) again with cement mortar (1:2) leveling the layer to obtain an even surface. Finally once the second plaster layer is dry apply the third layer of plaster in cement mortar (1:3) and render it with cement coat trowel to obtain a smooth surface finish.	m ²	60.48	220.00	13,305.60
4.6.2	Pointing of masonry joints on external walls of the reservoir.	m ²	69.12	60.00	4,147.20
4.6.3	Screeding for the bottom and top slab to create a slope of 1% for drainage	m ²	100.53	110.00	11,058.30
	TOTAL OF BILL NO 4.6				28,511.10
4.7	MISCELLANEOUS				
4.7.1	GS sheet metal manhole cover 800x800mm and 3mm thick, with angle iron reinforcements (2 diagonals), Dia 14mm bar handle, padlock and all accessories. Unit price includes one coat of anti-rust paint and two coats of oil paint	pcs	1	1,100.00	1,100.00
4.7.2	Place steel wire mesh with in cement plaster layers. The wire mesh is 2mm steel wire & with mesh opening of 2cmx2cm.	m ²	65.98	60.00	3,958.80
4.7.3	Water proofing chemical to treat the internal surfaces except the top slab (VANDEX or Equivalent).	m ²	98.97	400.00	39,588.00
4.7.4	Supply and Install ladder with RHS stands and rings. Unit price includes all the cutting, welding, grinding and				
	Dimension				
	Width = 0.4m				
	Length=3.10m				
	Stand : 50x50x5mm RHS				
	Rings : 25x25x5mm RHS	pcs	1	1,700.00	1,700.00

Item No	Description	Unit	QTY	Unit Price	Total Price
4.7.5	Construct a manhole with 200mm thick HCB wall, plastered internally in two coats of cement mortar 1:3 (cement:sand), on a base of 100mm thick mass concrete. And with 75mm thick R.C (C-25) cover slab, with a steel bar handle. Unit price includes all necessary works, excavation, back filling, etc	pcs	1	6,000.00	6,000.00
	Size : 1000x1000x600 depth (internal)				
	TOTAL OF BILL NO 4.7				52,346.80
	TOTAL OF BILL NO. 4				261,652.11
	5. Public Fountain				
5.1.	<u>Earth Work</u>				
5.1.1	Site clearance and removal of top soil to a depth of 15cm.	m ²	36	30.00	1,080.00
5.1.2	Excavation for foundation to an average depth of 0.60 meter from the stripped ground level.	m ³	14	72.00	1,008.00
	TOTAL BILL NO. 5.1				2,088.00
5.2	<u>Sub-Structure</u>				
5.2.1	25cm thick hardcore in basaltic stone or equivalent and well compacted and blinded with crushed stone.	m ²	22	92.00	2,024.00
5.2.2	40cm thick foundation all in basaltic stone or equivalent.	m ³	5.5	1,154.00	6,347.00
5.2.3	5cm thick C-10 lean concrete.	m ²	22	250.00	5,500.00
5.2.4	10cm thick concrete slab of C-25 concrete	m ³	2.2	2,340.00	5,148.00
5.2.5	Form work				0.00
	a) For bottom slab	m ²	2	355.00	710.00
5.2.6	Re-inforcement bar				0.00
	a) For bottom slab - Dia 10	kg	210	43.00	9,030.00
	TOTAL OF BILL NO. 5.2				28,759.00
5.3	<u>Super-Structure</u>				
5.3.1	40cm thick stone masonry 0.8m above ground level.	m ³	7	1,288.00	9,016.00
5.3.2	Stone masonry with 1:3 cement mortar pointed in all faces for stand pipe.	m ³	3.75	2,400.00	9,000.00
5.3.3	20cm thick H.C.B wall to a height of 1.2m with 25cm opening in 1:3 mix (cement: sand) and with the internal and external walls pointed.	m ²	27	150.00	4,050.00
5.3.4	Supply and fix metal gate as shown in the drawing.	pcs	1	7,200.00	7,200.00
5.3.5	Concrete capping at the top of the masonry wall with 5cm thick at the center	m ³	0.46	3,000.00	1,380.00
	TOTAL OF BILL NO. 5.3				30,646.00
	TOTAL OF BILL NO. 5				61,493.00

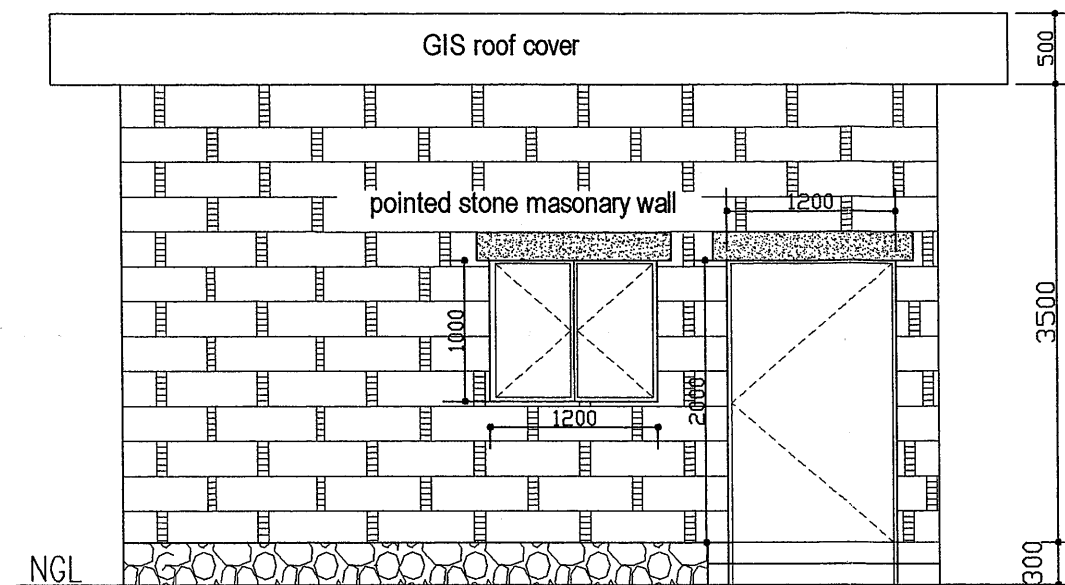
Item No	Description	Unit	QTY	Unit Price	Total Price
	6. Connection Box				
6.1	Earth work				
6.1.1	Bulk excavation in ordinary soil for foundation, slab and walls.	m ³	1	72.00	72.00
6.1.2	Bulk excavation in soft rock for foundation, slab and walls.	m ³	1	310.00	310.00
	TOTAL OF BILL NO. 6.1				382.00
6.2	Concrete Works				
6.2.1	C-25 class concrete with minnum cement content of 360kg/m ³				
	a) Cover slab	m ³	0.4	2,340.00	936.00
	b) Bottom slab	m ³	0.29	2,340.00	678.60
	TOTAL OF BILL NO. 6.2				1,614.60
6.3	Form Work				
6.3.1	Provide cut and fix sawn and sound wood form work to concrete works.				
	a) Cover slab	m ²	4.33	355.00	1,537.15
	b) Bottom slab	m ²	0.68	355.00	241.40
	TOTAL OF BILL NO. 6.3				1,778.55
6.4	Hollow Block Work				
6.4.1	20cm thick Hollow concrete block wall bedded in cement mortar 1:3 mix (cement:sand) internal walls plastered.	m ²	5.22	200.00	1,044.00
	TOTAL OF BILL NO. 6.4				1,044.00
6.5	Reinforcement				
6.5.1	Reinforcement steel bars according to structural drawing, price includes cutting bending, placing in position and tying of wires				
	a) dia 12	kg	76.56	43.00	3,292.08
	TOTAL OF BILL NO. 6.5				3,292.08
	TOTAL OF BILL NO. 6				8,111.23
	TOTAL OF BILL NO. 1-6				4,952,133.42



PLAN

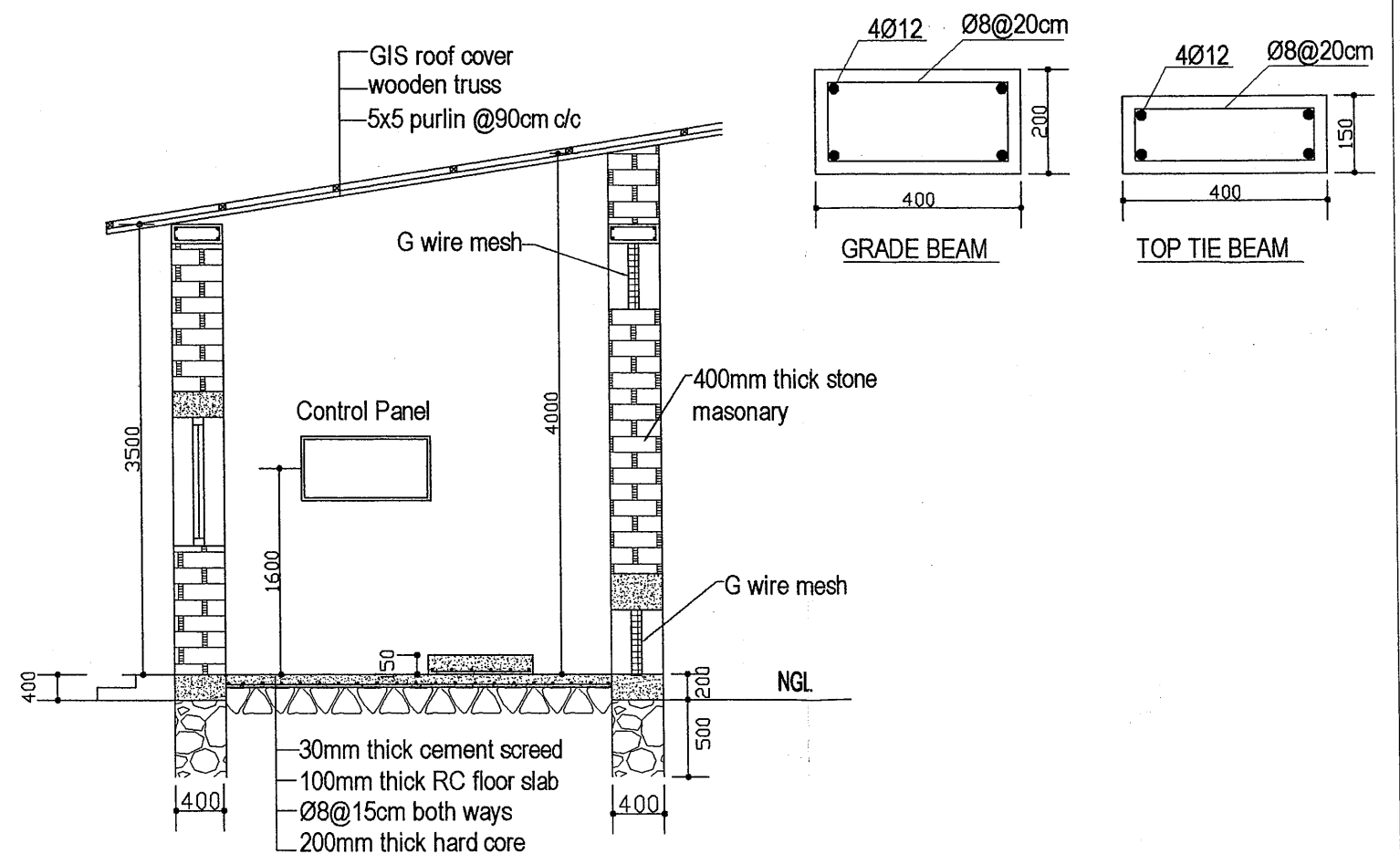


REAR VIEW

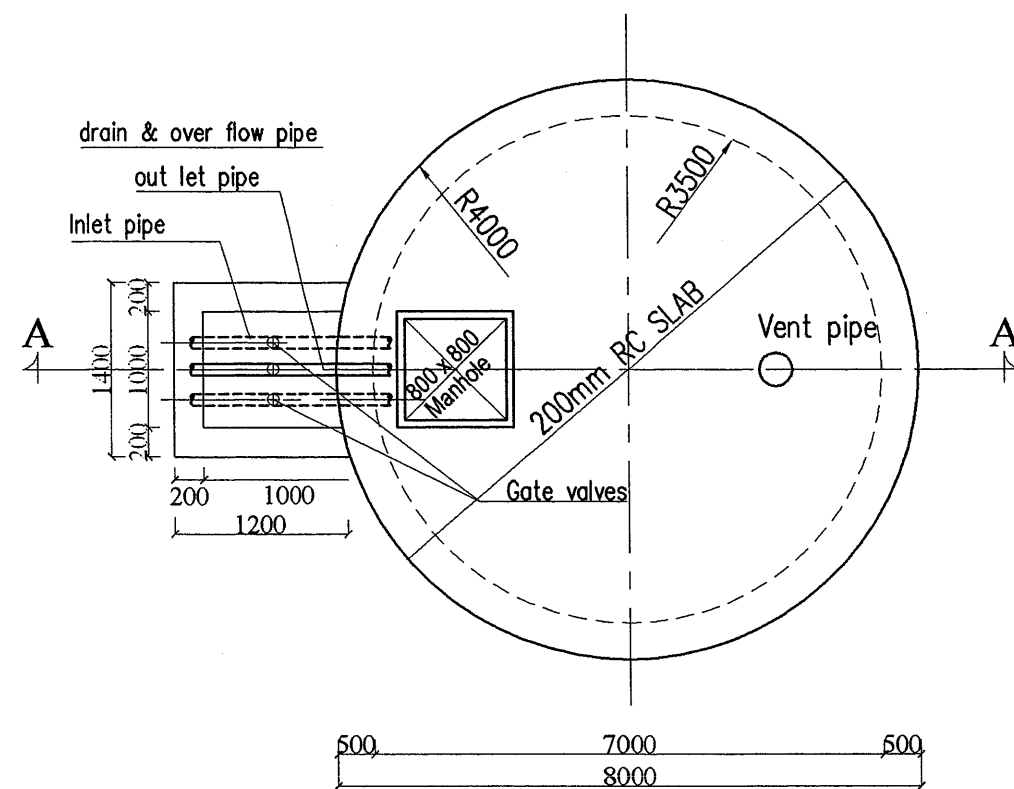


FRONT ELEVATION

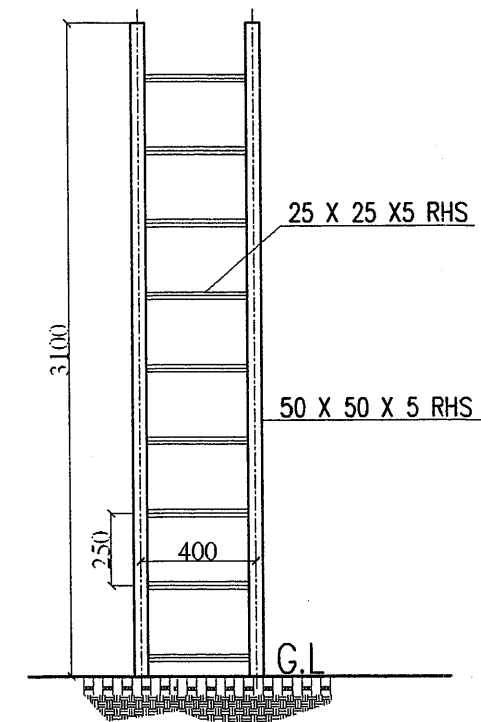
N.B:- All dimensions are in mm unless other wise specified



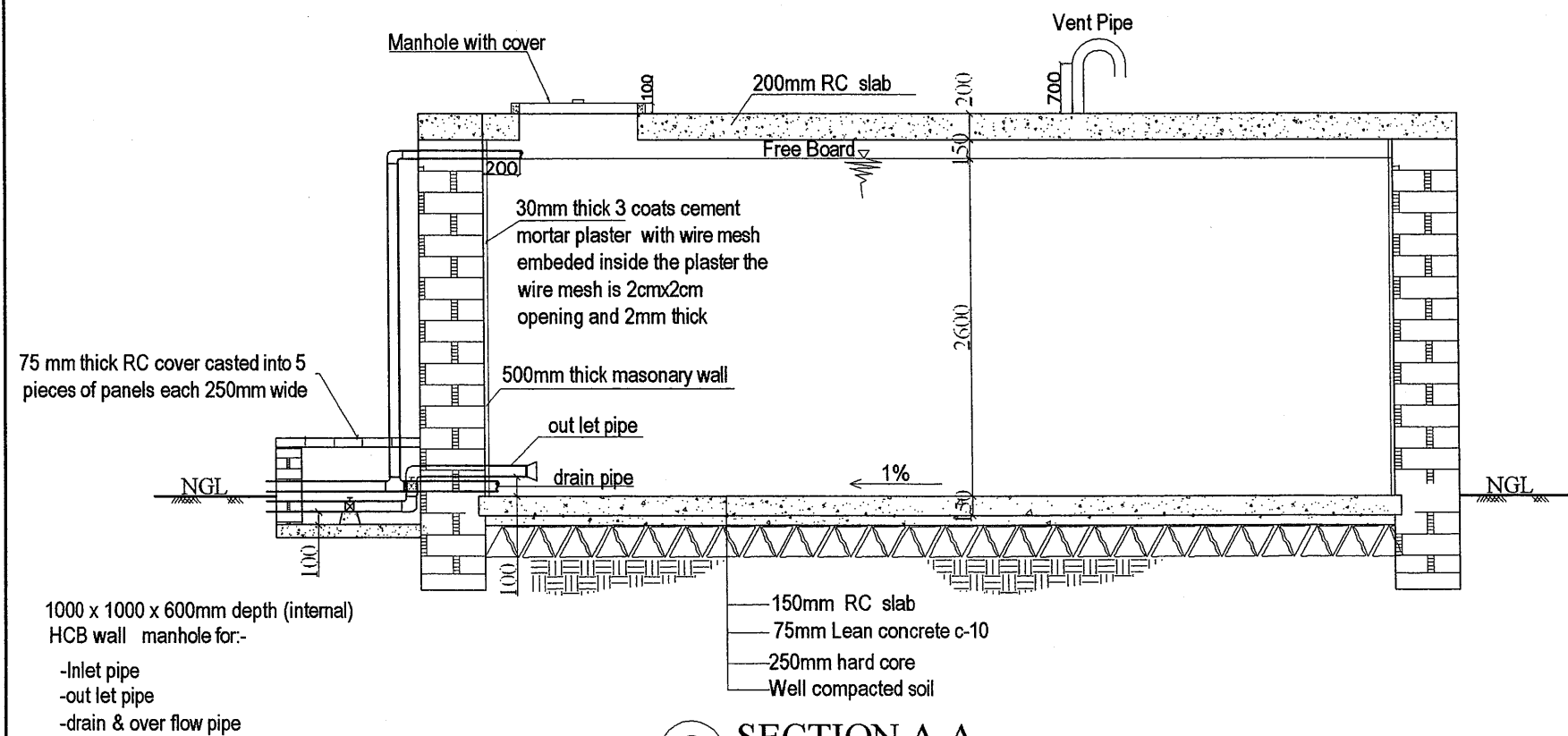
SECTION A-A



PLAN VIEW

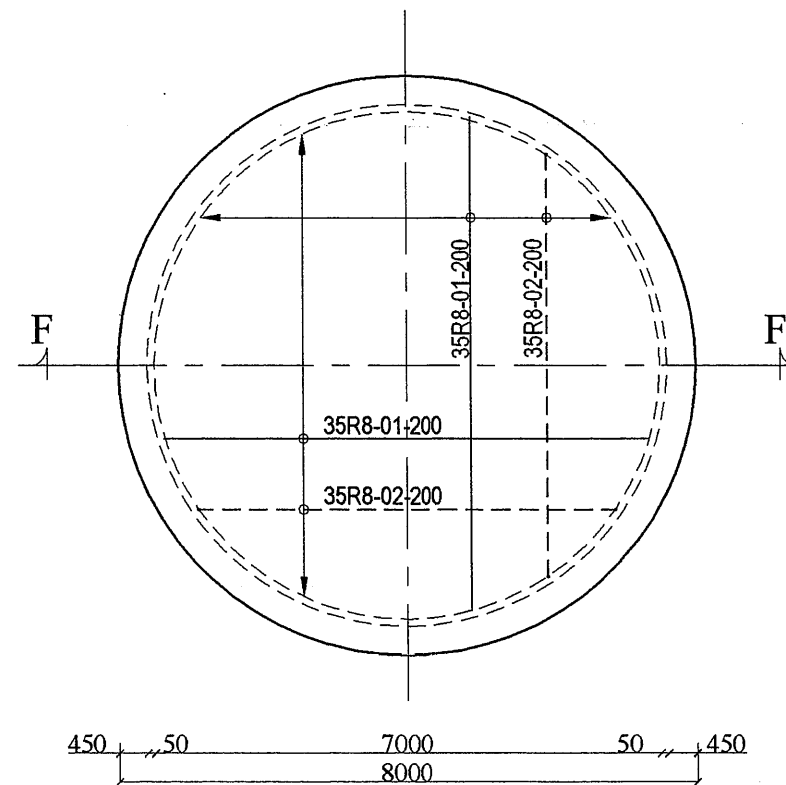


DETAIL OF STEEL LADDER-MOBILE



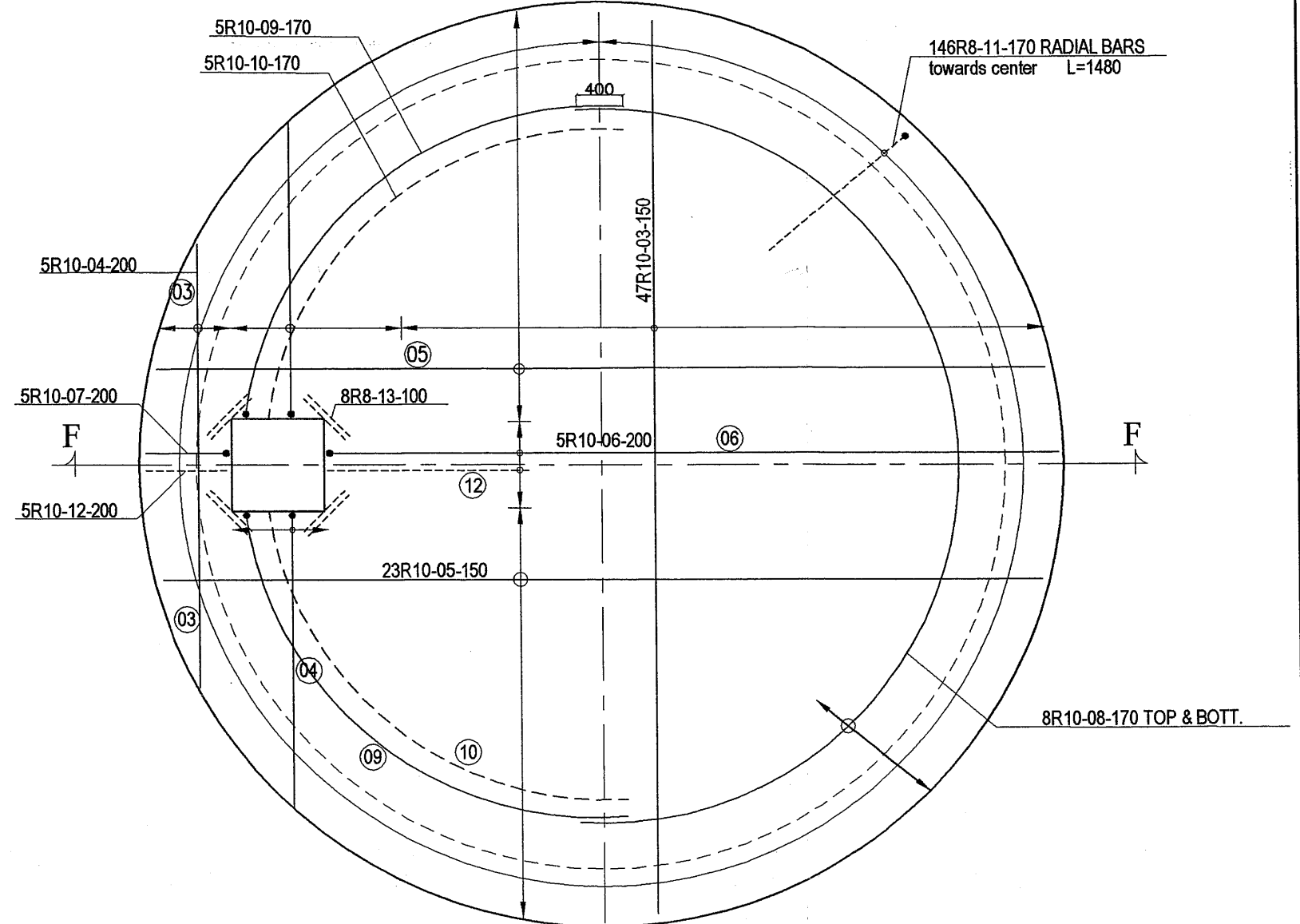
2 SECTION A-A

PROJECT	MAELEWYA WATER SUPPLY PROJECT		
COMPONENT	100m3 ON GROUND-STONE MASONRY RESERVOIR		
CLIENT	SENAI FOUNDATION (MAELEWYA WATER DEVELOPMENT PROJECT)		
CONSULTANT	AAT-WREC		
TITLE	DETAIL OF RESERVOIR PLAN, SECTIONS AND PIPE LAY OUT		
CHECKED BY			DWG.No.
DATE	JANUARY 2009		100m3 SM-G-1/2



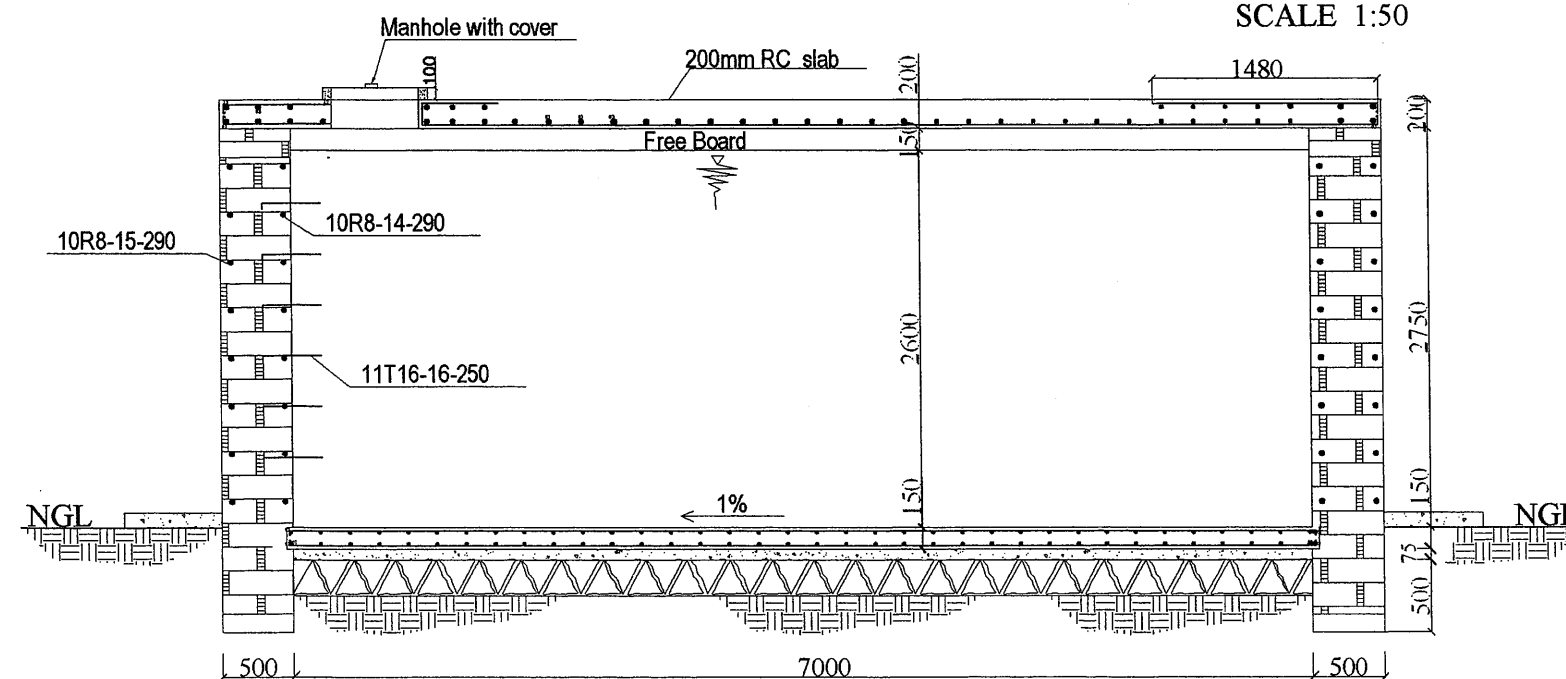
RC DETAIL OF RESERVOIR BOTTOM SLAB

SCALE 1:100



RC DETAIL OF RESERVOIR TOP SLAB

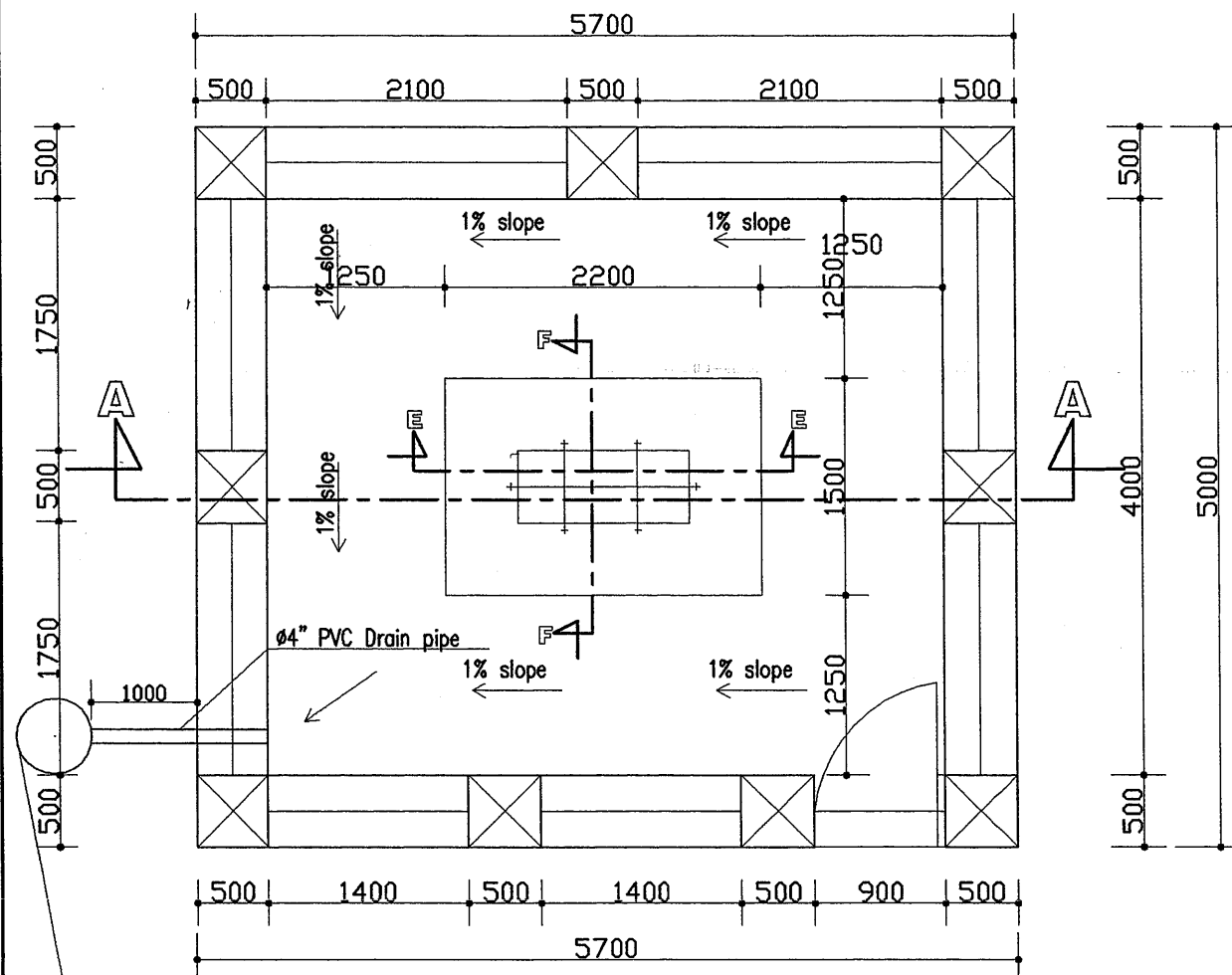
SCALE 1:50



SECTION F-F

SCALE 1:50

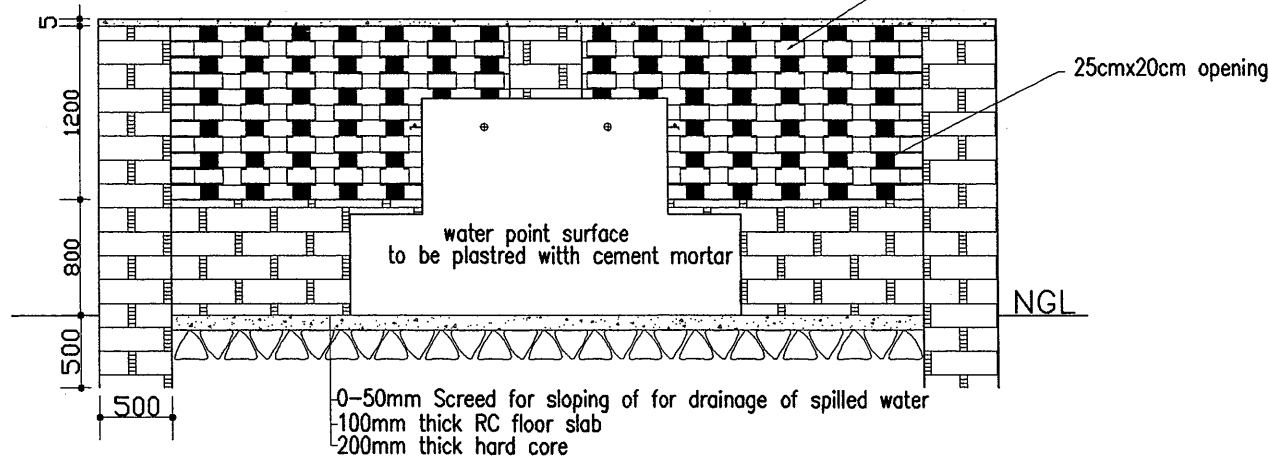
PROJECT	MALEWYA WATER SUPPLY PROJECT	
COMPONENT	100m3 ON GROUND-STONE MASONRY RESERVOIR	
CLIENT	SENAI FOUNDATION (MALEWYA WATER DEVELOPMENT PROJECT)	
CONSULTANT	AAT-WREC	
TITLE	REINFORCEMENT DETAIL OF RESERVOIR WALL AND SLABS	
CHECKED BY		DWG.No.
DATE	JANUARY 2009	100m3 SM-G-2/2



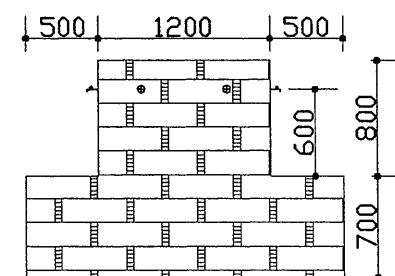
Soak away pit 1m dia. & 2m deep
filled with stone and gravel

PLAN

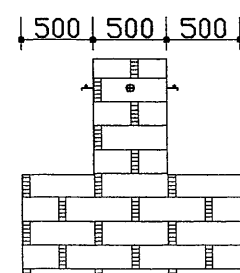
Cement block wall using blocks of 40cmx20cmx20cm
with hollow space filled by concrete, blocks are to be placed
leaving 25cmx20cm for openings



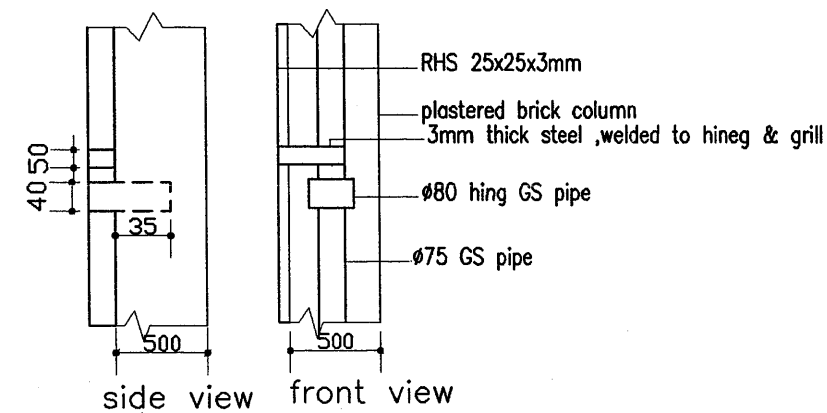
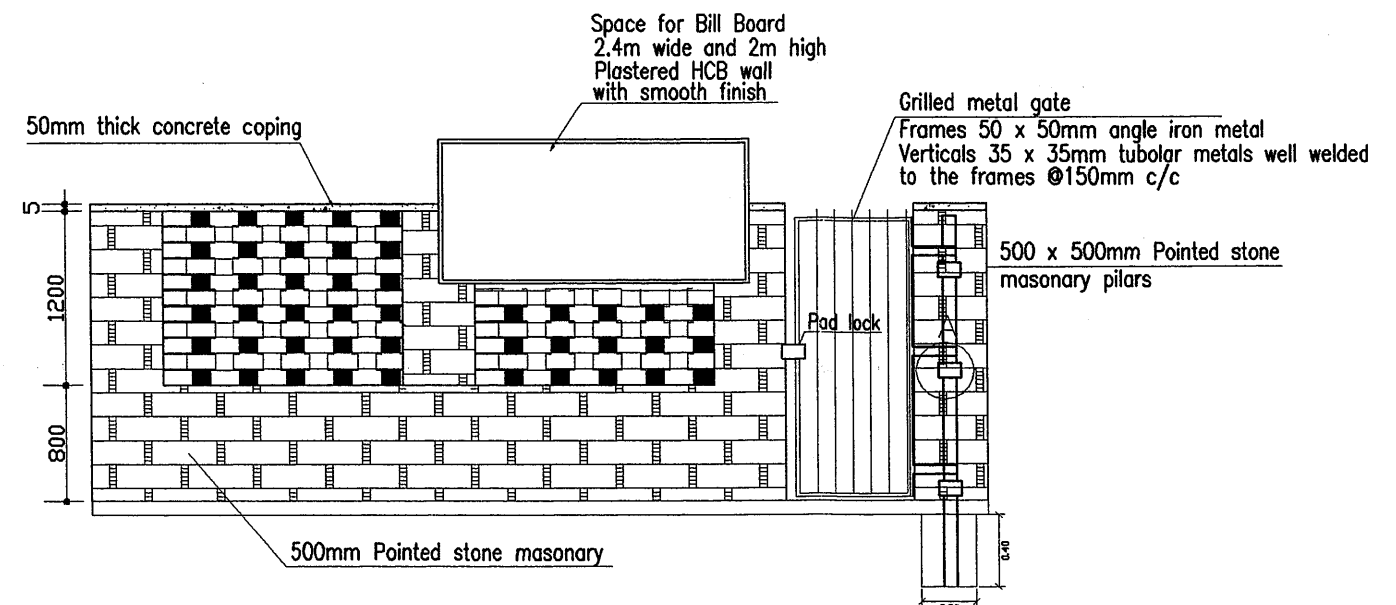
SECTION A-A



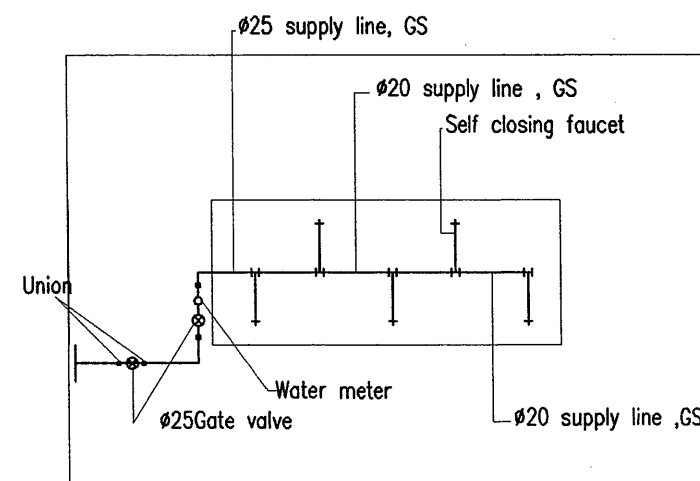
SECTION E-E



SECTION F-F

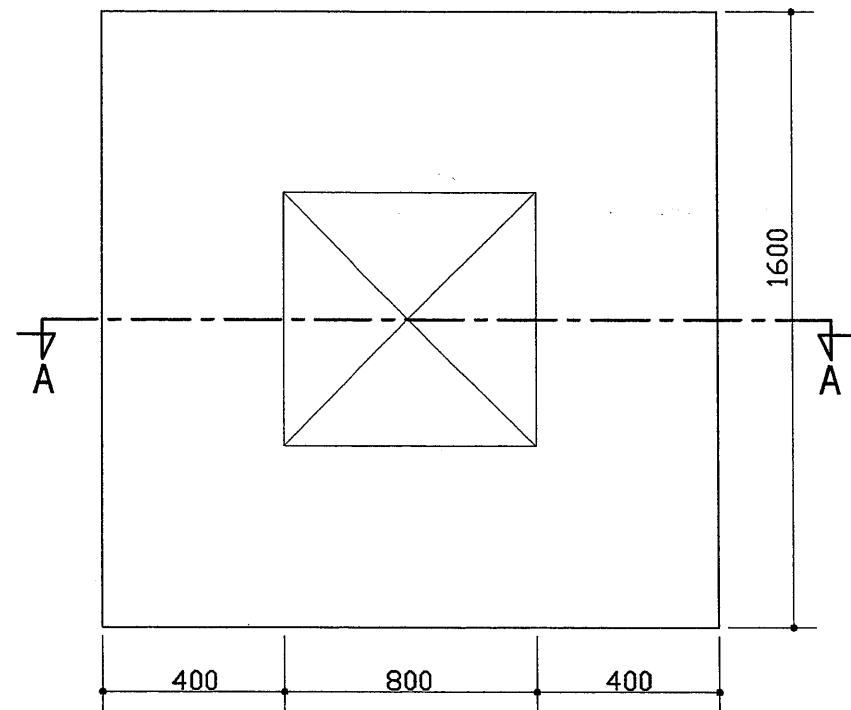


DETAIL-A

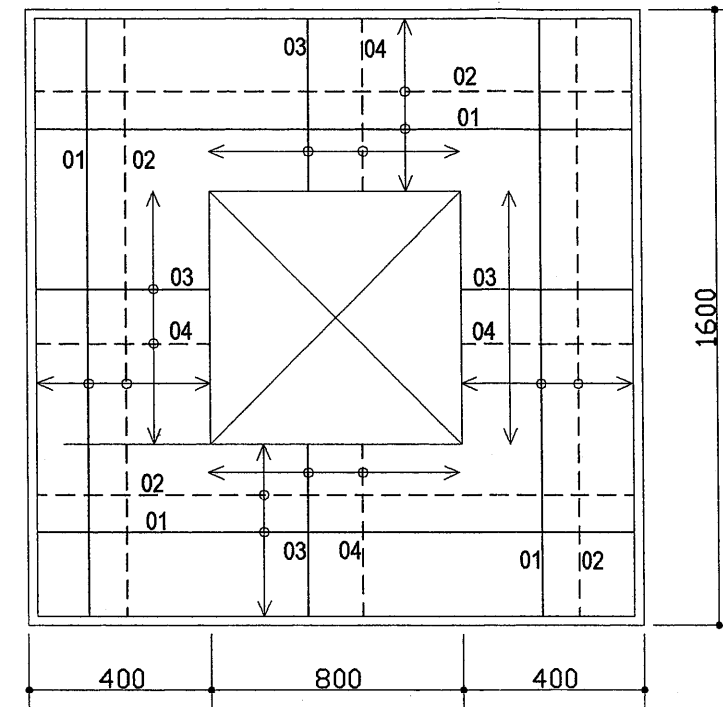


PIPE LAY-OUT

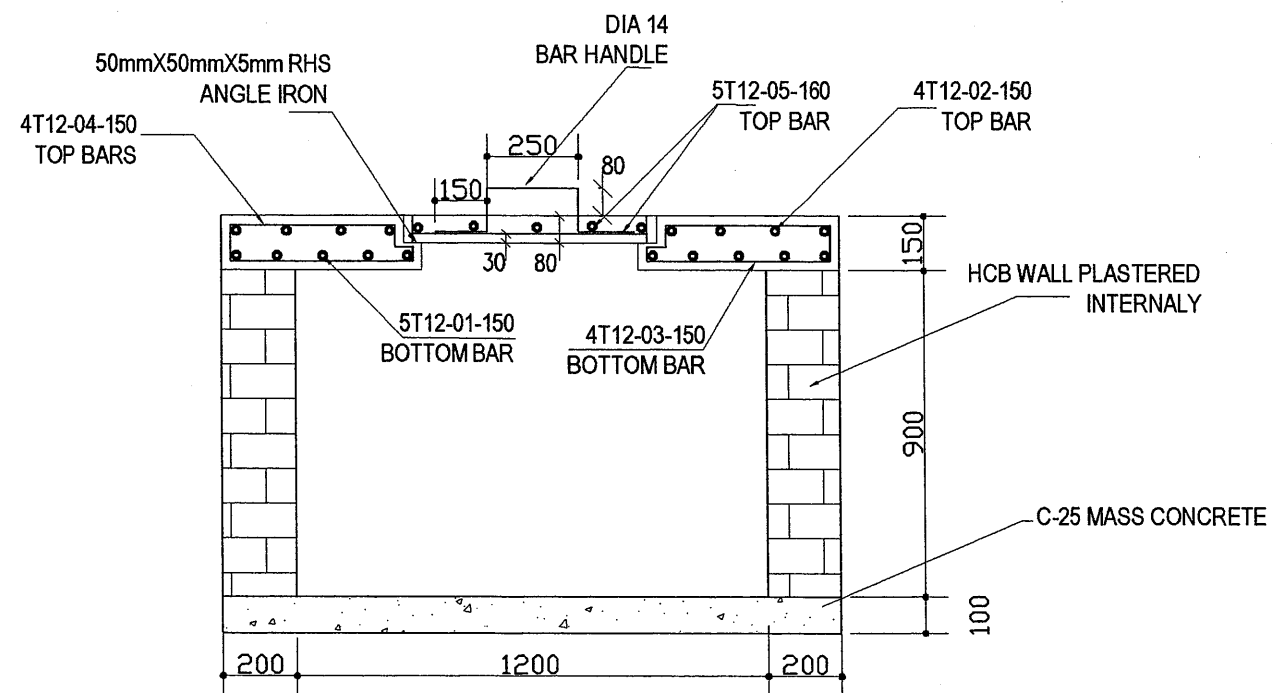
PROJECT	STANDARD WRD PUBLIC FOUNTAIN		
COMPONENT	PUBLIC FOUNTAIN		
CLIENT	SENAI FOUNDATION (MAELEWYA WATER DEVELOPMENT PROJECT)		
CONSULTANT	AAT-WREC		
TITLE	SECTION AND PLAN		
CHECKED BY			DWG.No.
DATE	JANUARY 2009		PF-1/1



PLAN



REINFORCEMENT PLAN



SECTION A-A

PROJECT	MAELEWYA WATER SUPPLY PROJECT	
COMPONENT	TYPICAL VALVE CHAMBER	
CLIENT	SENAI FOUNDATION (MAELEWYA WATER DEVELOPMENT PROJECT)	
CONSULTANT	AAT-WREC	
TITLE	PLAN, SECTION AND REINFORCEMENT DETAIL	
CHECKED BY		DWG.No.
DATE	JANUARY 2009	VC-1/1

STATE OF ERITREA
ADMINISTRATION OF ZOBA DEBUB

PROJECT:-

MAELEWYA WATER SUPPLY PROJECT

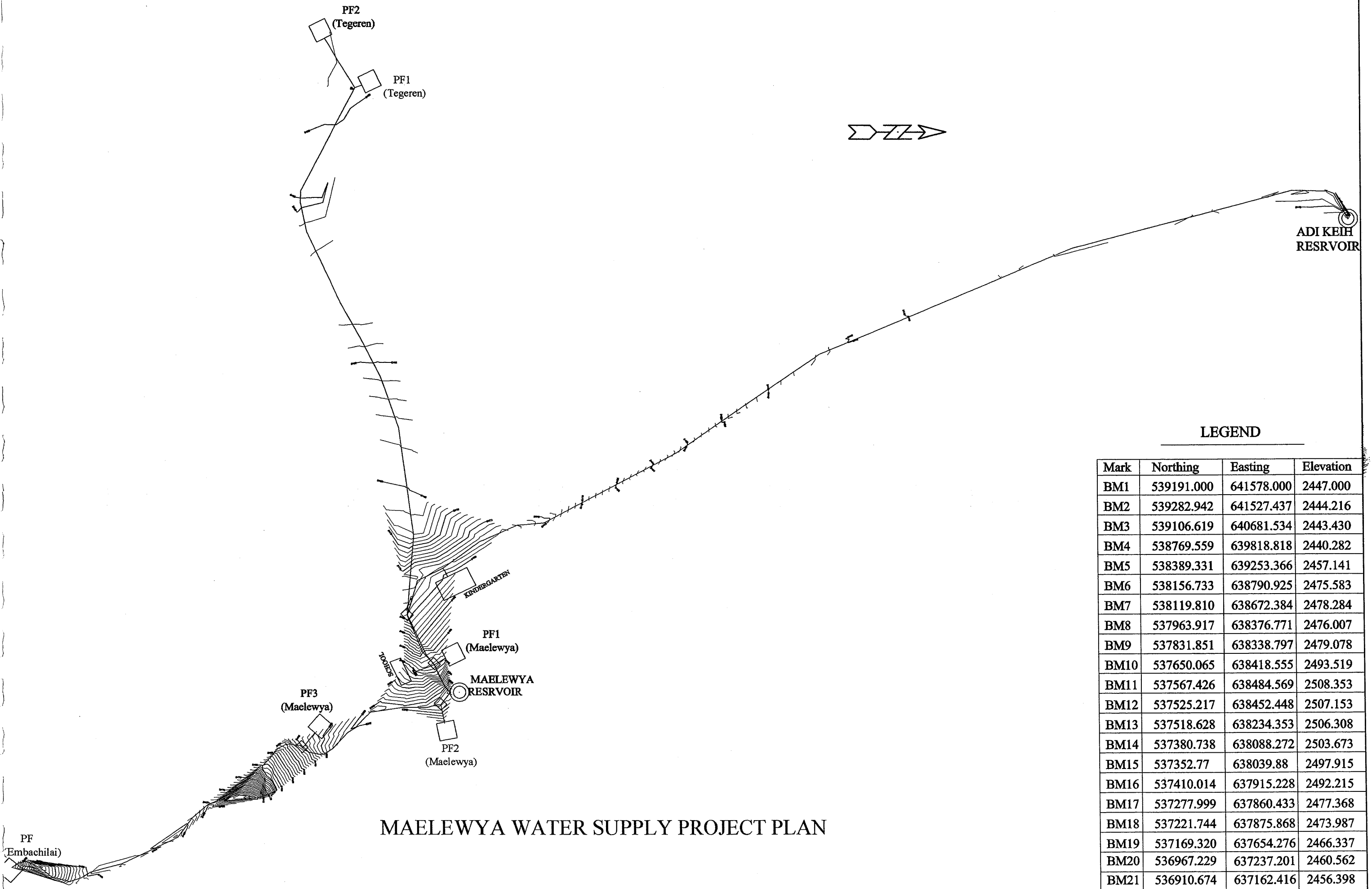
CLIENT:-

SENAI FOUNDATION
(MAELEWYA WATER DEVELOPMENT PROJECT)

CONSULTANT:-

ALEM A. TEFAMARIAM WATER RESOURCES
ENGINEERING CONSULTANT
(AAT-WREC)

DATE:- JANUARY 2009



LEGEND

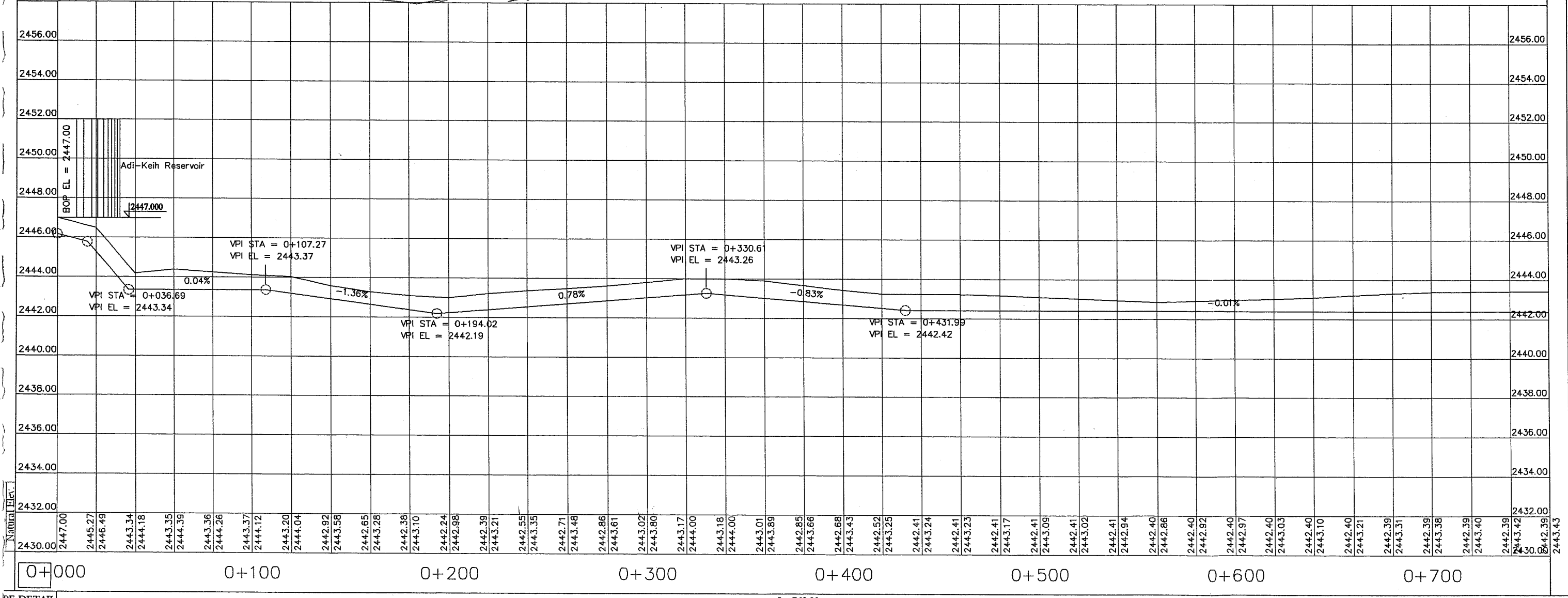
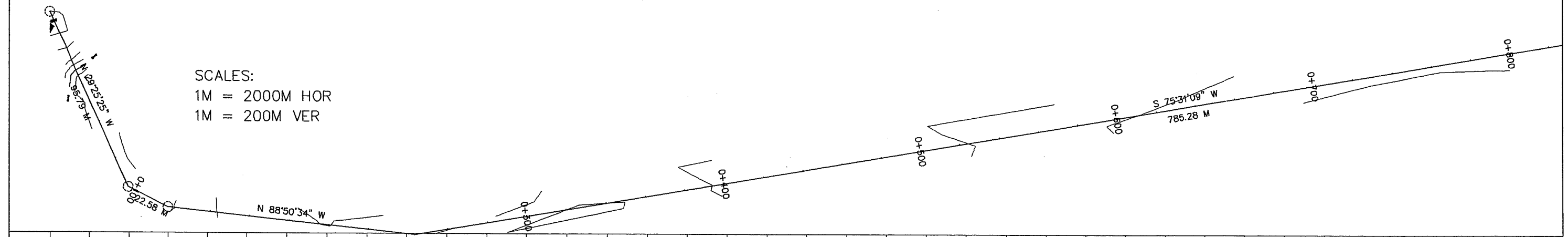
Mark	Northing	Easting	Elevation
BM1	539191.000	641578.000	2447.000
BM2	539282.942	641527.437	2444.216
BM3	539106.619	640681.534	2443.430
BM4	538769.559	639818.818	2440.282
BM5	538389.331	639253.366	2457.141
BM6	538156.733	638790.925	2475.583
BM7	538119.810	638672.384	2478.284
BM8	537963.917	638376.771	2476.007
BM9	537831.851	638338.797	2479.078
BM10	537650.065	638418.555	2493.519
BM11	537567.426	638484.569	2508.353
BM12	537525.217	638452.448	2507.153
BM13	537518.628	638234.353	2506.308
BM14	537380.738	638088.272	2503.673
BM15	537352.77	638039.88	2497.915
BM16	537410.014	637915.228	2492.215
BM17	537277.999	637860.433	2477.368
BM18	537221.744	637875.868	2473.987
BM19	537169.320	637654.276	2466.337
BM20	536967.229	637237.201	2460.562
BM21	536910.674	637162.416	2456.398

MAELEWYA WATER SUPPLY PROJECT PLAN



BOP = 0+000.00
E = 641578.00
N = 539191.00

SCALES:
1M = 2000M HOR
1M = 200M VER



PE DETAIL L= 760.00m uPVC PIPE DN80



0+0

0+6

0+1

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N = 539088.82
E = 640624.88
I = 08°08'32"L

0+1

0+1

0+1

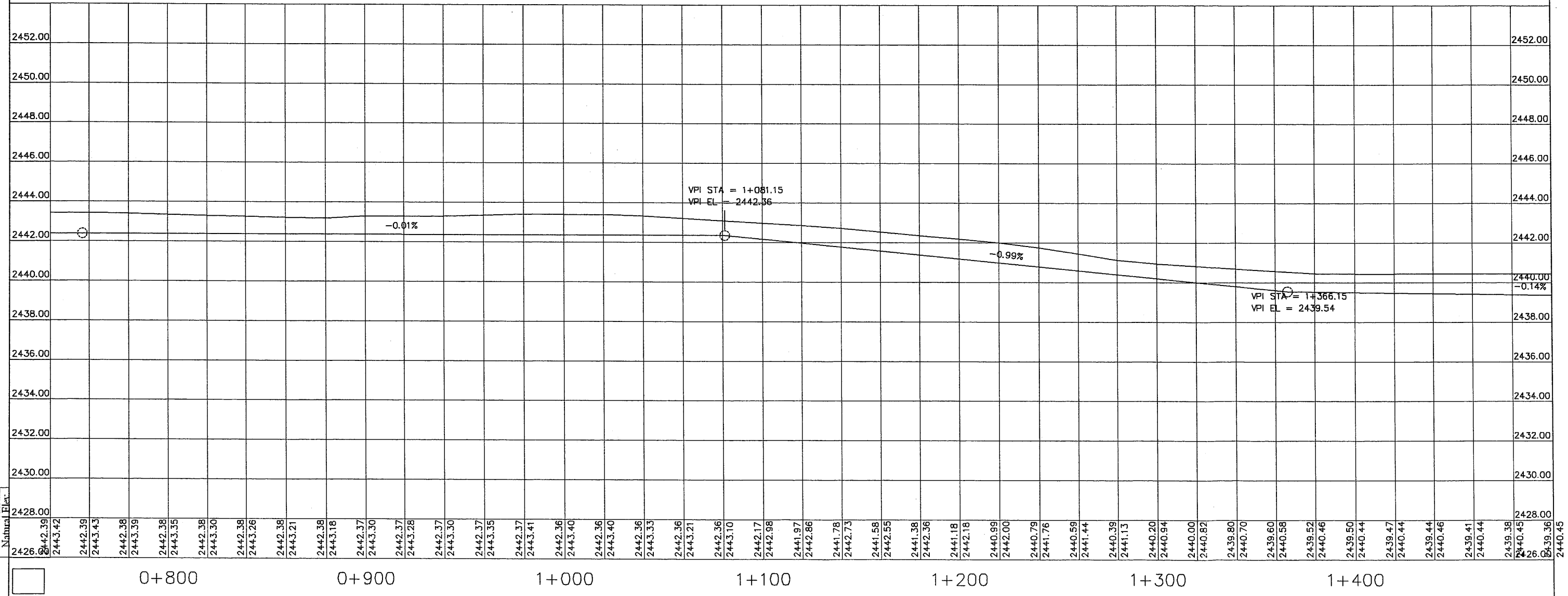
0+1

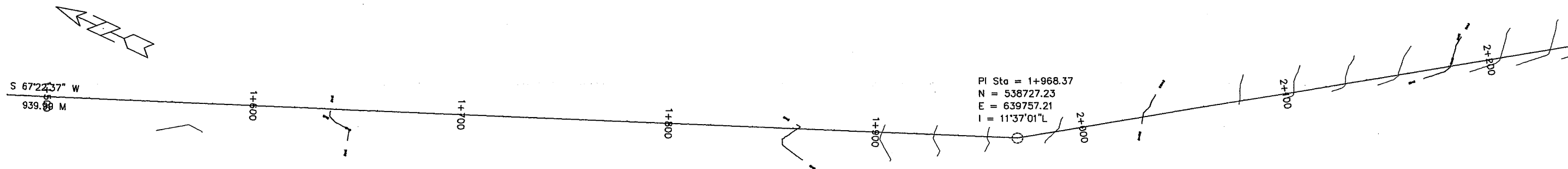
0+1

SCALES:

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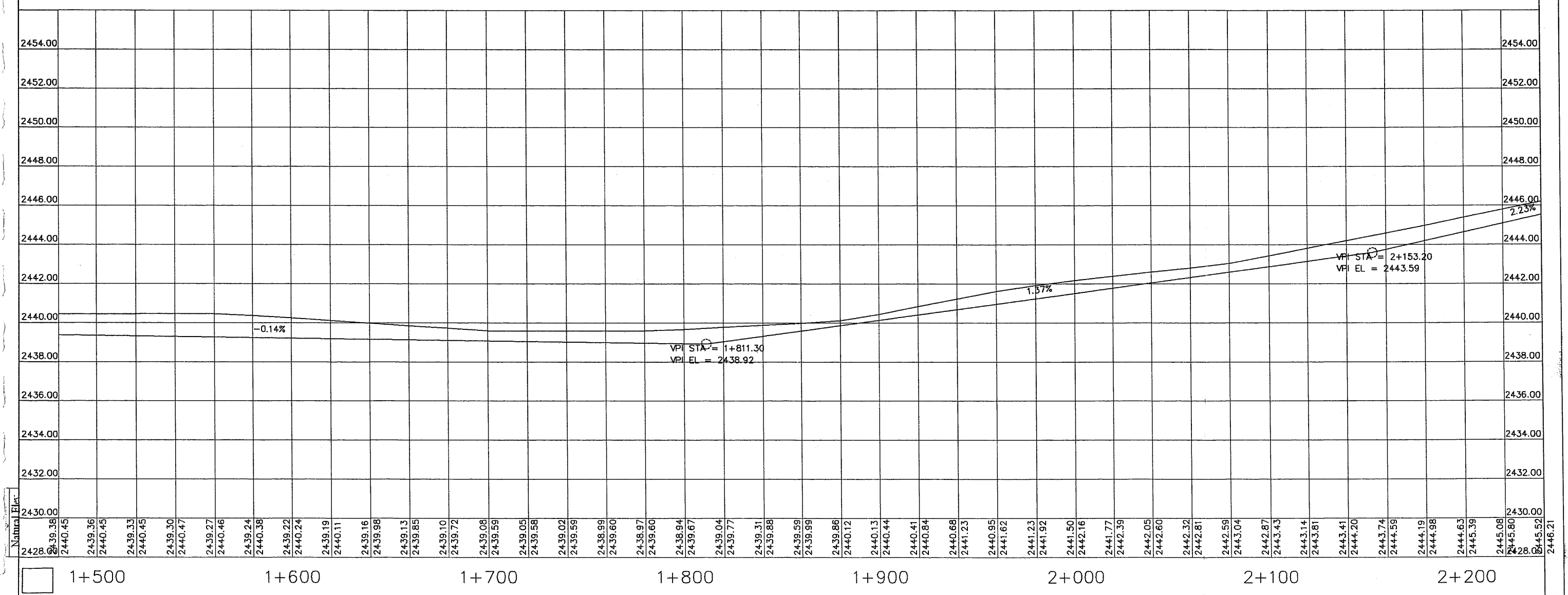
1M = 200M VER

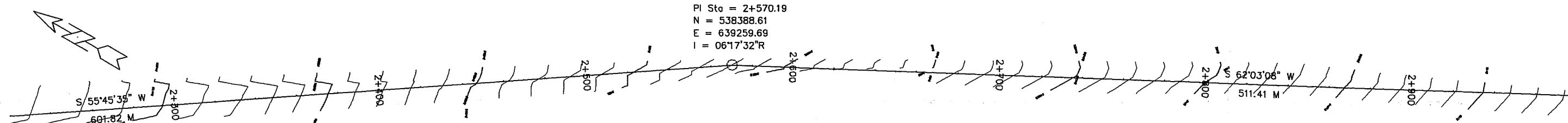




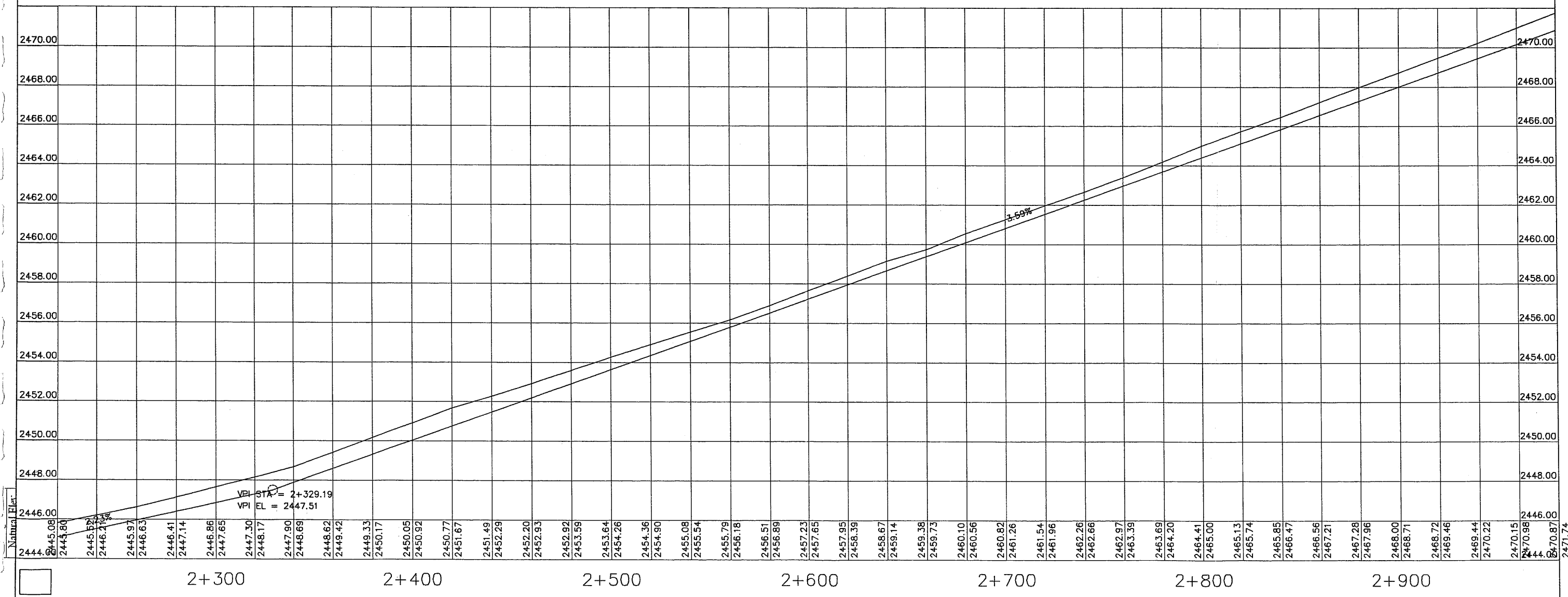
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N = 538727.23
E = 639757.21
I = 11°37'01\"/>

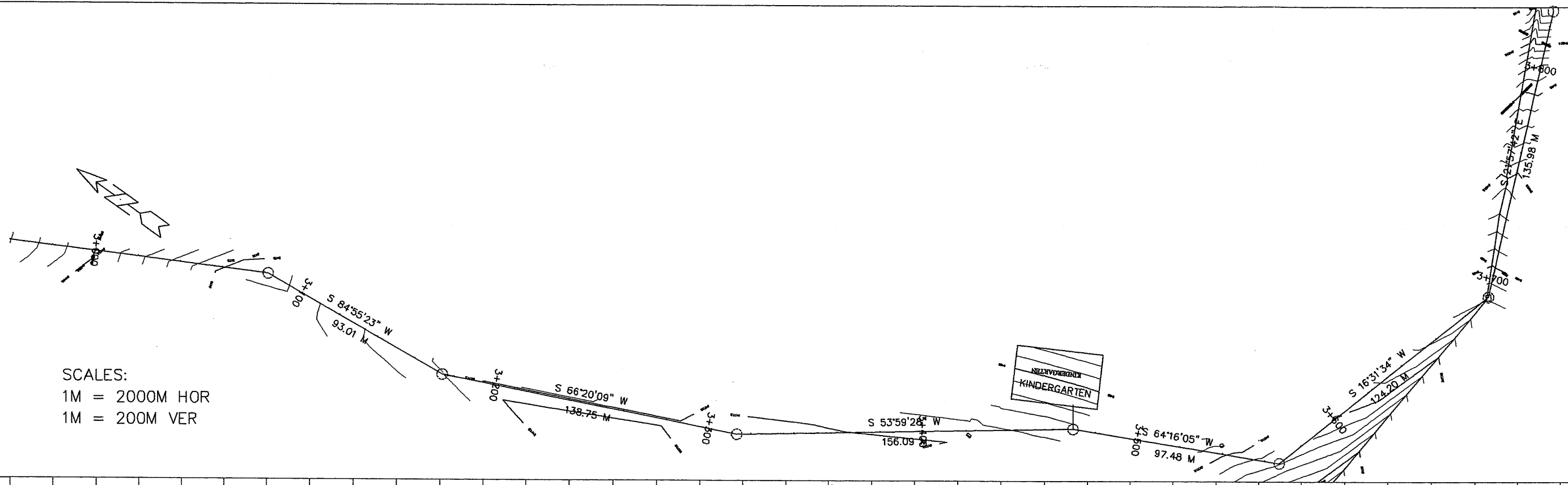
SCALES:
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1M = 200M VER



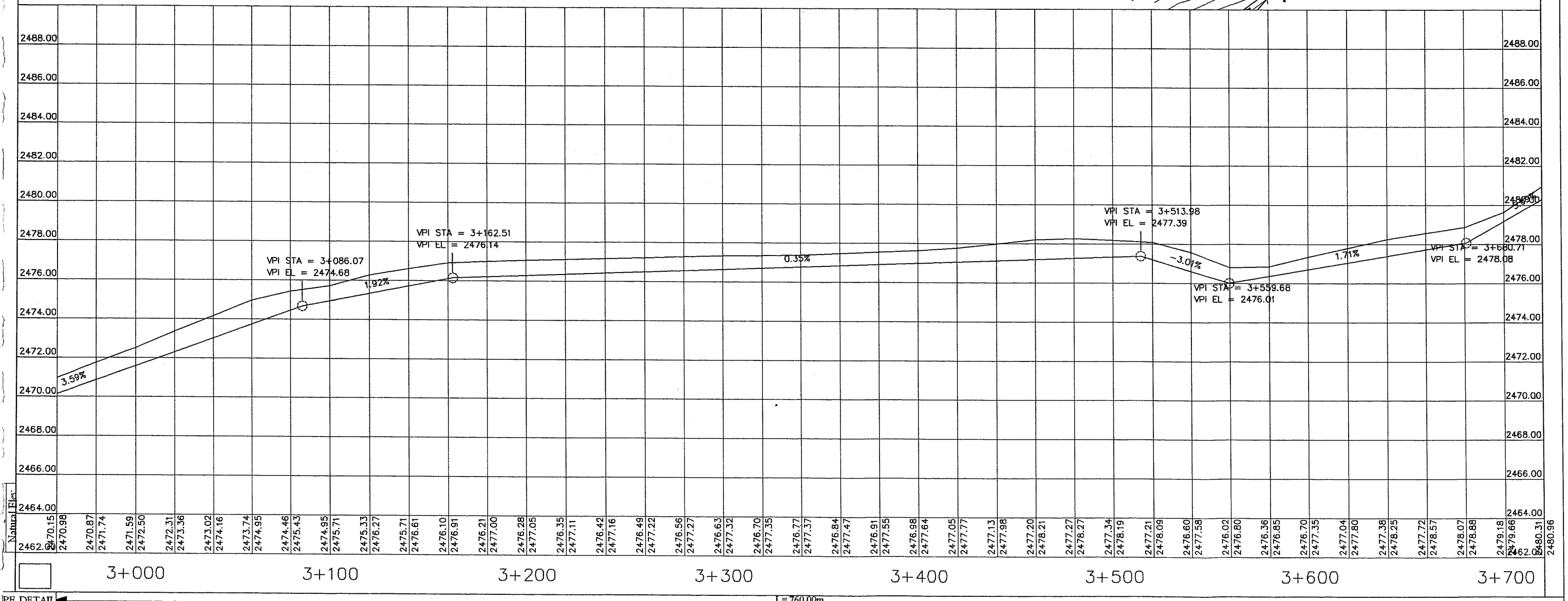


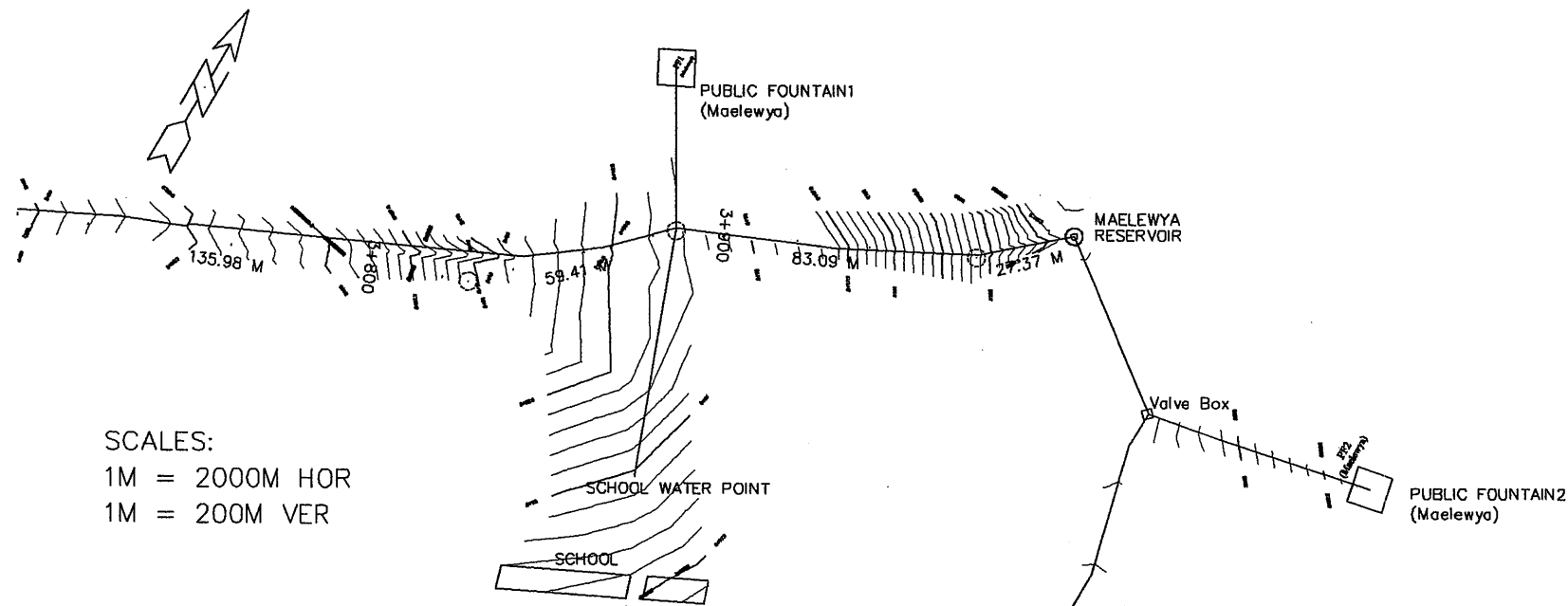
SCALES:
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1M = 200M VER



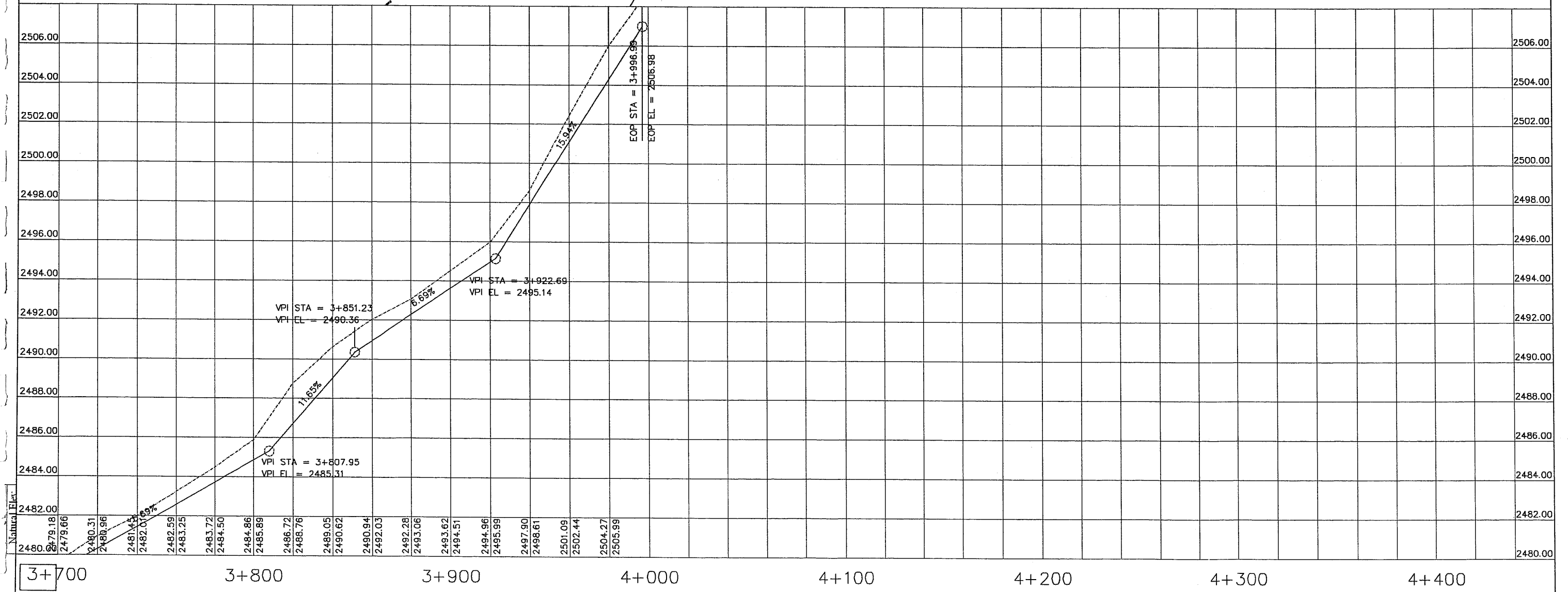


SCALES:
 1M = 2000M HOR
 1M = 200M VER



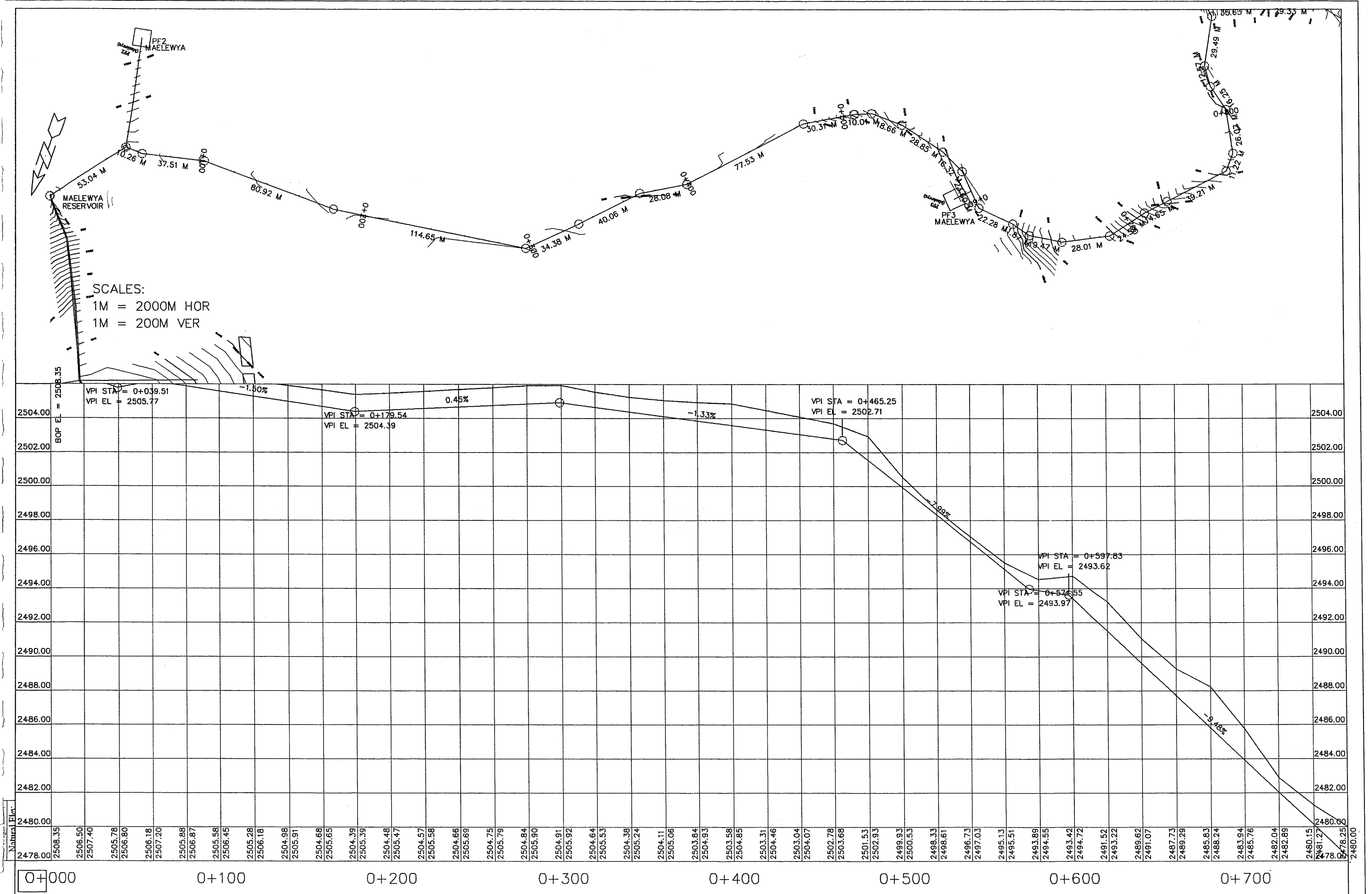


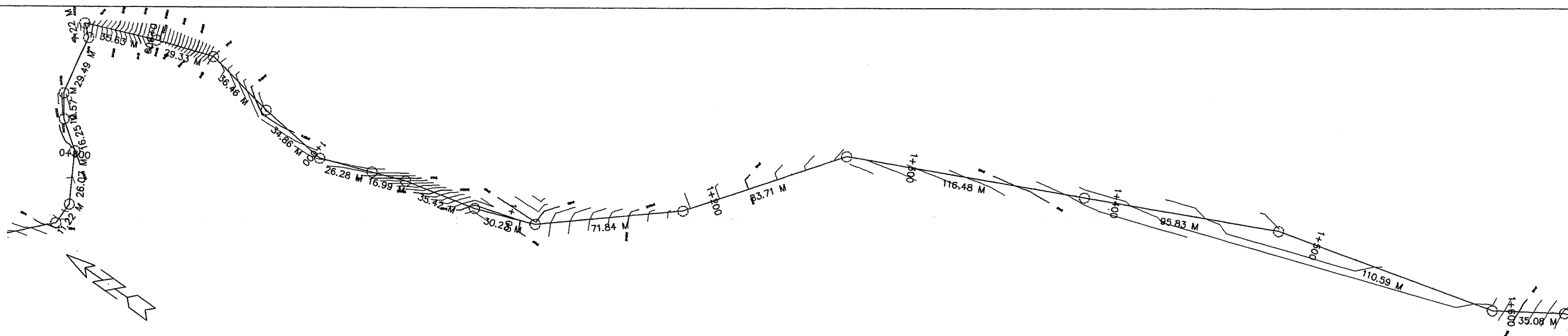
SCALES:
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1M = 200M VER



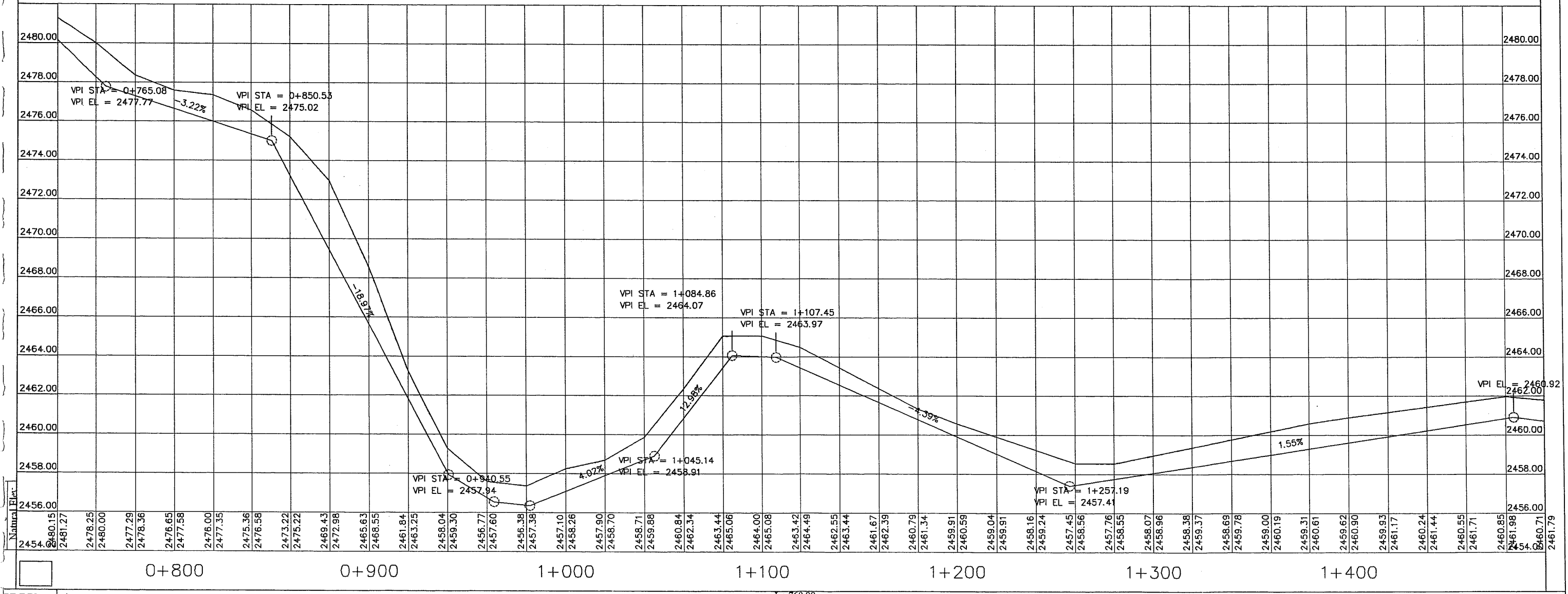
PE DETAIL L= 760.00m
uPVC PIPE DN80

CONSULTANT:- ALEM A. TESFAMARIAM WATER RESOURCES ENGINEERING CONSULTANT (AAT-WREC)	DATE :- JANUARY 2009	CLIENT :- SENAI FOUNDATION (MAELEWYA WATER DEVELOPMENT PROJECT)	PROJECT:- MAELEWYA WATER DEVELOPMENT PROJECT DRAWING TITLE:- PLAN AND PROFILE OF THE WATER SUPPLY LINE - ST. 3+700 TO 4+000 (TRANSMISSION LINE FROM ADI-KEIH RESERVOIR TO MAELEWYA RESERVOIR)	DRAWING NO. SHEET NO. 6/6
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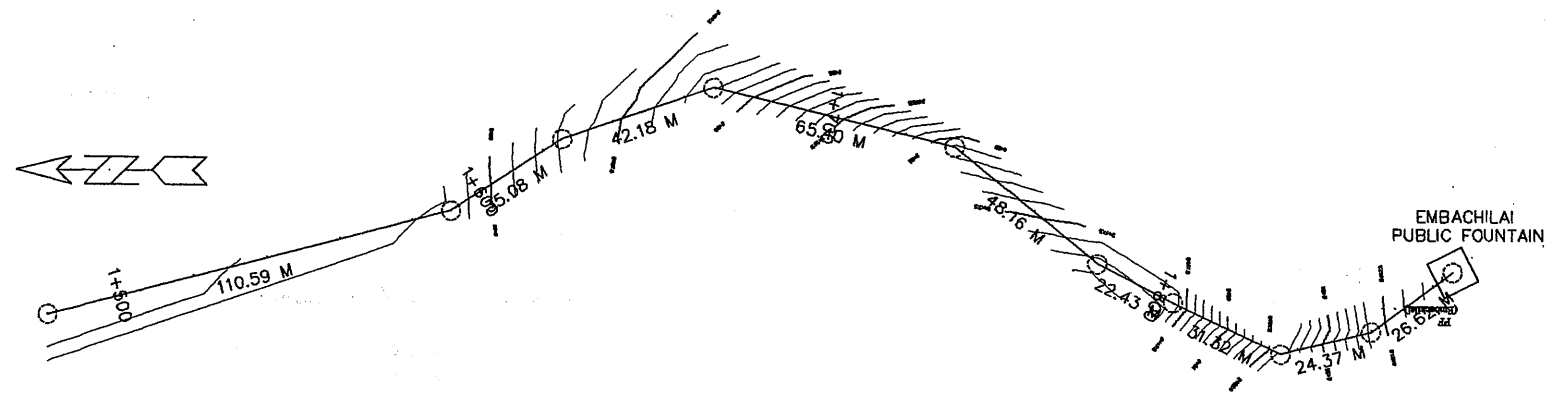




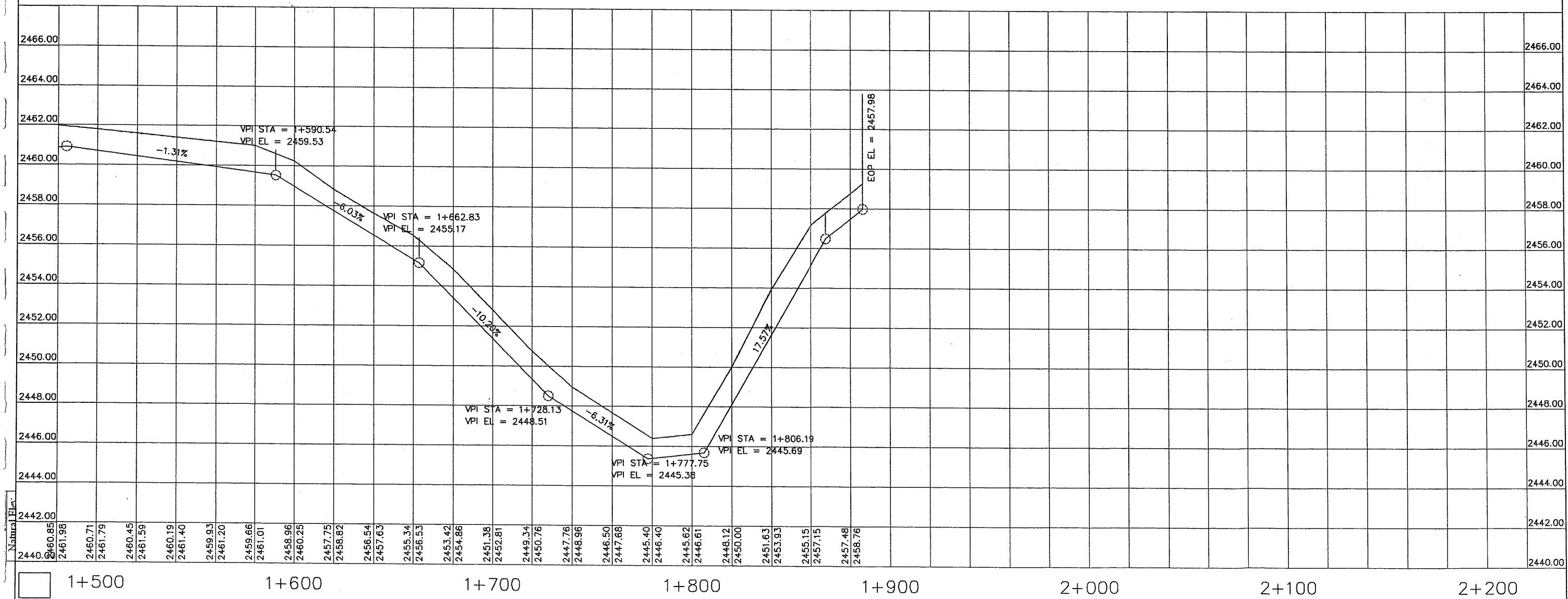
SCALES:
 1M = 2000M HOR
 1M = 200M VER



PE DETAIL L = 760.00m
uPVC PIPE DN80



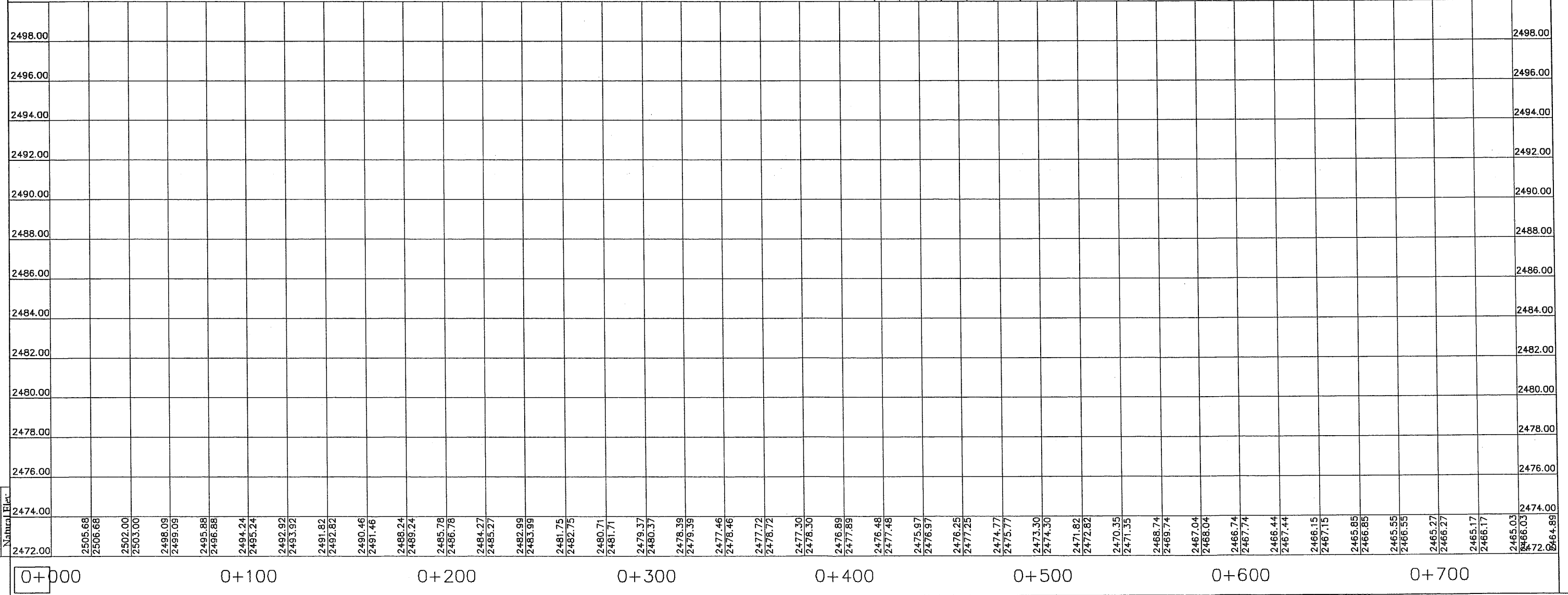
SCALES:
1M = 2000M HOR
1M = 200M VER

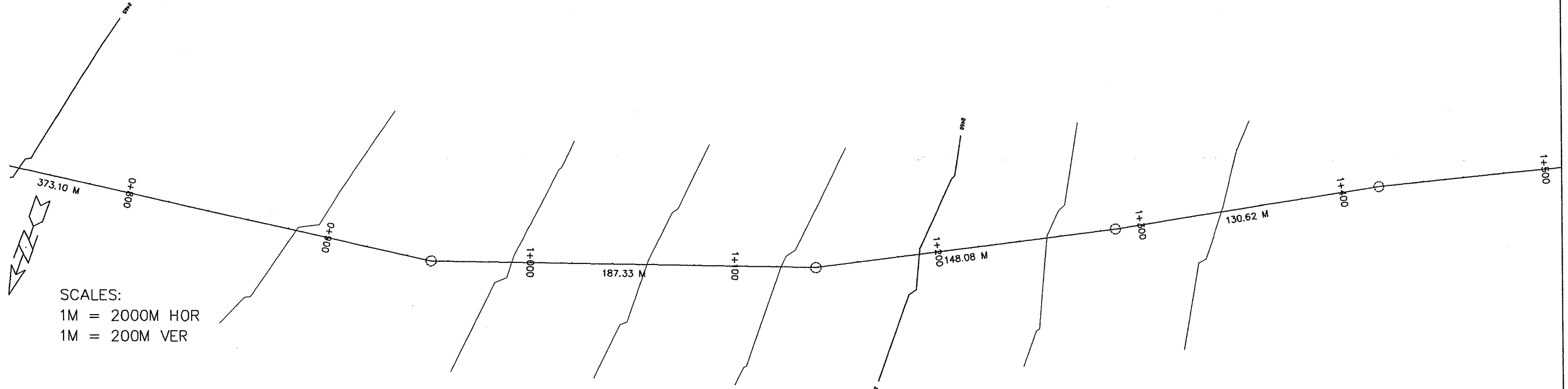


PIPE DETAIL: L=420.00m, uPVC PIPE DN80

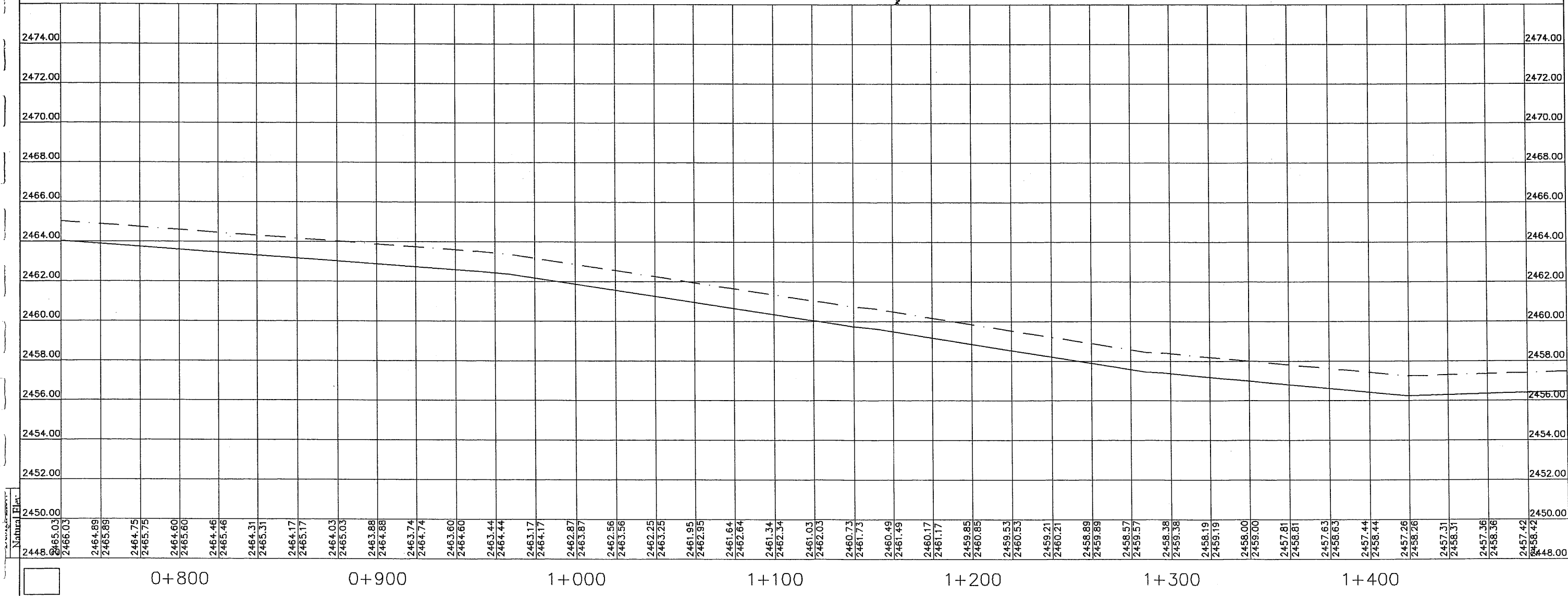


SCALES:
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1M = 200M VER

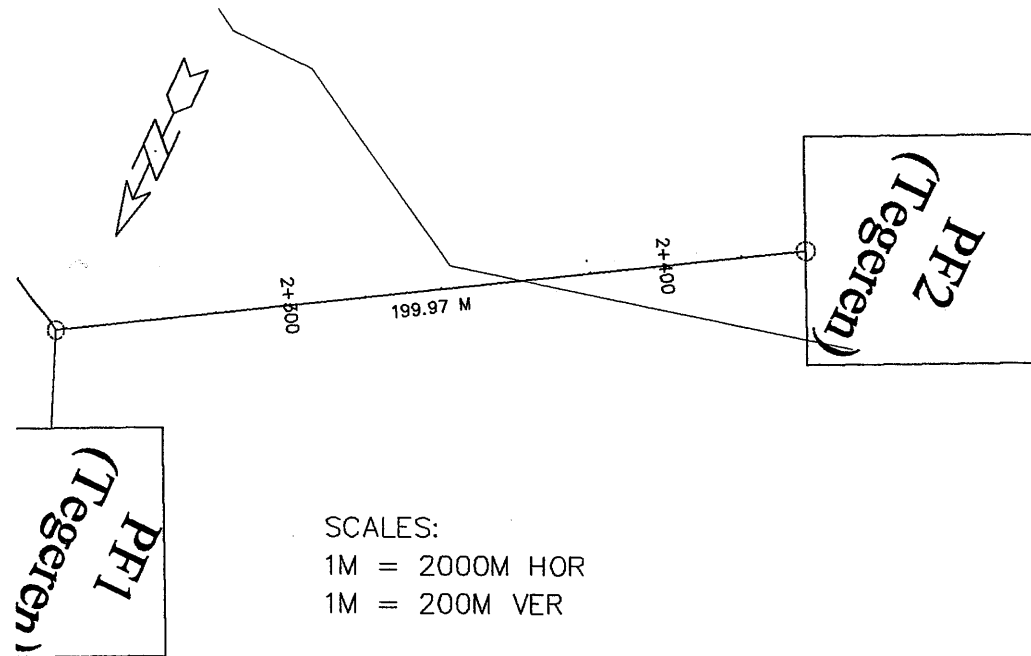




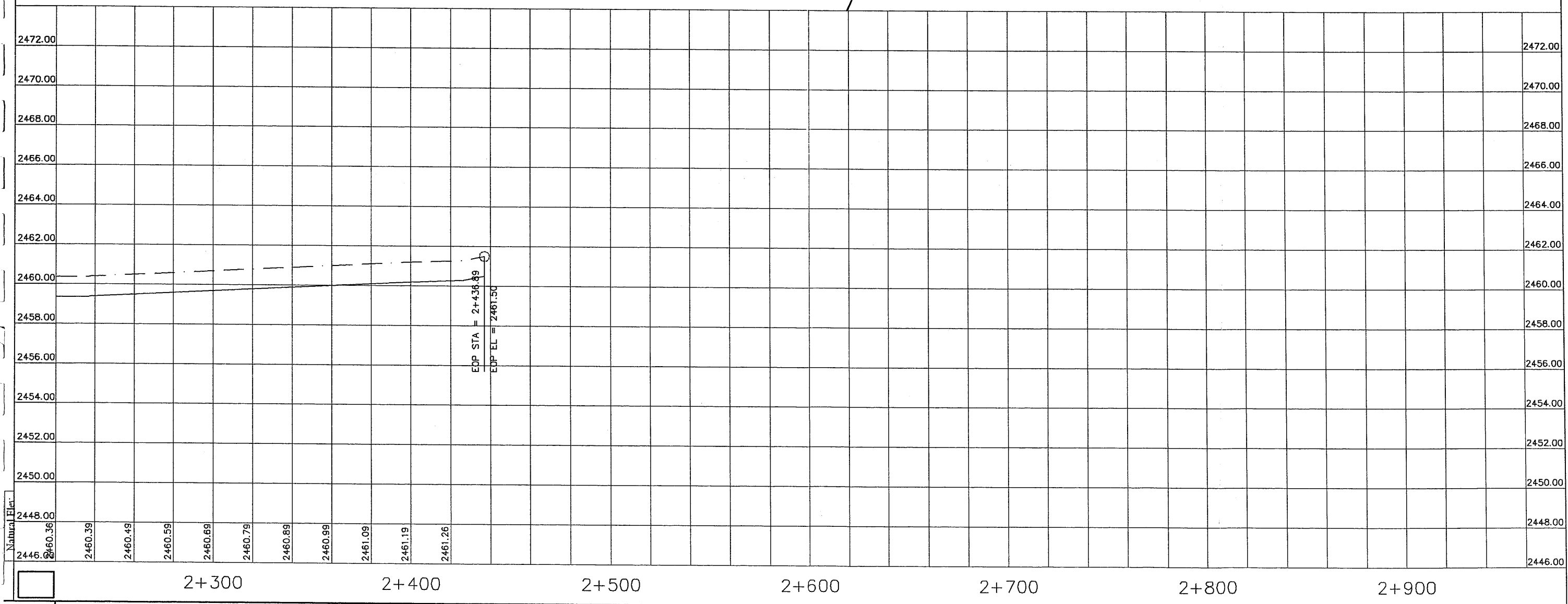
SCALES:
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1M = 200M VER



CONSULTANT:- ALEM A. TESFAMARIAM WATER RESOURCES ENGINEERING CONSULTANT (AAT-WREC)		DATE :- JANUARY 2009	CLIENT :- SENAI FOUNDATION (MAELEWYA WATER DEVELOPMENT PROJECT)	PROJECT:- MAELEWYA WATER DEVELOPMENT PROJECT	DRAWING NO.
				DRAWING TITLE:- PLAN AND PROFILE OF THE WATER SUPPLY LINE - ST. 7+600 TO 1+500 (DISTRIBUTION LINE FROM MAELEWYA RESERVOIR TO TEGREN PUBLIC FOUNTAINS)	SHEET NO. 2/4



SCALES:
1M = 2000M HOR
1M = 200M VER



PE DETAIL L=760.00m
uPVC PIPE DN80

CONSULTANT:- ALEM A. TEFAMARIAM WATER RESOURCES ENGINEERING CONSULTANT (AAT-WREC)	DATE :- JANUARY 2009	CLIENT :- SENAI FOUNDATION (MAELEWYA WATER DEVELOPMENT PROJECT)	PROJECT:- MAELEWYA WATER DEVELOPMENT PROJECT	DRAWING NO.
			DRAWING TITLE:- PLAN AND PROFILE OF THE WATER SUPPLY LINE - ST. 2+220 TO 2+450 (DISTRIBUTION LINE FROM MAELEWYA RESERVOIR TO TEGREN PUBLIC FOUNTAINS)	SHEET NO. 4/4

