Part II: Strategy of the Brackish Groundwater Development

1. Drawings for Alternative Plans

Drawings for Alternative Plans

	Dwg. No.	Title
Common	G-1	Project Location 1/200,000
Common	G-2	Project Location Map (Deir Alla Area)
Common	G-3	Project Location Map (Kafrein Area)
Common	G-4	Basic Flow of Desalination Plant
Common	G-5	Common Brine Discharge Line
Common	G-6	Profile of Common Brine Discharge Line
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Plan A	A-3	Oneline Diagram (Plan A)
Plan A	A-4	Schematic Flow of Water Transfer Trunk Line (Plan A)
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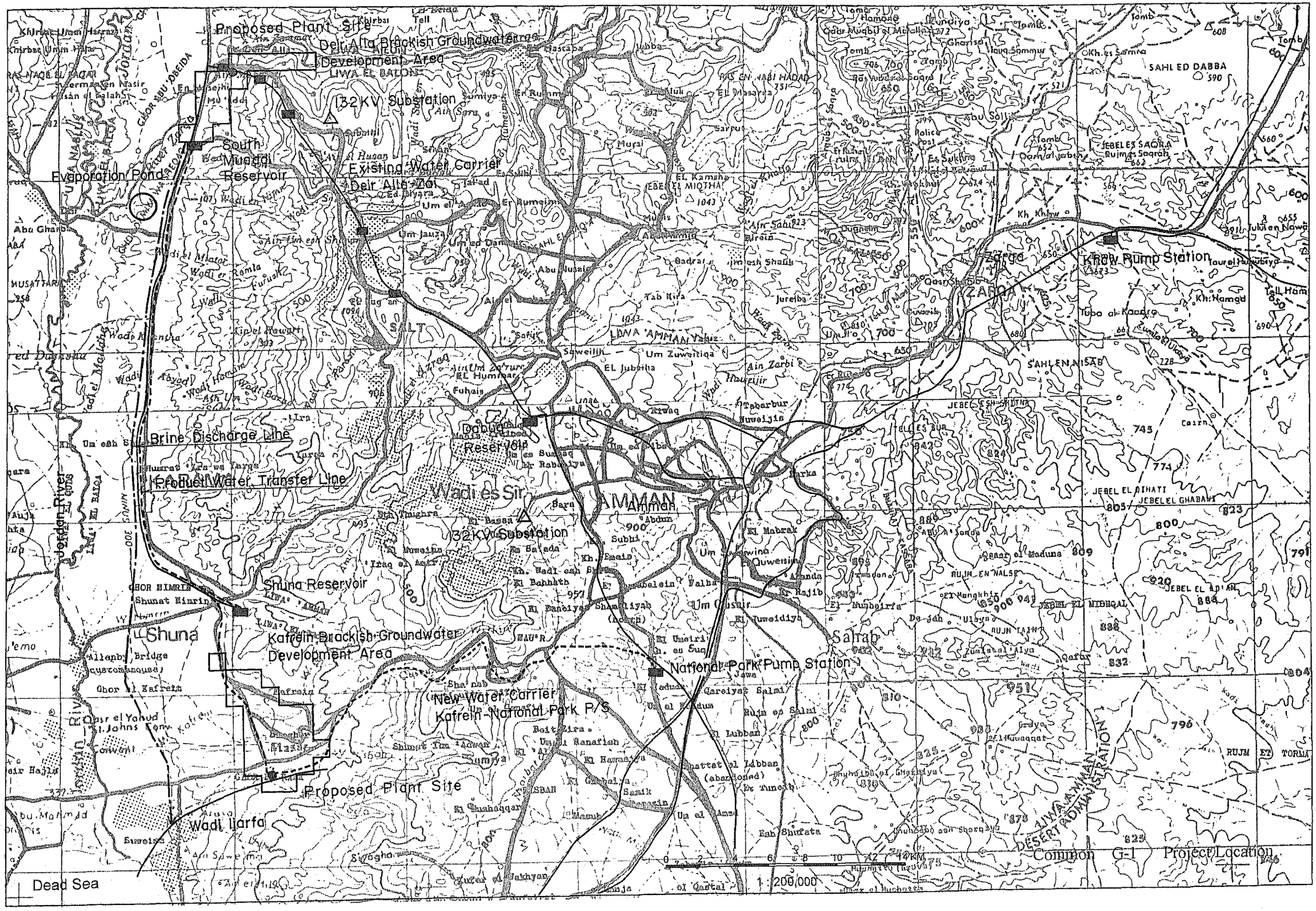
Plan C	C-4-2	Schematic Flow of Water Highlift Pump Line (Plan C 2/4)
Plan C	C-4-3	Schematic Flow of Water Highlift Pump Line (Plan C 3/4)
Plan C	C-4-4	Schematic Flow of Water Highlift Pump Line (Plan C 4/4)
Plan C	C-5	Profile of Water Highlift Pump Line (Plan C)
Plan C	C-6	Brine Discharge Line (Plan C)
Plan C	C-7	Profile of Brine Discharge Line (Plan C)
Plan C	C-8	Power Station (Plan C)
Plan C	C-9	Equipment List (Plan C)


Proposed Plant Site
Deir Alla Brackish Groundwater Development Area
LIWA EL BALQA
132KV Substation
South Muqeddi Reservoir
Evaporation Pond
Existing Water Carrier
Deir Alla Zor
Brine Discharge Line
Produced Water Transfer Line
Dabuq Reservoir
Wadi es Sir
32KV Substation
AMMAN
Amman
Shuna Reservoir
Shuna
Kafrein Brackish Groundwater Development Area
New Water Carrier
Kafrein-National Park P/S
National Park Pump Station
Khaw Pump Station
Zarqa
Salrab
Proposed Plant Site
Wadi Ijarfa
Dead Sea
Jordan River
SALT
ZARQA
SAHLEN NISAB
SAHL ED DABBA
JEBEL ES SAQRA
JEBEL EL QIHATI
JEBEL EL GHABAWI
RUJM EN NALS
JEBEL EL ADYAN
JEBEL EL MIBRAQ
RUJM TAJIN
RUJM ET TORMA
0 2 4 6 8 10 12 14KM
1:200,000
Common G-1 Project Location

Existing Pumping Station No. 1

Desalination Plant

Water Reservoir

Production Well

Transmission Line

132KV

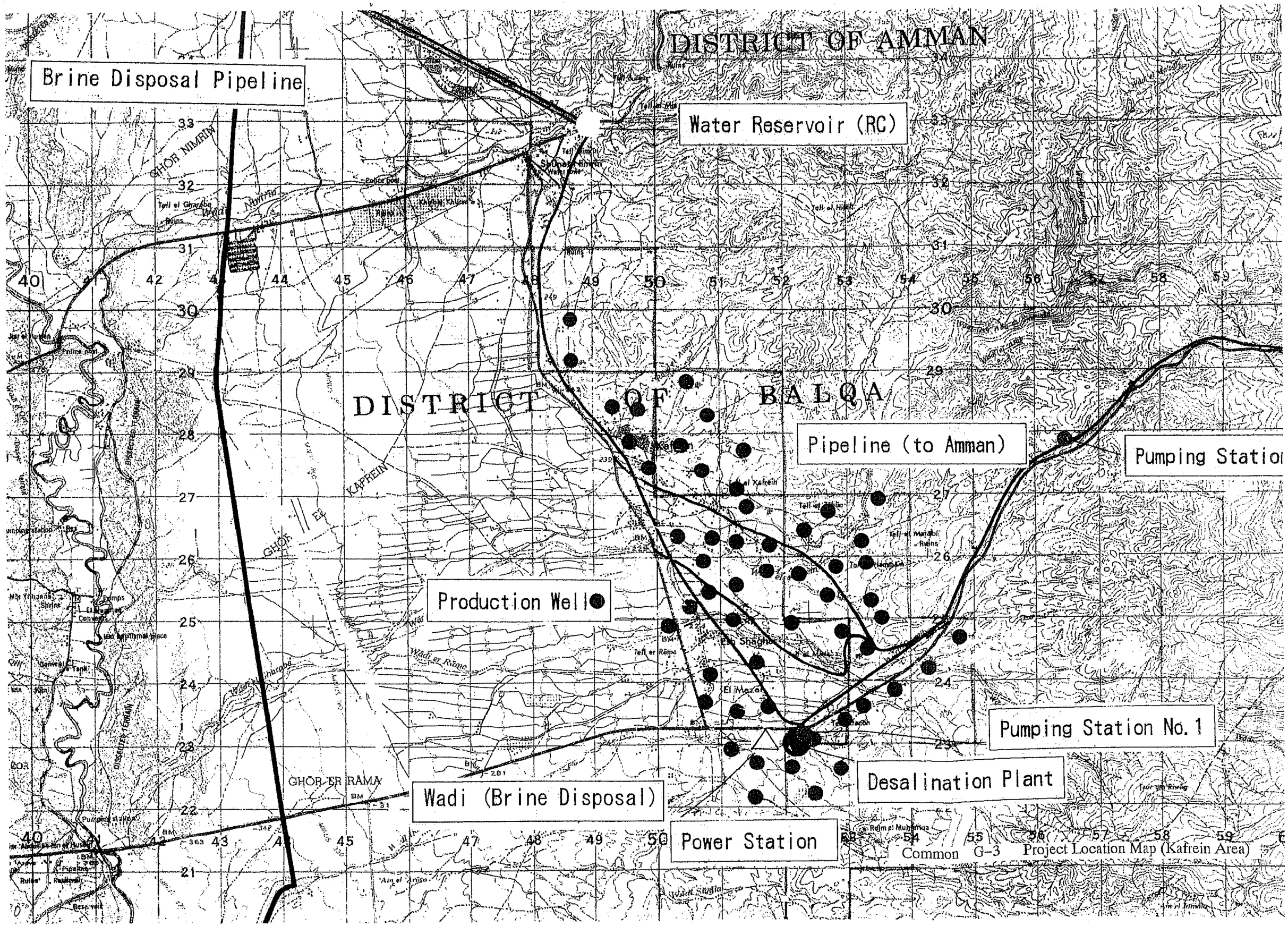
Existing Pipeline
(Deir Alla / Amman Pipeline)

Brine Disposal Pipeline

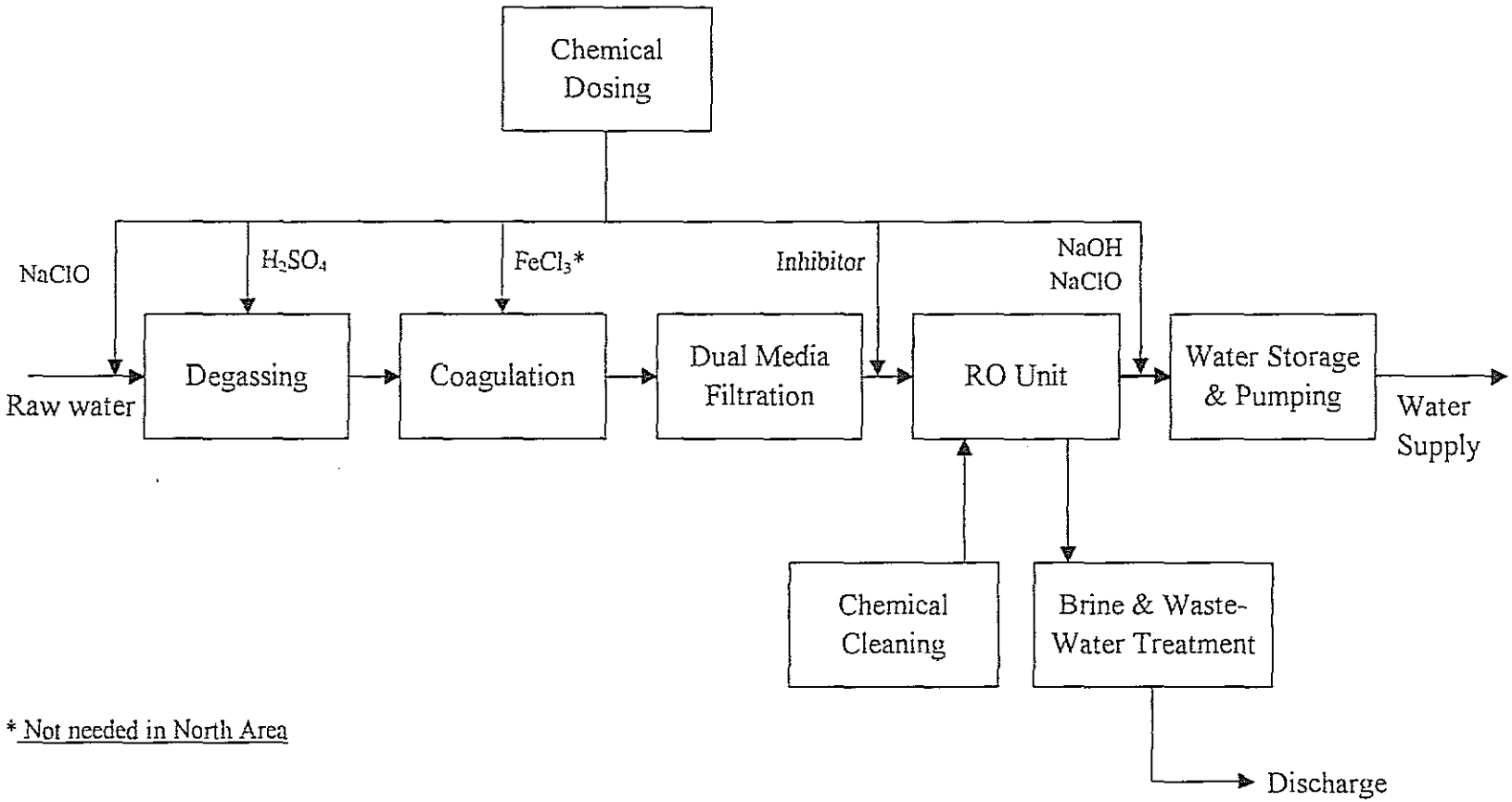
DISTRICT OF BALQA

DISTRICT OF NABLUS

Common G-2 Project Location Map (Deir Alla Area)



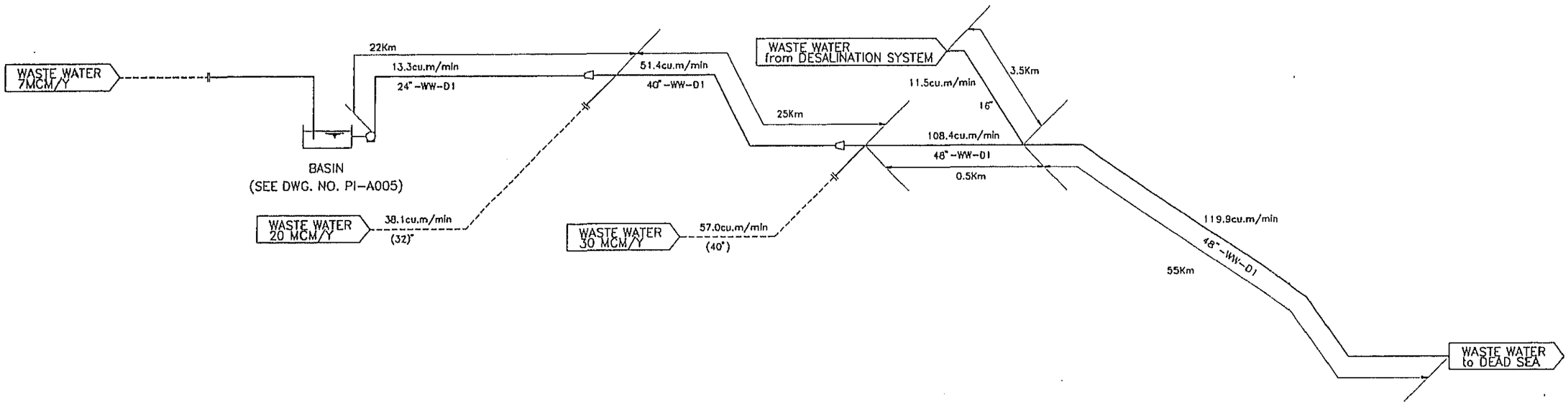
Common G-3 Project Location Map (Kafrein Area)

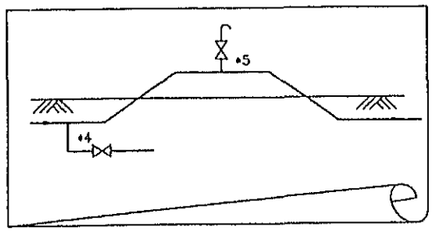


* Not needed in North Area

Common G-4 Basic Flow of Desalination Plant

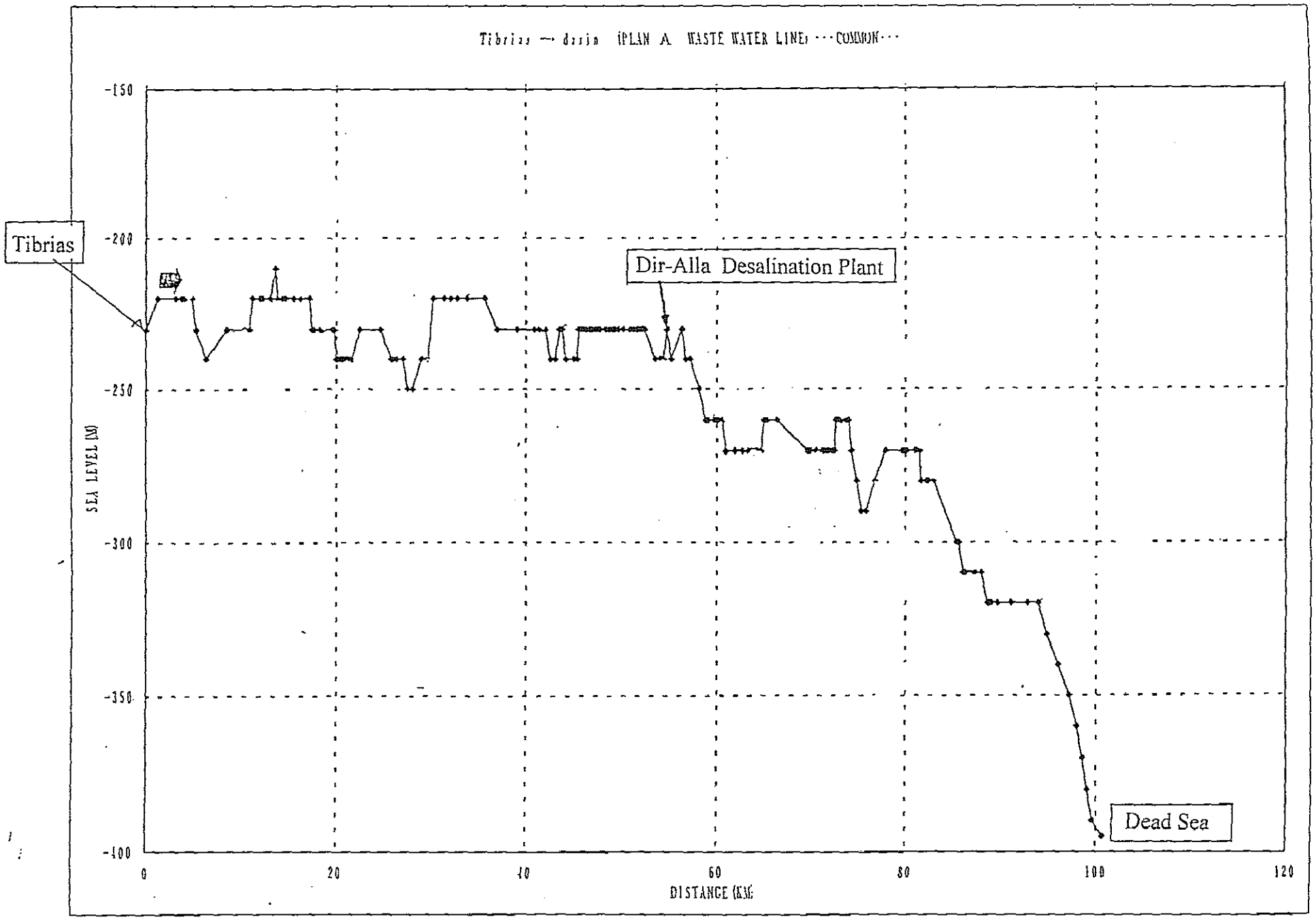
COMMON BRINE DISCHARGE LINE



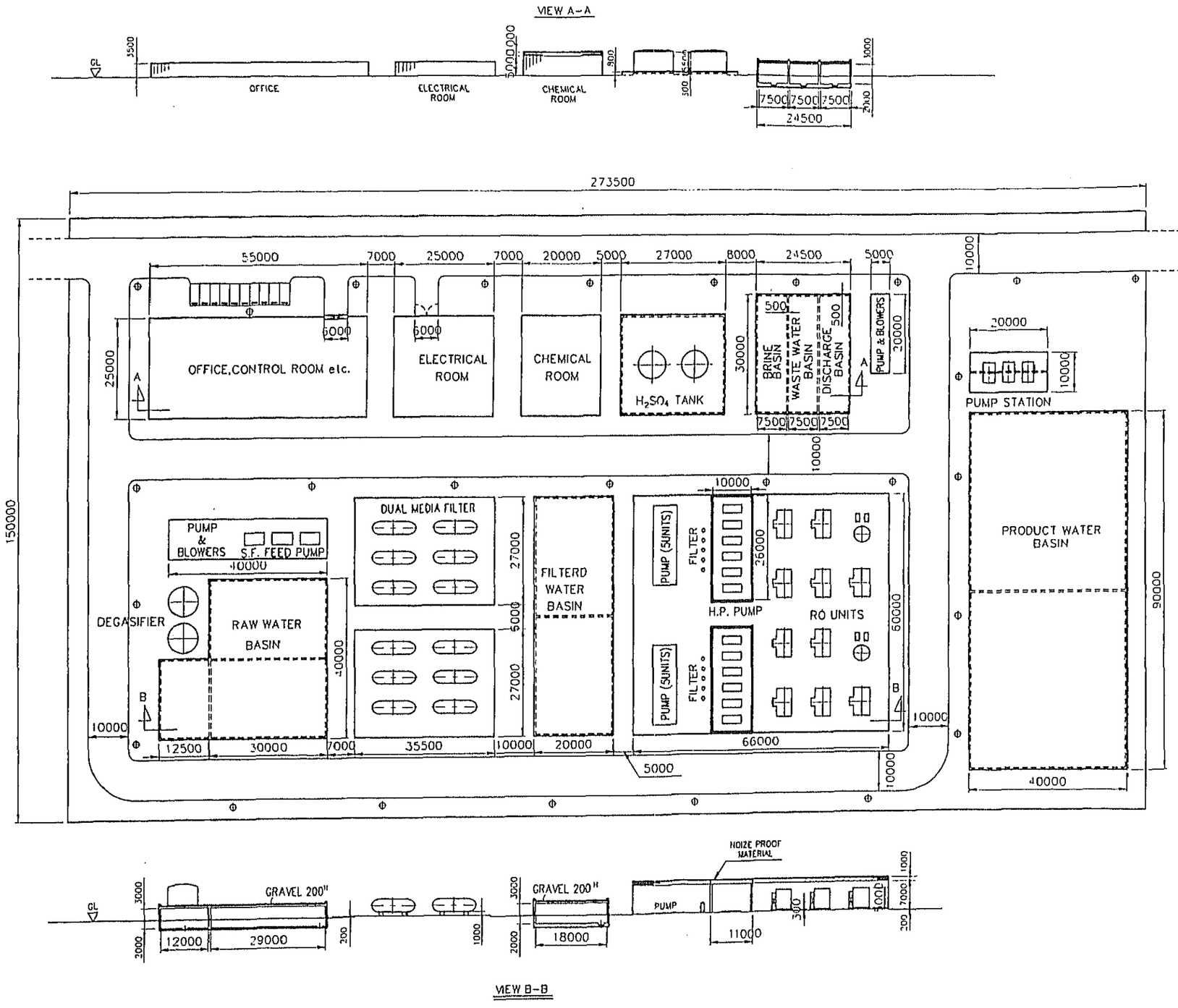


VENT NOZZLES AND VALVES SHALL BE PROVIDED AT THE PART THOSE LEVEL IS HIGHER THAN UPSTREAM AND WHERE THE AIR IS HARD TO BE PURGED.

Common G-5 Common Brine Discharge Line

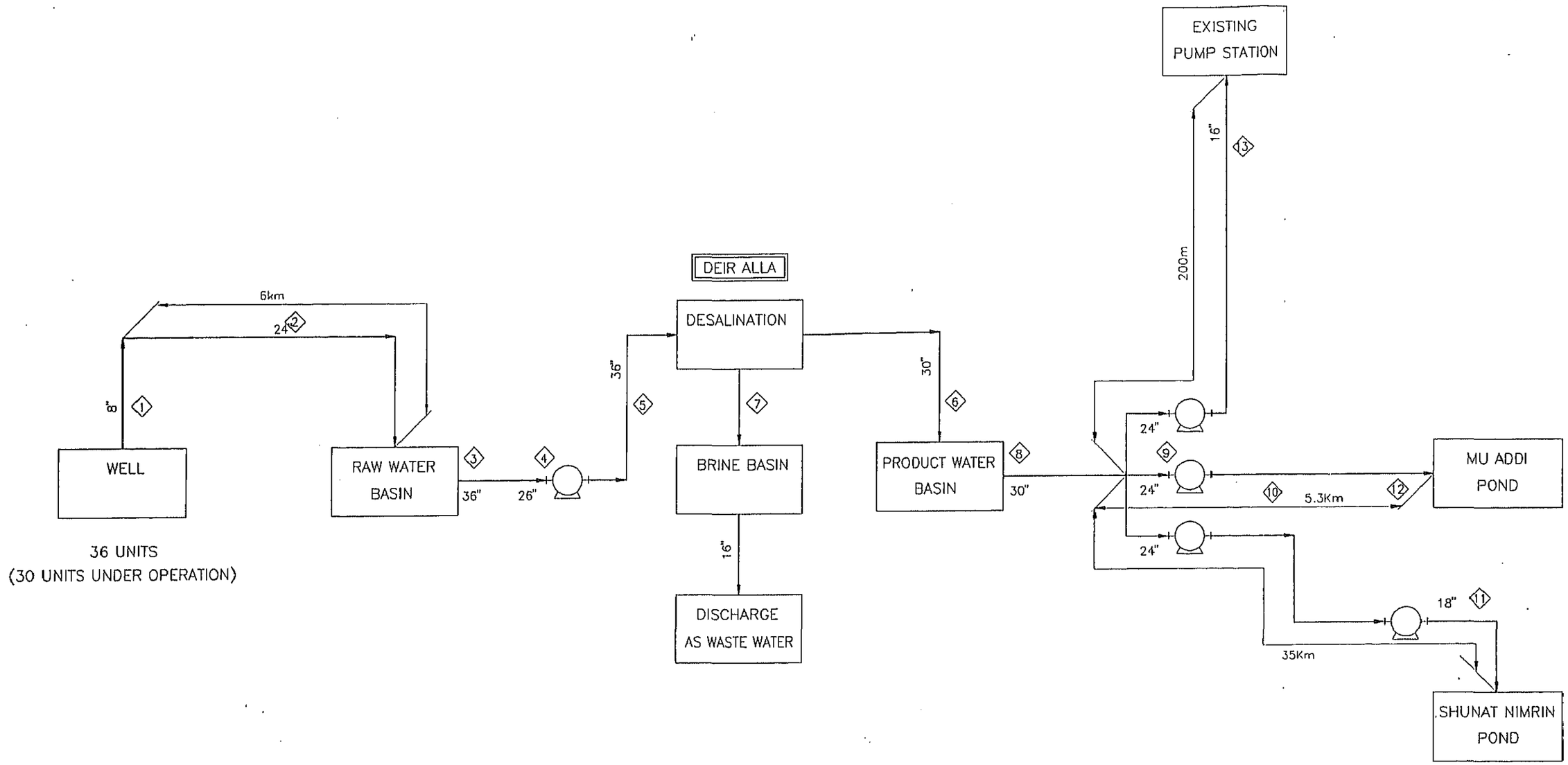


Common G–6 Profile of Common Brine Discharge Line

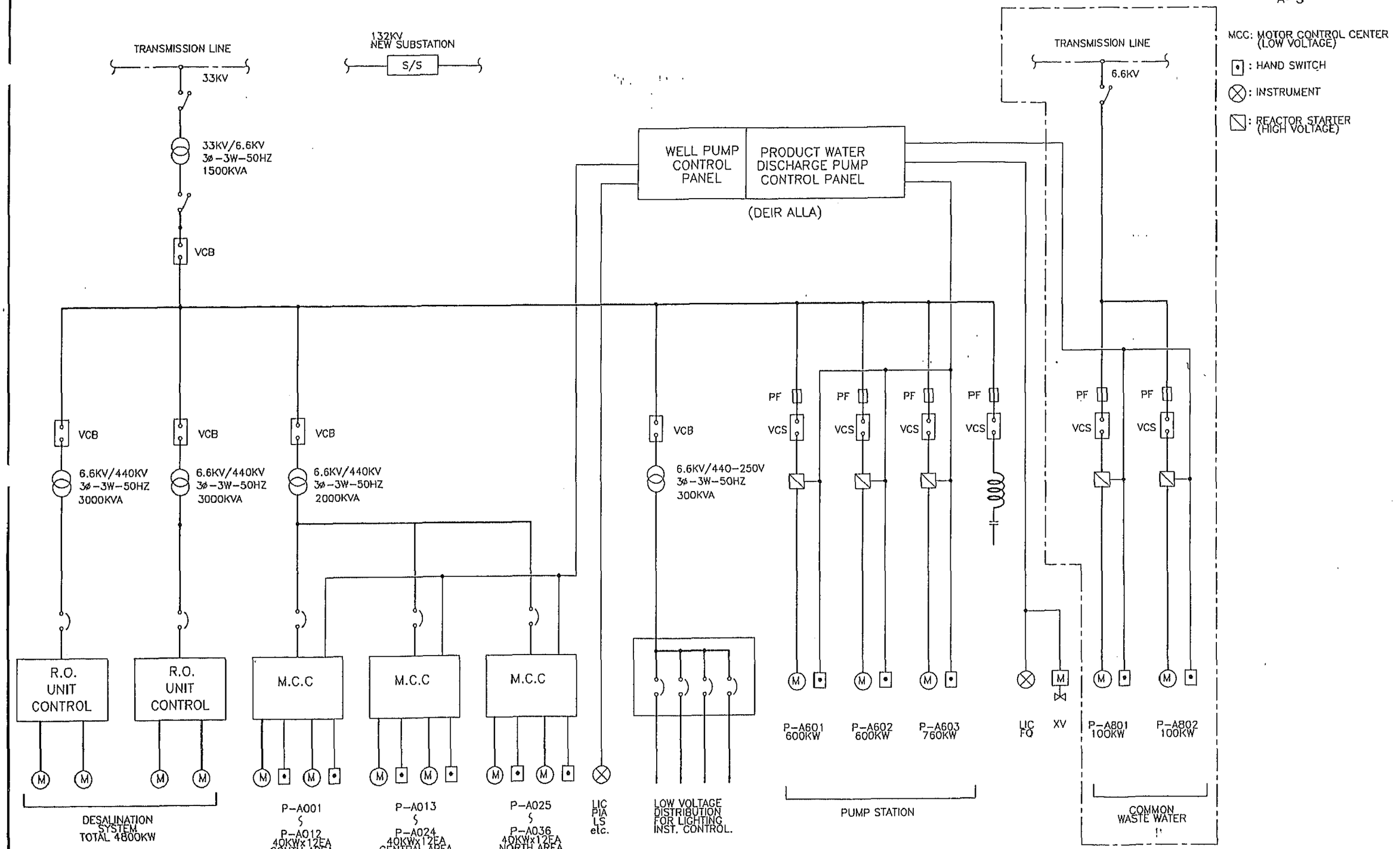


Φ : OUTDOOR LIGHT

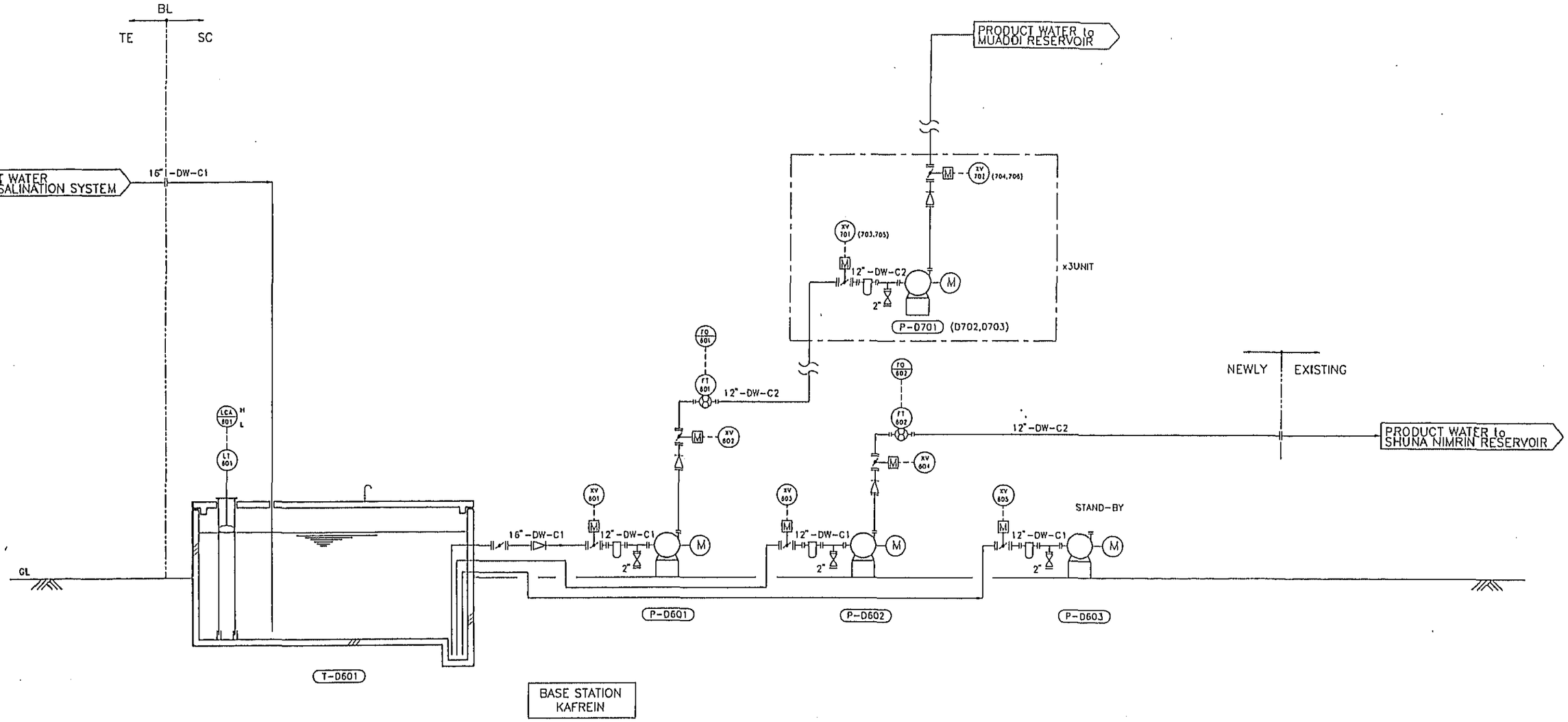
Plan A A-1 Layout of Desalination Plant (Plan A)



Plan A A–2 Flow Diagram of the Project (Plan A)

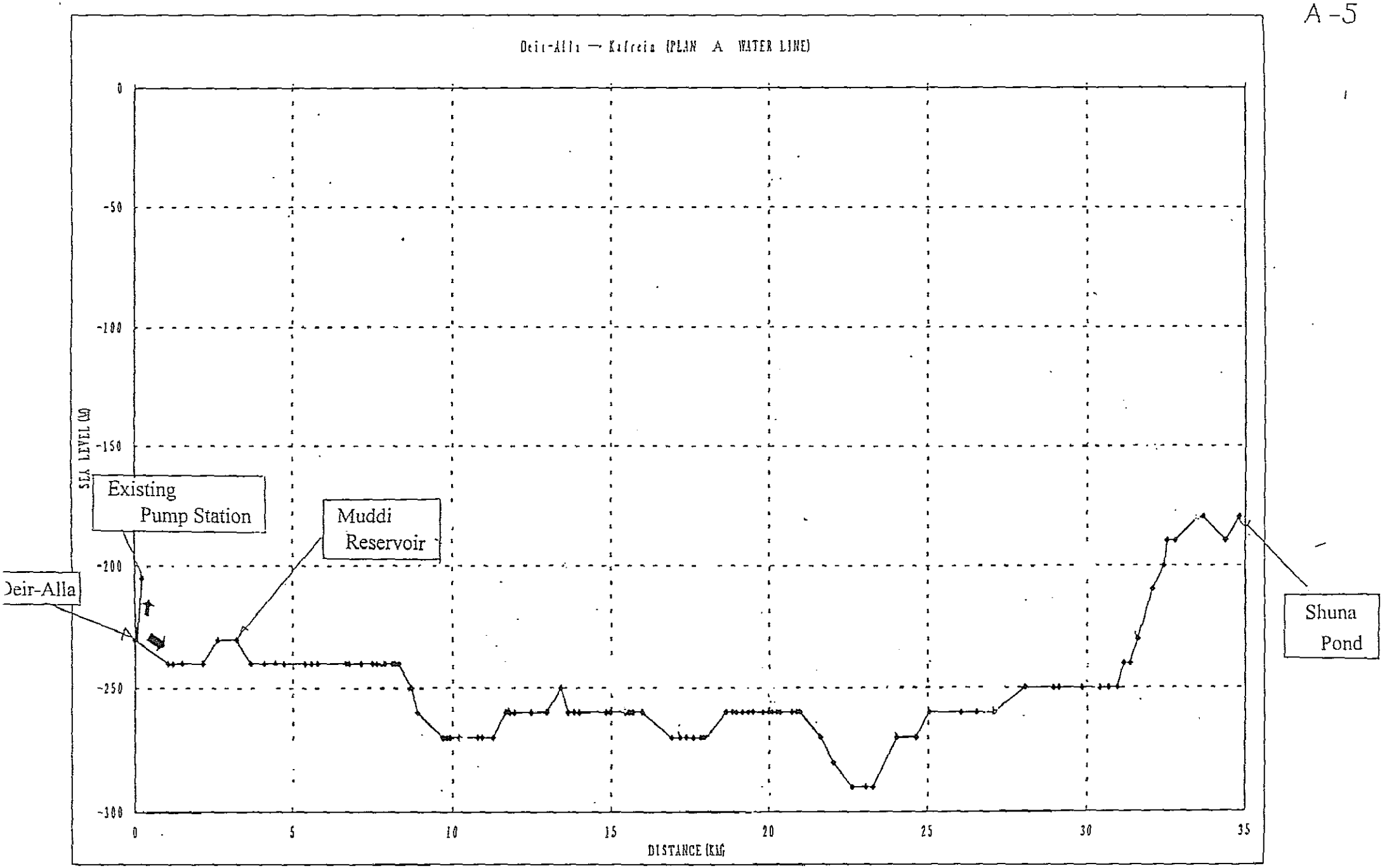


Plan A A–3 Oneline Diagram (Plan A)



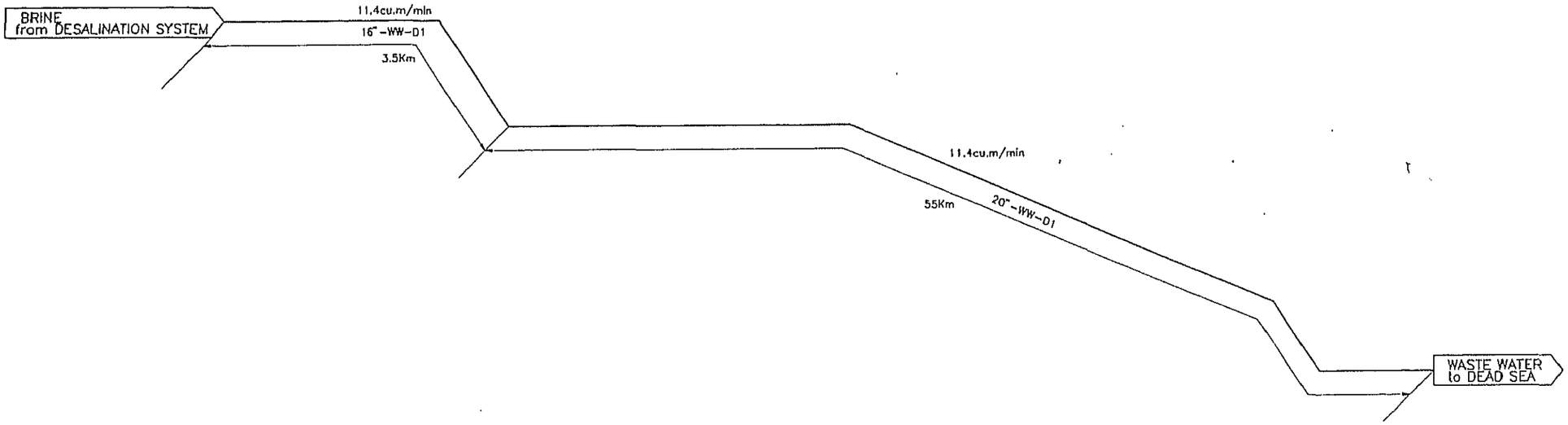
NOTE:
(1) TDS IN PRODUCT WATER SHALL BE 800 PPM.

Plan A A–4 Schematic Flow of Water Transfer Trunk Line (Plan A)



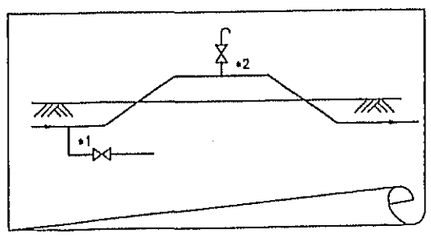
Plan A A–5 Profile of Water Transfer Trunk Line (Plan A)

BRINE DISCHARGE LINE FOR NEW PLANT

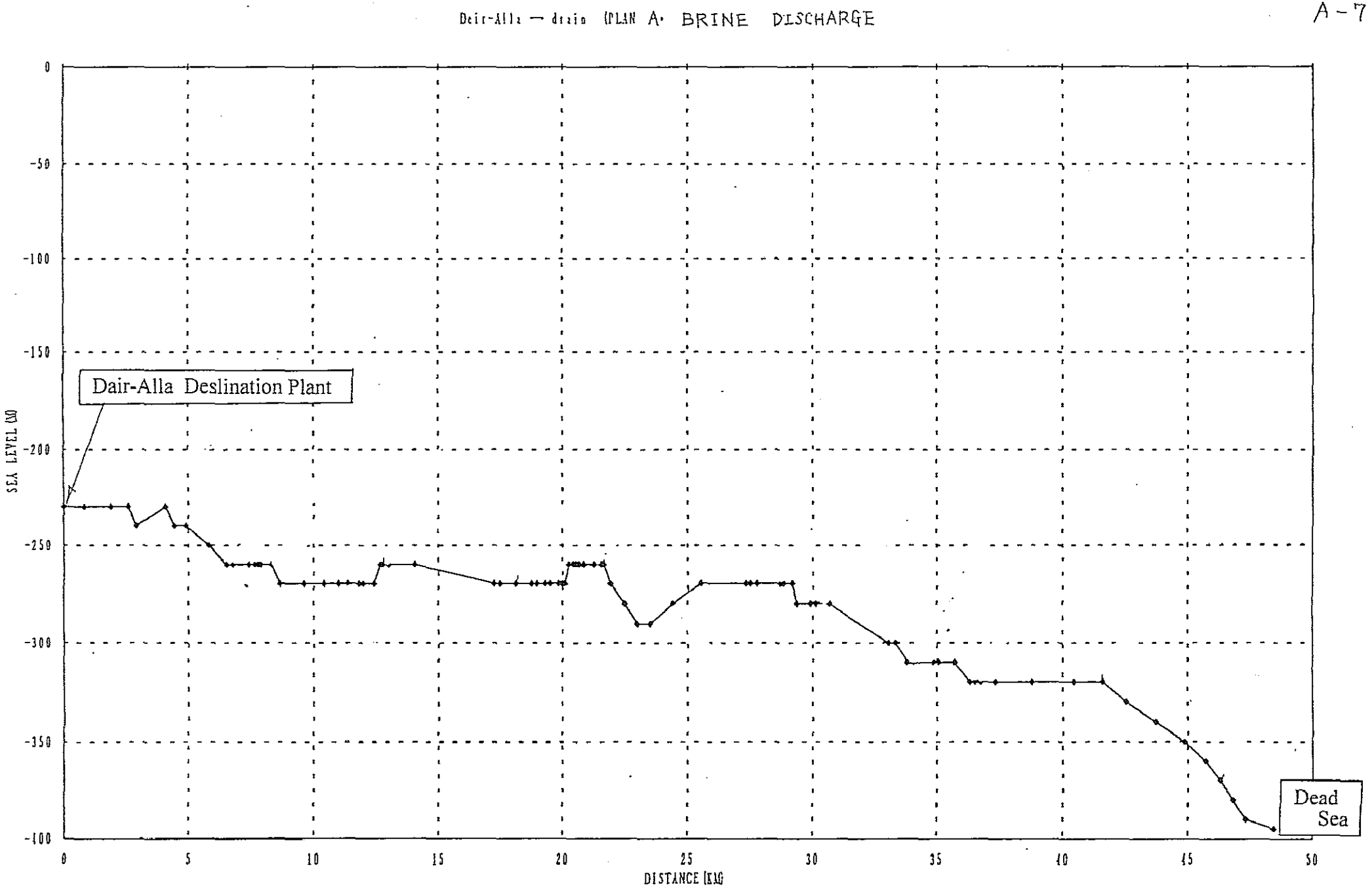


NOTE*1: DRAIN NOZZLES AND VALVES SHALL BE FURNISHED TO THE DEAD SPACE WHERE THE WATER CAN BE ACCUMULATED.

NOTE*2: VENT NOZZLES AND VALVES SHALL BE PROVIDED AT THE PART THOSE LEVEL IS HIGHER THAN UPSTREAM AND WHERE THE AIR IS HARD TO BE PURGED.



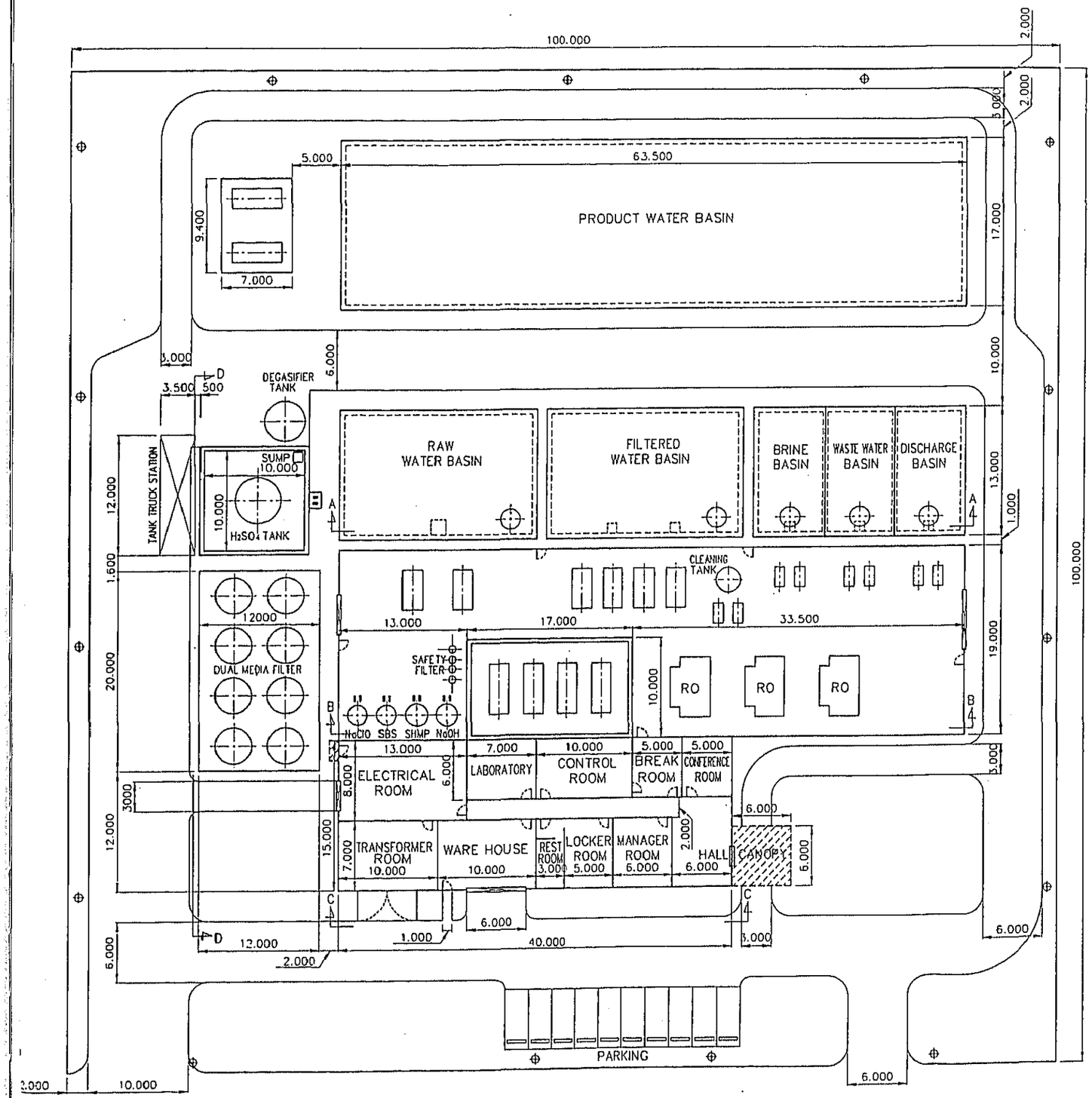
Plan A A-6 Brine Discharge Line (Plan A)



Plan A A–7 Profile of Brine Discharge Line (Plan A)

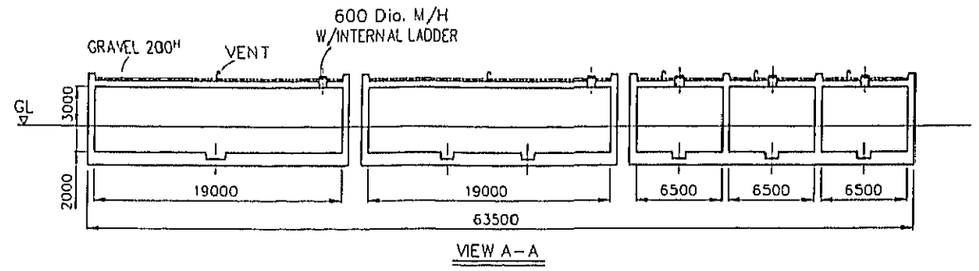
A-8 Equipment List (Plan-A)

No.	Item	Q'ty	Main Material	Specification	
001	Well Pump	30	SCS13	$125m^3/hr$ x 70mH	45Kw
002	pH Adjust Basin	1	RC	$200m^3$ with Agitator	55Kw
003	Intake Basin Blower	1+1	FC	$20m^3/min$ x $0.5kg/cm^2$	30Kw
004	Intake Basin	1	RC	$1000m^3$	
005	Intake Pump	1+1	SCS13	$1000m^3/hr$ x 15mH	220Kw
006	Degasifier	5	SS/Rubber Lining	ϕ =4.0m, H=4m	$770m^3/hr$
007	Degasifier Blower	5+1	FC	$250Nm^3/min$ x $250mmH_2O$	15Kw
008	H_2SO_4 Tank	2	SS	$300m^3$	
009	H_2SO_4 Pump (Main)	2+1	SUS316	0-50L/min	1.5Kw
010	H_2SO_4 Pump (Control)	2+1	SUS316	0-10L/min	0.4Kw
011	Coagulation Basin	1	RC	$200m^3$ with Agitator	55Kw
012	Raw Water Basin	1	RC	$5000m^3$	
013	Raw Water Basin Blower	1+1	FC	$100m^3/min$ x $0.5kg/cm^2$	75Kw
014	Dual Media Filter Pump	2+1	SCS313	$2000m^3/hr$ x 30mH	220Kw
015	Dual Media Filter	12	SS/Rubber Lining	Horizontal Type	ϕ =3.2m x 11mL
016	NaOCl Tank	1	FRP	$200m^3$	
017	NaOCl Pump (1)	1+1	PVC	0-20L/min	0.4Kw
018	NaOCl Pump (2)	1+1	PVC	0-2L/min	0.2Kw
019	Back Washing Pump	2+1	SCS13	$1200m^3/hr$ x 15mH	7.5Kw
020	Blower	1+1	FC	$32Nm^3/min$ x $0.5kg/cm^2$	45Kw
021	Filtered Water Basin	1	RC	$5000m^3$	
022	RO Feed Pump	10+2	SCS13	$380m^3/hr$ x 30mH	55Kw
023	SBS Tank	1	FRP	$10m^3$ with Agitator	2.2Kw
024	SBS Pump	10+2	PVC	0-200mL/min	0.1Kw
025	Inhibitor Tank	1	FRP	$20m^3$ with Agitator	5.5Kw
026	Inhibitor Pump	10+2	PVC	0-300mL/min	0.1Kw
027	Filter	10	SUS304	$380m^3/hr$	
028	RO HP Pump	10+2	SCS14	$380m^3/hr$ x 350mH	620Kw
029	RO Element	4500	POLYAMIDE	8B x 1m	
030	RO Vessel	900	FRP/SUS316	5 Elements/Vessel	
031	Product Water Basin	1	RC	$12000m^3$	
032	Brine Basin	1	RC	$1000m^3$	
033	Discharge Basin	1	RC	$1000m^3$	
034	Discharge Pump	1+1	SCS13	$1500m^3/hr$ x 30mH	165Kw
035	Cleaning Tank	2	FRP	$30m^3$ with Agitator	7.5Kw
036	Cleaning Pump	2+1	SCS13	380m3/hr x 30mH	55Kw
037	Waste Water Basin	1	RC	$1000m^3$	
038	Waste Water Pump	1+1	SCS13	$500m^3/hr$ x 20mH	45Kw
039	Waste Water Blower	1+1	FC	$1000Nm^3/hr$ x $0.5kg/cm^2$	30Kw
040	NaOH Tank	1	SS	$80m^3$ with Agitator	22Kw
041	NaOH Pump (1)	1+1	PVC	0-20L/min	0.4Kw
042	NaOH Pump (2)	1+1	SCS13	$3m^3/hr$ x 35mH	2.2Kw
043	Product Water Pump	3	SCS13	$24m^3/min$ x 100mH	600Kw

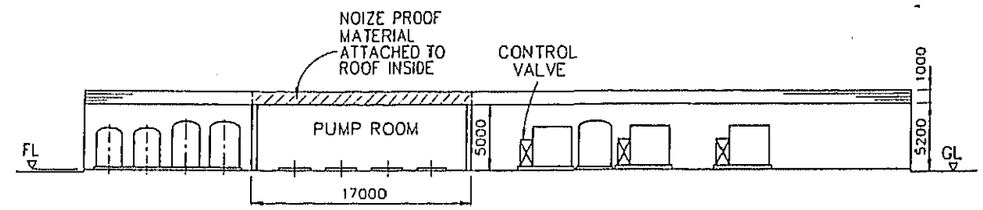


⊕ : OUTSIDE LIGHTING

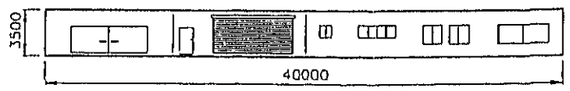
▭ : OVERHEAD SHUTTER



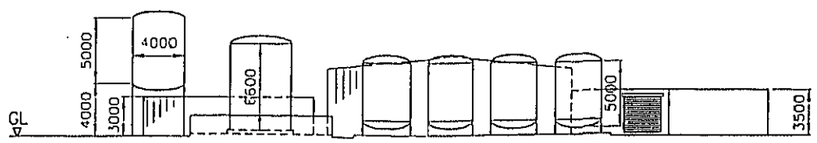
VIEW A–A



VIEW B–B



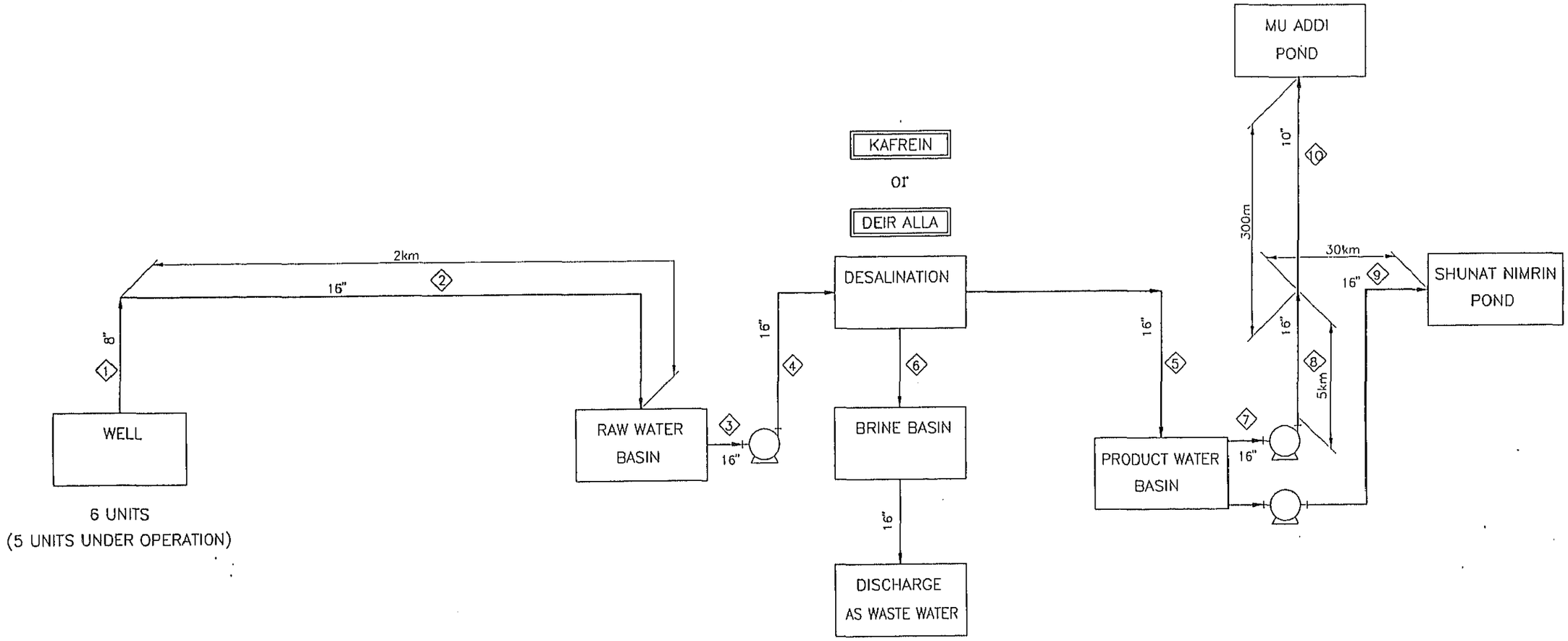
VIEW C–C



VIEW D–D

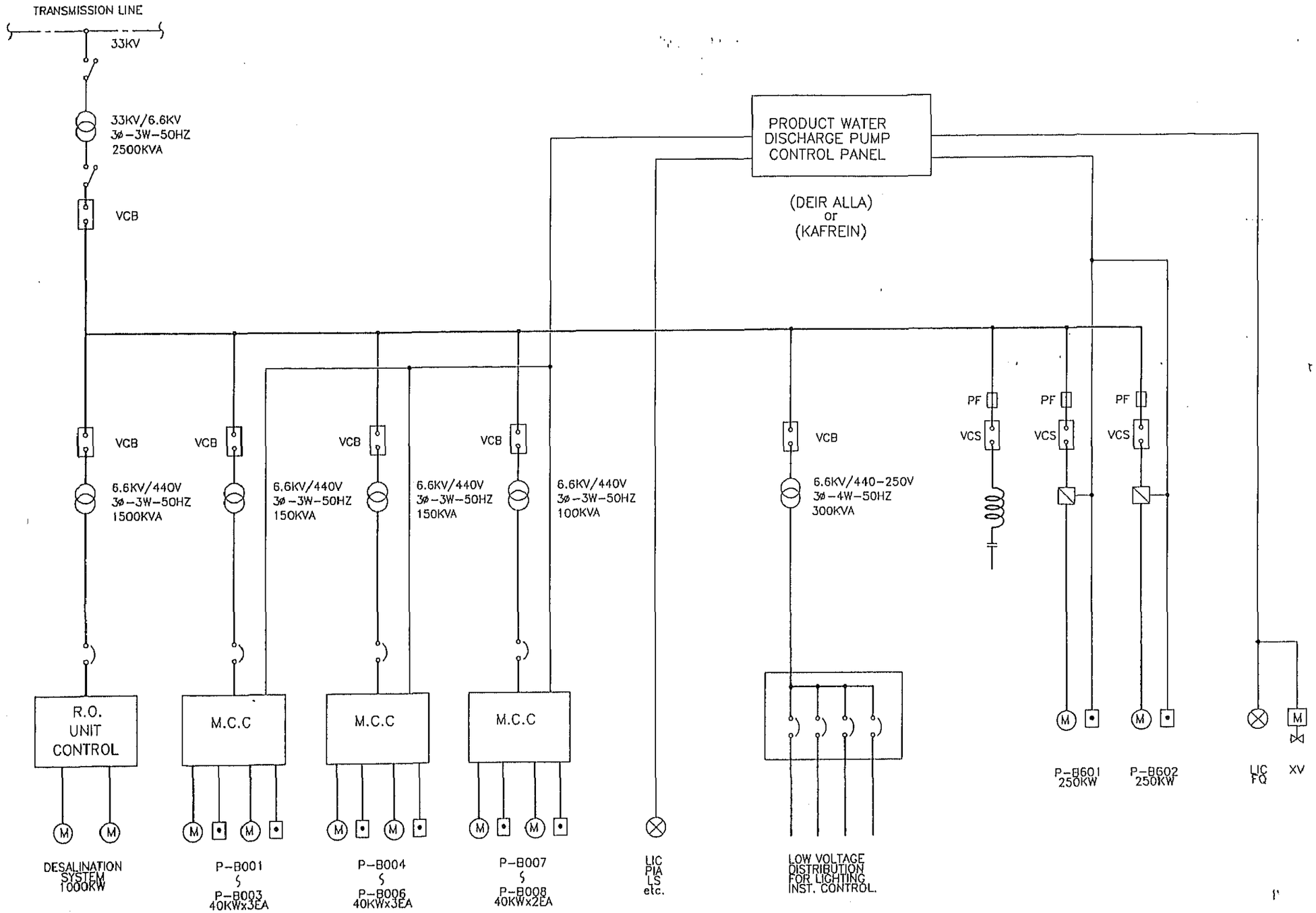
NOTE :
(1) UNIT : MM

Plan B/D B/D–1 Layout of Desalination Plant (Plan B/D)



Plan B/D B/D-2 Flow Diagram of the Project (Plan B/D)

MCC: MOTOR CONTROL CENTER (LOW VOLTAGE)
: HAND SWITCH
: INSTRUMENT
: REACTOR STARTER (HIGH VOLTAGE)



Plan B/D B/D-3 Oneline Diagram (Plan B/D)

B/D-4 (1) Equipment List (Plan-B)

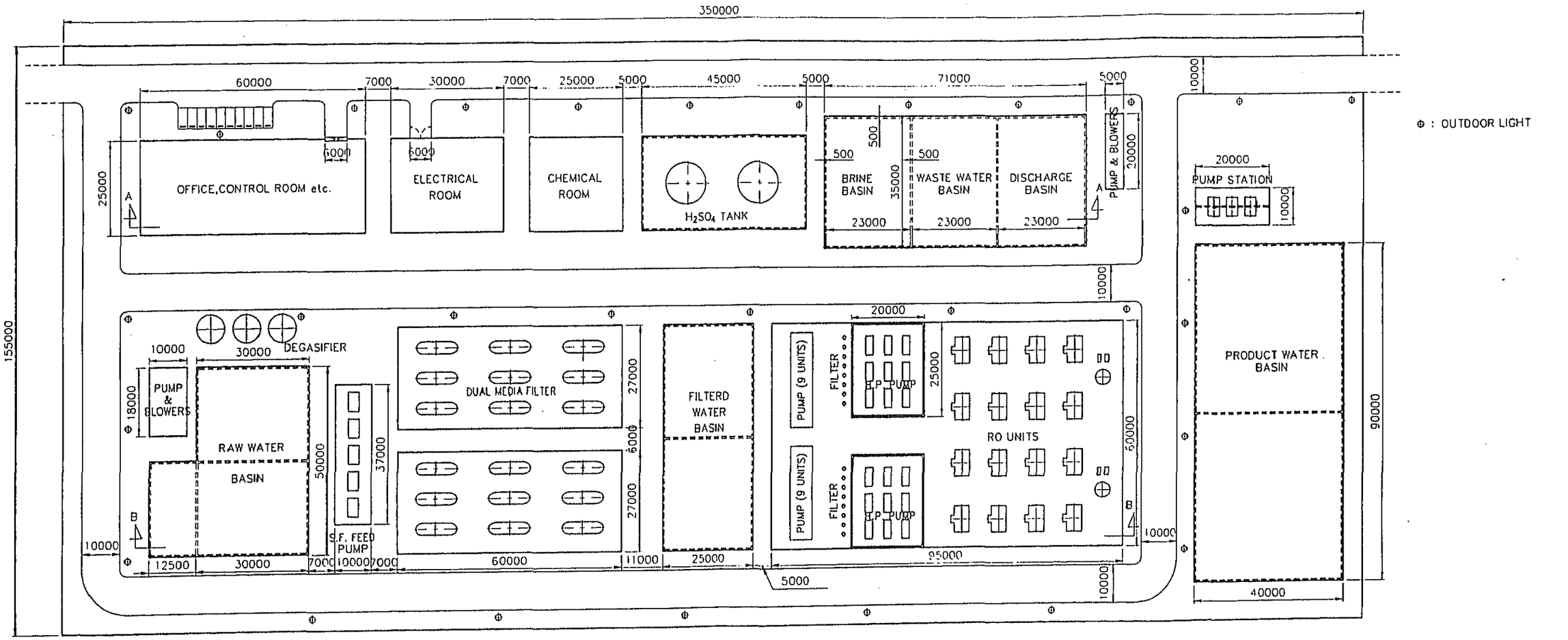
No.	Item	Q'ty	Main Material	Specification	
001	Well Pump	6	SCS13	125m³/hr x 70mH	45Kw
002	pH Adjust Basin	1	RC	50m³ with Agitator	15Kw
003	Intake Basin	1	RC	500m³	
004	Intake Basin Blower	1+1	FC	10m³/min x 0.5kg/cm²	15Kw
005	Intake Pump	1+1	SCS13	770m³/hr x 15mH	55Kw
006	Degasifier	1	SS/Rubber Lining	ϕ =4.0m, H=4m	770m³/hr
007	Degasifier Blower	1+1	FC	250Nm³/min x 250mmH_2O	15Kw
008	H_2SO_4 Tank	1	SS	100m³	
009	H_2SO_4 Pump (Main)	1+1	PVC	0-10L/min	0.2Kw
010	H_2SO_4 Pump (Control)	1+1	PVC	0-3L/min	0.2Kw
011	Raw Water Basin	1	RC	1000m³	
012	Raw Water Basin Blower	1+1	FC	20m³/min x 0.5kg/cm²	30Kw
013	Dual Media Filter Pump	1+1	SCS13	770m³/hr x 30mH	110Kw
014	Dual Media Filter	8	SS/Rubber Lining	ϕ =3.6m	
015	NaOCl Tank	1	FRP	10m³	
016	NaOCl Pump (1)	1+1	PVC	0-3L/min	0.2Kw
017	NaOCl Pump (2)	1+1	PVC	0-500L/min	0.1Kw
018	Back Washing Pump	1+1	SCS13	400m³/hr x 15mH	30Kw
019	Blower	1+1	FC	10Nm³/min x 0.5kg/cm²	15Kw
020	Filtered Water Basin	1	RC	1000m³	
021	RO Feed Pump	3+1	SCS13	245m³/hr x 30mH	37Kw
022	SBS Tank	1	FRP	2m³ with Agitator	0.4Kw
023	SBS Pump	3+1	PVC	0-100mL/min	0.1Kw
024	Inhibitor Tank	1	FRP	3m³ with Agitator	0.75Kw
025	Inhibitor Pump	3+1	PVC	0-200mL/min	0.1Kw
026	Filter	3+1	SUS304	245m³/hr	
027	RO HP Pump	3+1	SCS14	245m³/hr x 350mH	370Kw
028	RO Element	900	POLYAMIDE	8B x 1m	
029	RO Vessel	180	FRP/SUS316	5 Elements/Vessel	
030	Product Water Basin	1	RC	4000m³	
031	Brine Basin	1	RC	300m³	
032	Discharge Basin	1	RC	300m³	
033	Discharge Pump	1+1	SCS13	245m³/hr x 30mH	37Kw
034	Cleaning Tank	1	FRP	15m³ with Agitator	3.7Kw
035	Cleaning Pump	1+1	SCS13	260m³/hr x 30mH	37Kw
036	Waste Water Basin	1	RC	300m³	
037	Waste Water Pump	1+1	SCS13	150m³/hr x 20mH	15Kw
038	Waste Water Blower	1+1	FC	300Nm³/hr x 0.5kg/cm²	7.5Kw
039	NaOH Tank	1	SS	45m³ with Agitator	3.7Kw
040	NaOH Pump (1)	1+1	PVC	0-5L/min	0.2Kw
041	NaOH Pump (2)	1+1	SCS13	1m³/hr x 35mH	0.75Kw
042	Product Water Pump	3+3*	SCS13	10m³/min x 30mH	140Kw

* 3 lift pumps along the water transfer trunk line to Shuna Nimrin Reservoir

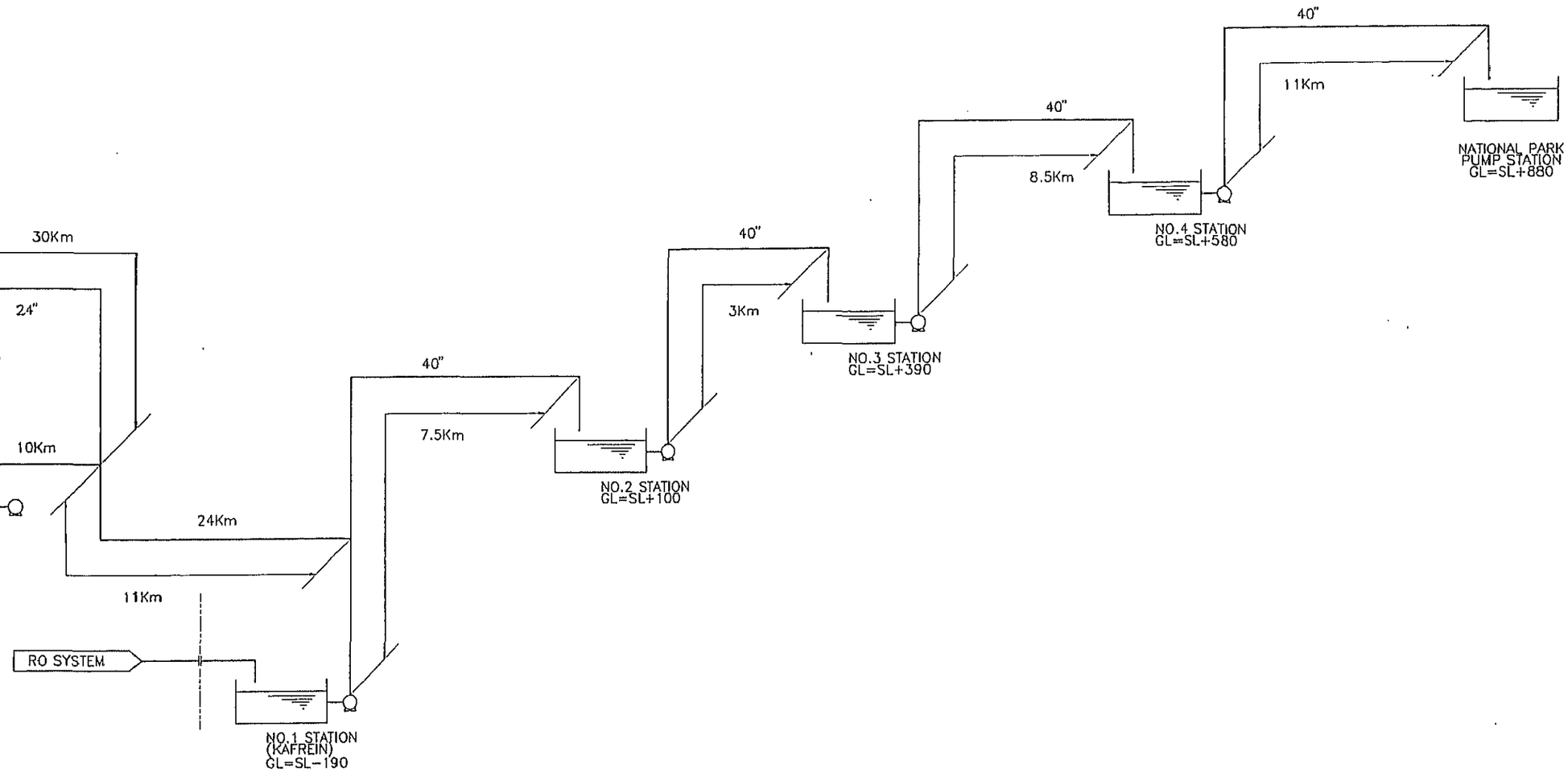
B/D-4 (2) Equipment List (Plan-D)

No.	Item	Q'ty	Main Material	Specification	
001	Well Pump				
002	pH Adjust Basin	1	RC	$50m^3$ with Agitator	15Kw
003	Intake Basin	1	RC	$500m^3$	
004	Intake Basin Blower	1+1	FC	$10m^3/min \times 0.5kg/cm^2$	15Kw
005	Intake Pump	1+1	SCS13	$7700m^3/hr \times 15mH$	55Kw
006	Degasifier	1	SS/Rubber Lining	ϕ =4.0m, H=4m	$770m^3/hr$
007	Degasifier Blower	1+1	FC	$250Nm^3/min \times 250mmH_2O$	15Kw
008	H_2SO_4 Tank	1	SS	$100m^3$	
009	H_2SO_4 Pump (Main)	1+1	PVC	0-10L/min	0.2Kw
010	H_2SO_4 Pump (Control)	1+1	PVC	0-3L/min	0.2Kw
011	Coagulation Basin	1	RC	$50m^3$ with Agitator	15Kw
012	$FeCl_3$ Tank	1	FRP	$6m^3$	
013	$FeCl_3$ Pump	1+1	PVC	0-1L/min	1.2Kw
014	NaOH Pump	1+1	PVC	0-1L/min	0.2Kw
015	Raw Water Basin	1	RC	$1000m^3$	
016	Raw Water Basin Blower	1+1	FC	$20Nm^3/min \times 0.5kg/cm^2$	30Kw
017	Dual Media Filter Pump	1+1	SCS13	$770m^3/hr \times 30mH$	110Kw
018	Dual Media Filter	8	SS/Rubber Lining	ϕ =3.6m	
019	NaOCl Tank	1	FRP	$10m^3$	
020	NaOCl Pump (1)	1+1	PVC	0-3L/min	0.2Kw
021	NaOCl Pump (2)	1+1	PVC	0-500L/min	0.1Kw
022	Back Washing Pump	1+1	SCS13	$400m^3/hr \times 15mH$	30Kw
023	Blower	1+1	FC	$10Nm^3/min \times 0.5kg/cm^2$	15Kw
024	Filtered Water Basin	1	RC	$1000m^3$	
025	RO Feed Pump	3+1	SCS13	$245m^3/hr \times 30mH$	37Kw
026	SBS Tank	1	FRP	$2m^3$ with Agitator	0.4Kw
027	SBS Pump	3+1	PVC	0-100mL/min	0.1Kw
028	Inhibitor Tank	1	FRP	$3m^3$ with Agitator	0.75Kw
029	Inhibitor Pump	3+1	PVC	0-200mL/min	0.1Kw
030	Filter	3+1	SUS304	$245m^3/hr$	
031	RO HP Pump	3+1	SCS14	$245m^3/hr \times 300mH$	320Kw
032	RO Element	900	POLYAMIDE	8B x 1m	
033	RO Vessel	180	FRP/SUS316	5 Elements/Vessel	
034	Product Water Basin	1	RC	$4000m^3$	
035	Brine Basin	1	RC	$300m^3$	
036	Discharge Basin	1	RC	$300m^3$	
037	Discharge Pump	1+1	SCS13	$245m^3/hr \times 30mH$	37Kw
038	Cleaning Tank	1	FRP	$15m^3$ with Agitator	3.7Kw
039	Cleaning Pump	1+1	SCS13	$260m^3/hr \times 30mH$	37Kw
040	Waste Water Basin	1	RC	$300m^3$	
041	Waste Water Pump	1+1	SCS13	$160m^3/hr \times 20mH$	15Kw
042	Waste Water Blower	1+1	FC	$300Nm^3/hr \times 0.5kg/cm^2$	7.5Kw
043	NaOH Tank	1	SS	$45m^3$ with Agitator	3.7Kw
044	NaOH Pump (1)	1+1	PVC	0-5L/min	0.2Kw
045	NaOH Pump (2)	1+1	SCS13	$1m^3/hr \times 35mH$	0.75Kw
046	Product Water Pump	3+3*	SCS13	$10m^3/min \times 30mH$	140Kw

* 3 lift pumps along the water transfer trunk line to Muaddi Reservoir

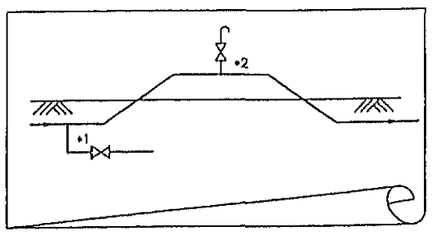


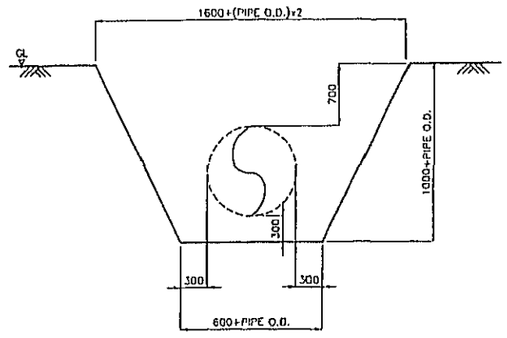
Plan C C–1 Layout of Desalination Plant (Plan C)



NOTE*1: DRAIN NOZZLES AND VALVES SHALL BE FURNISHED TO THE DEAD SPACE WHERE THE WATER CAN BE ACCUMULATED.

NOTE*2: VENT NOZZLES AND VALVES SHALL BE PROVIDED AT THE PART THOSE LEVEL IS HIGHER THAN UPSTREAM AND WHERE THE AIR IS HARD TO BE PURGED.





EXCAVATION STANDARD

Plan C C-2 Flow Diagram of the Project (Plan C)

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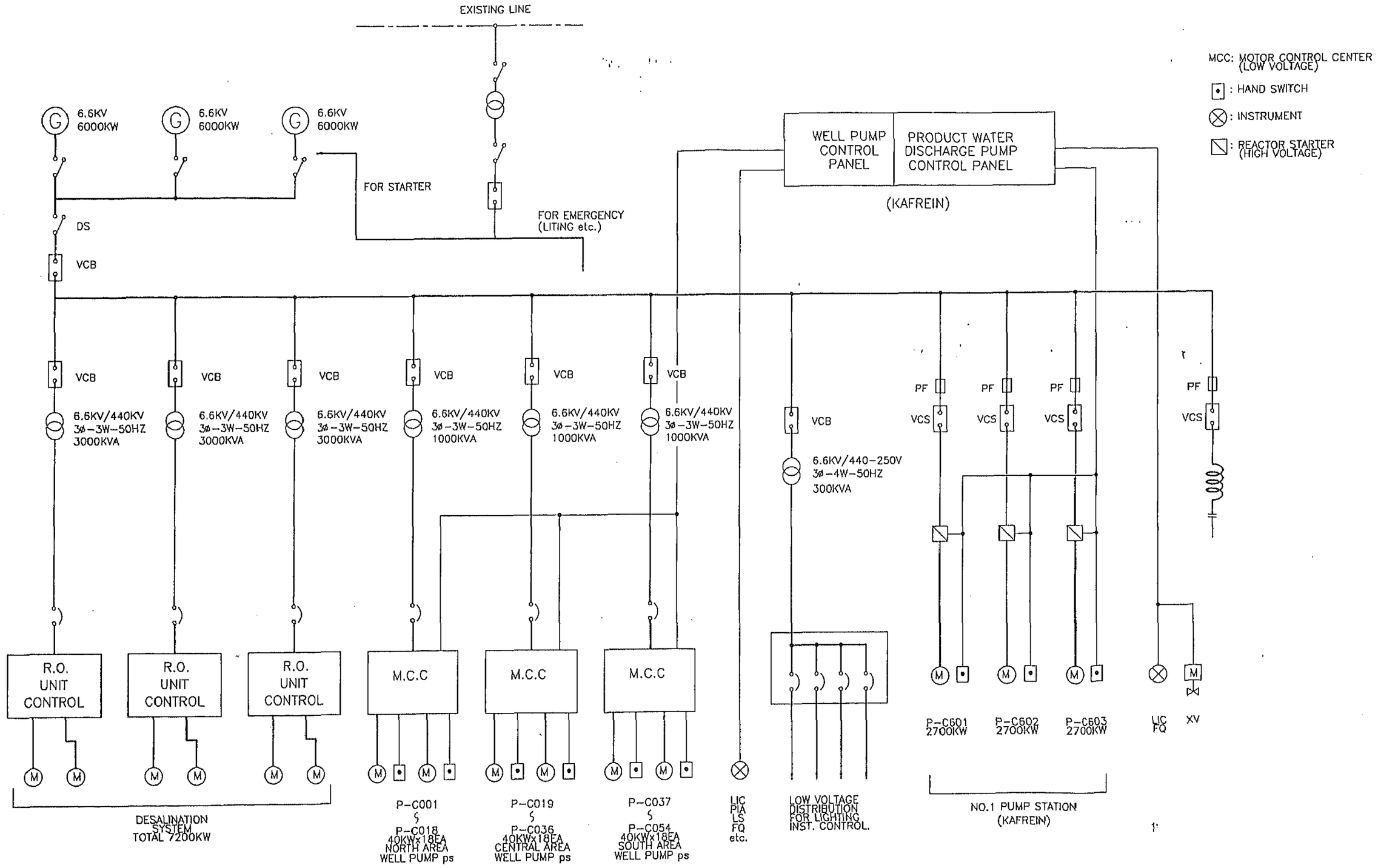


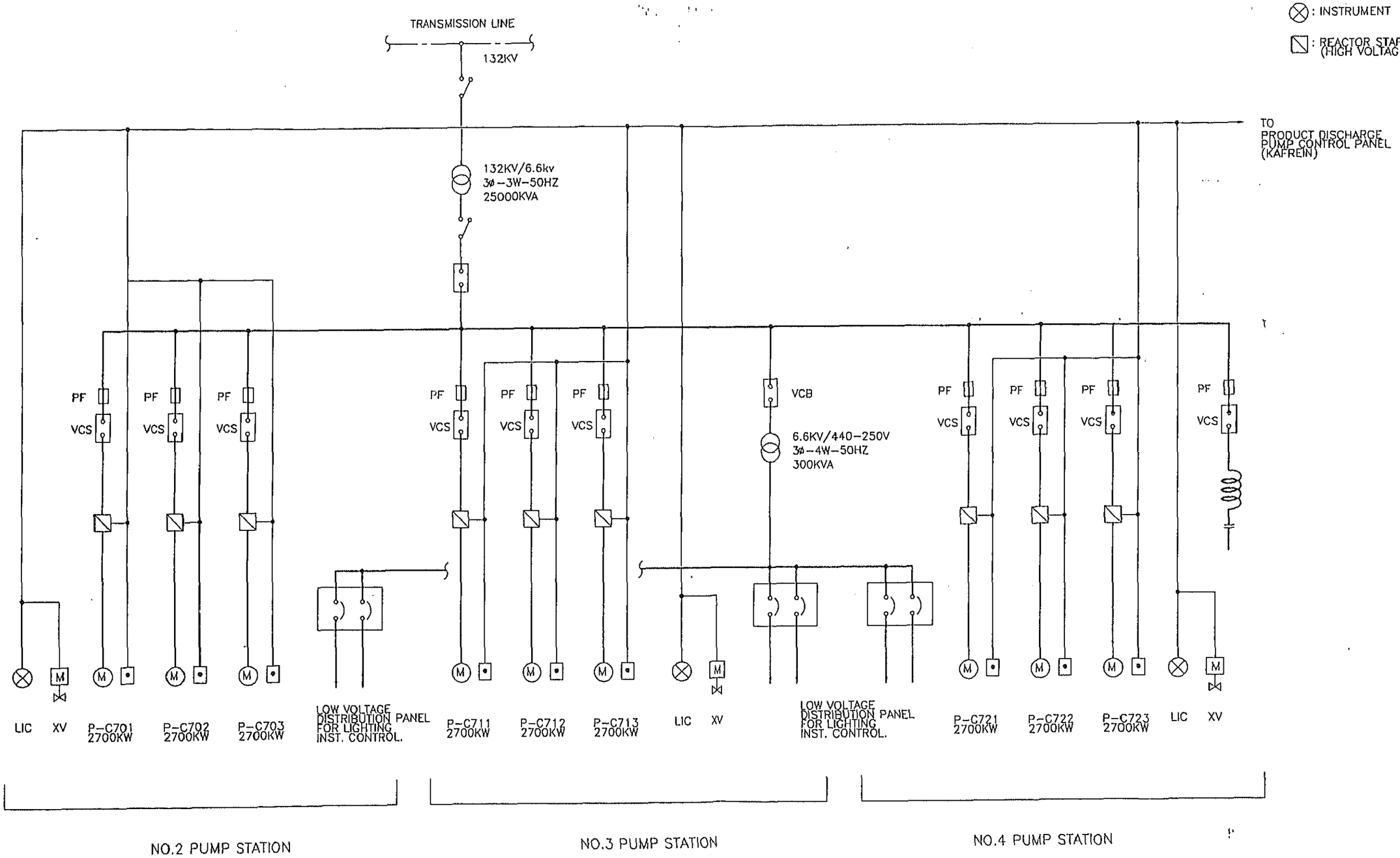
Plan C C-3-1 Oneline Diagram (Plan C 1/2)

MCC: MOTOR CONTROL CENTER (LOW VOLTAGE)

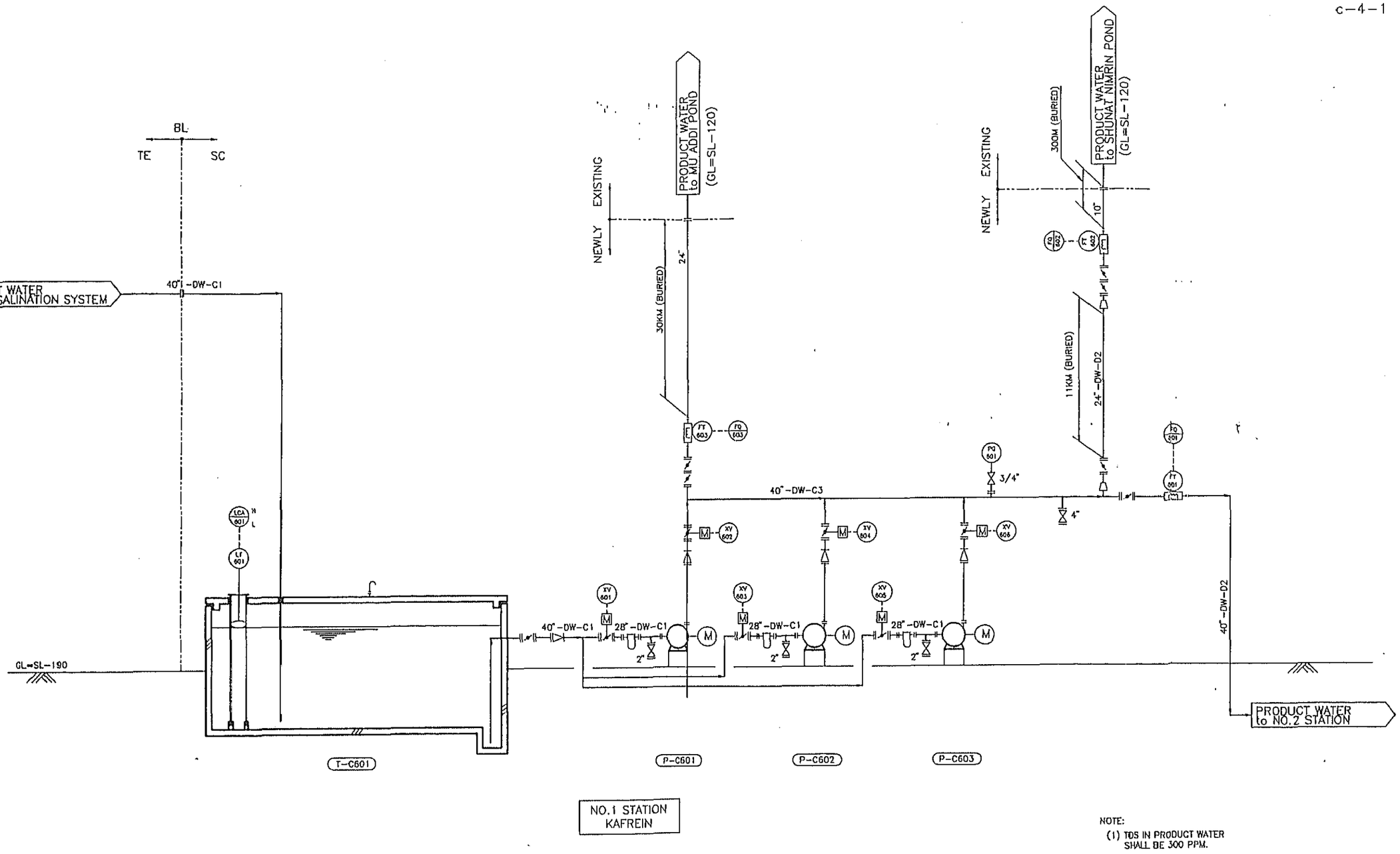
: HAND SWITCH

: INSTRUMENT

: REACTOR STARTER (HIGH VOLTAGE)

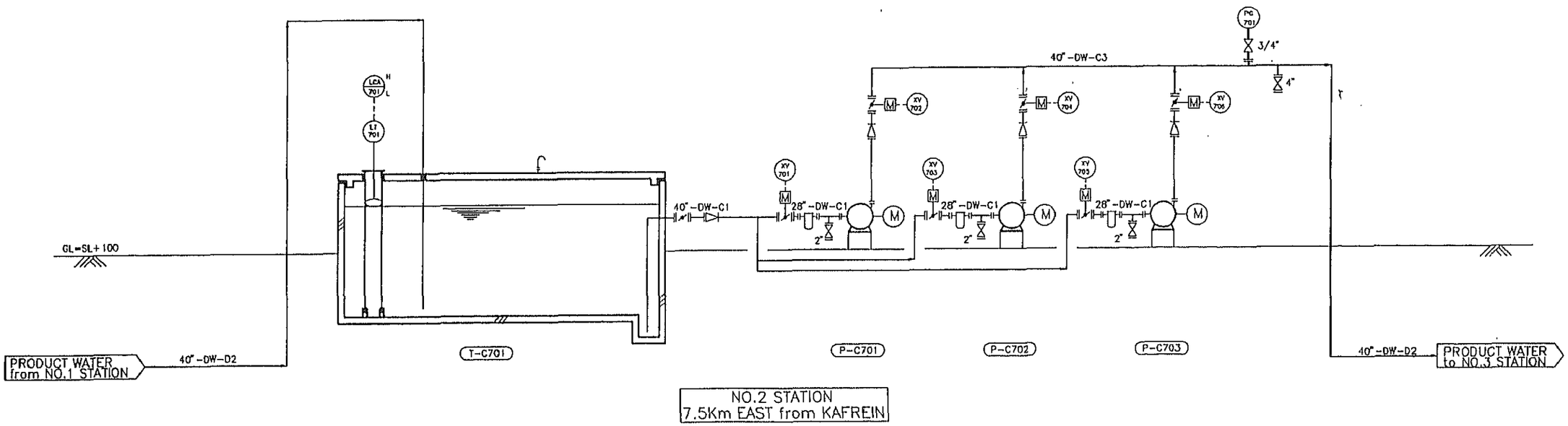


Plan C C-3-2 Oneline Diagram (Plan C 2/2)



NOTE:
(1) TDS IN PRODUCT WATER SHALL BE 300 PPM.

Plan C C-4-1 Schematic Flow of Water Highlift Pump Line (Plan C 1/4)



Plan C C-4-2 Schematic Flow of Water Highlift Pump Line (Plan C 2/4)

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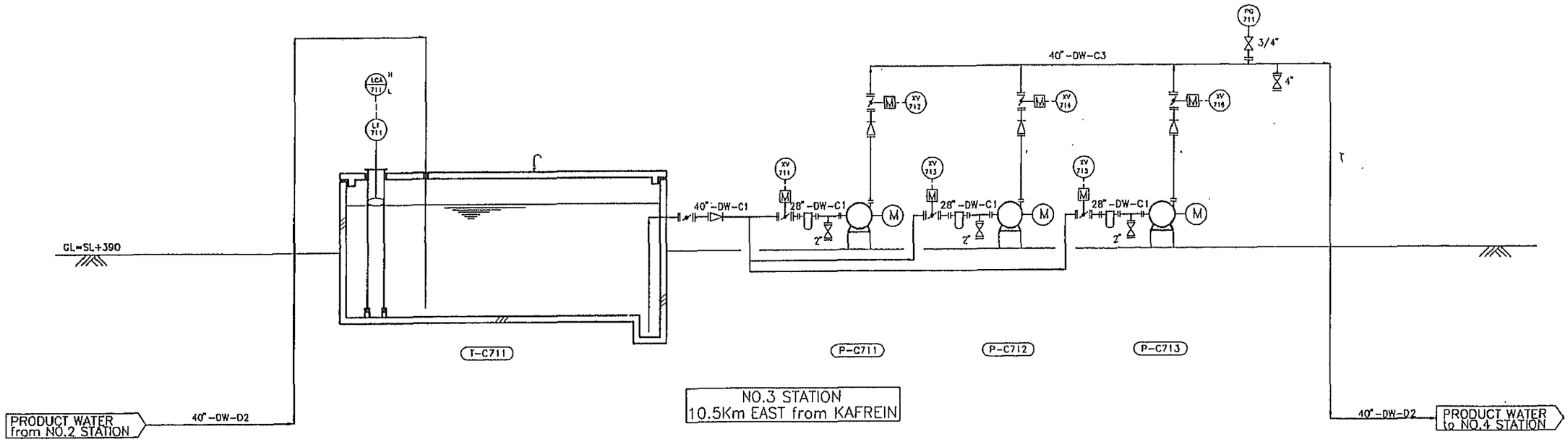
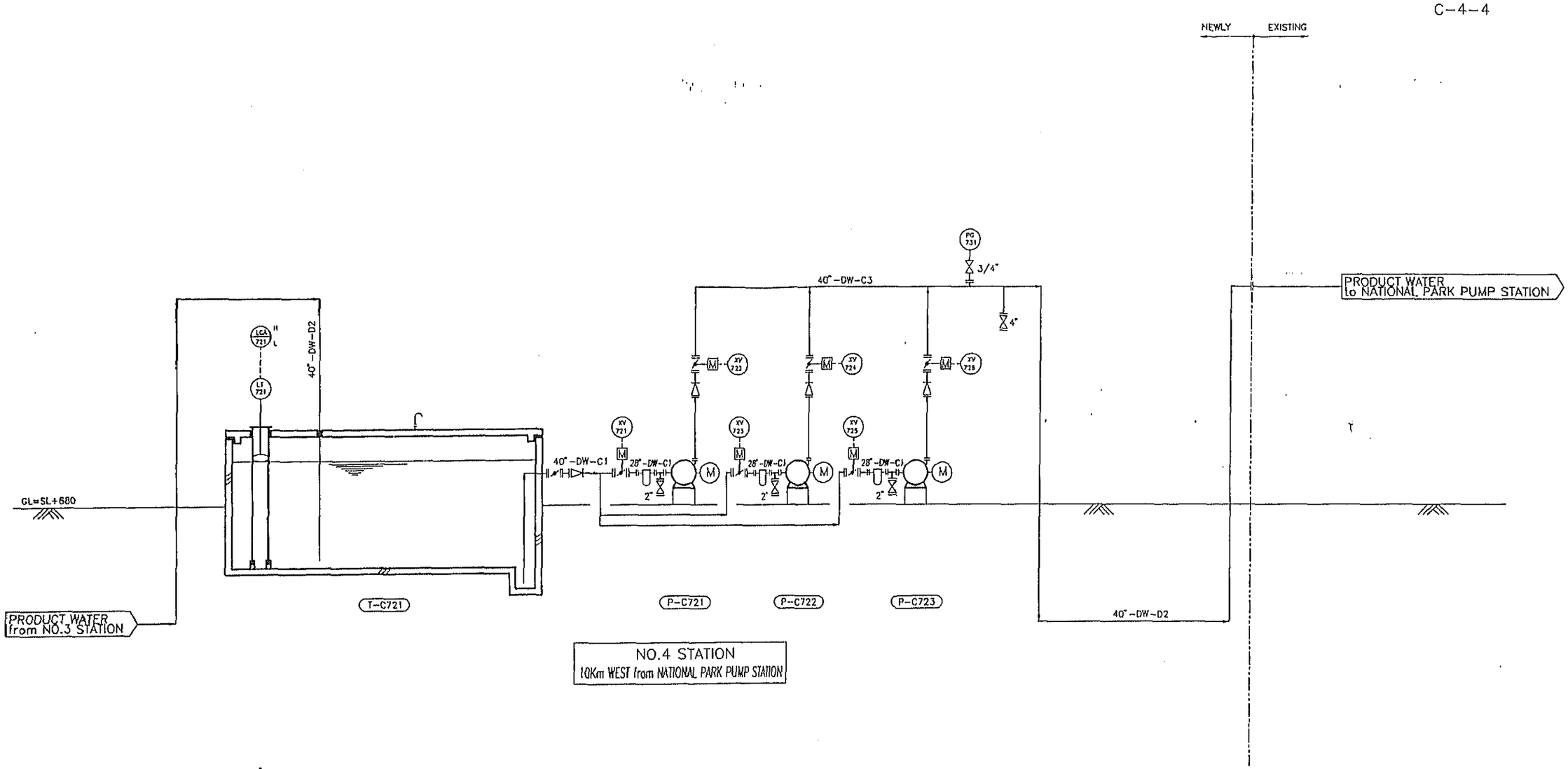
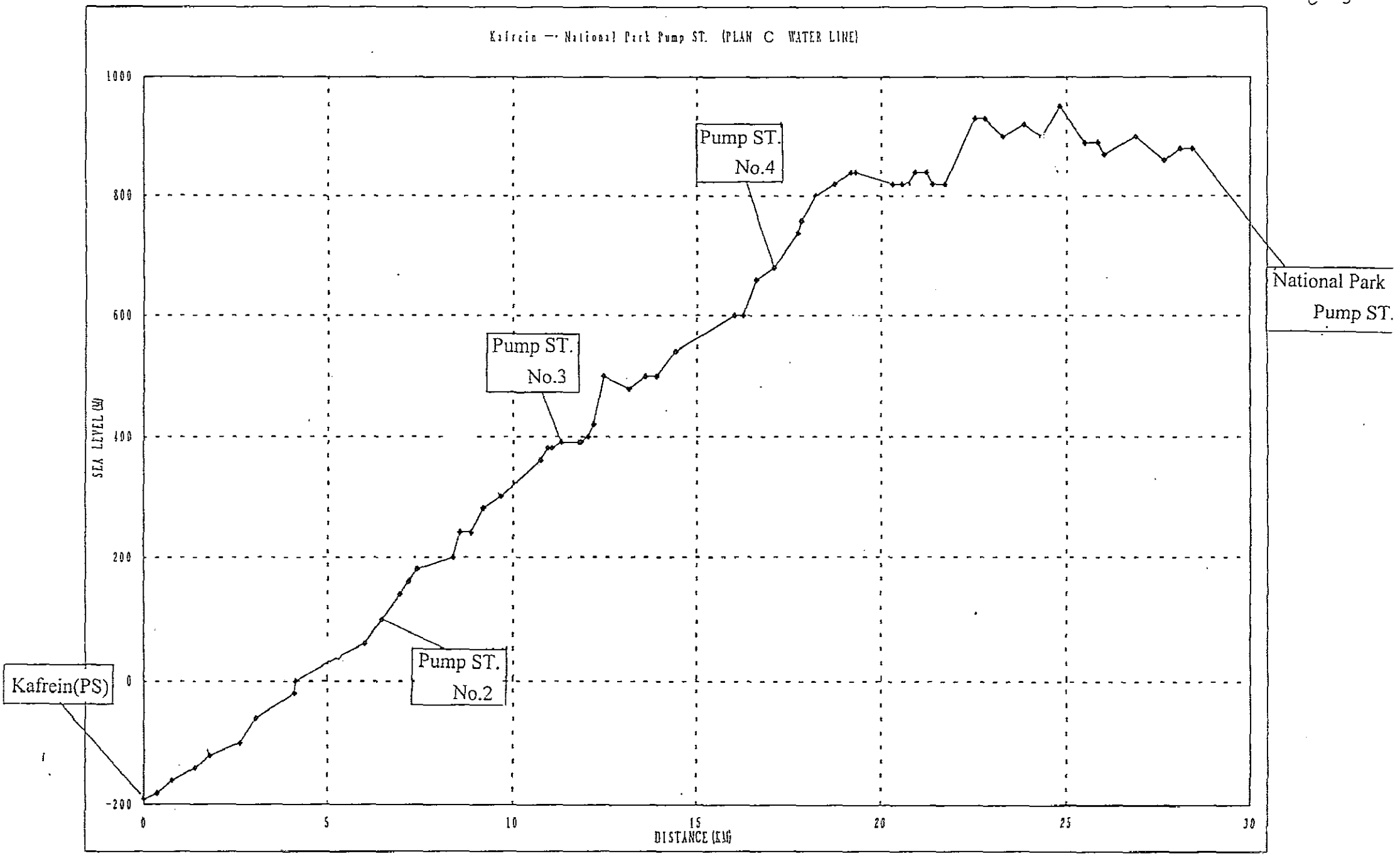


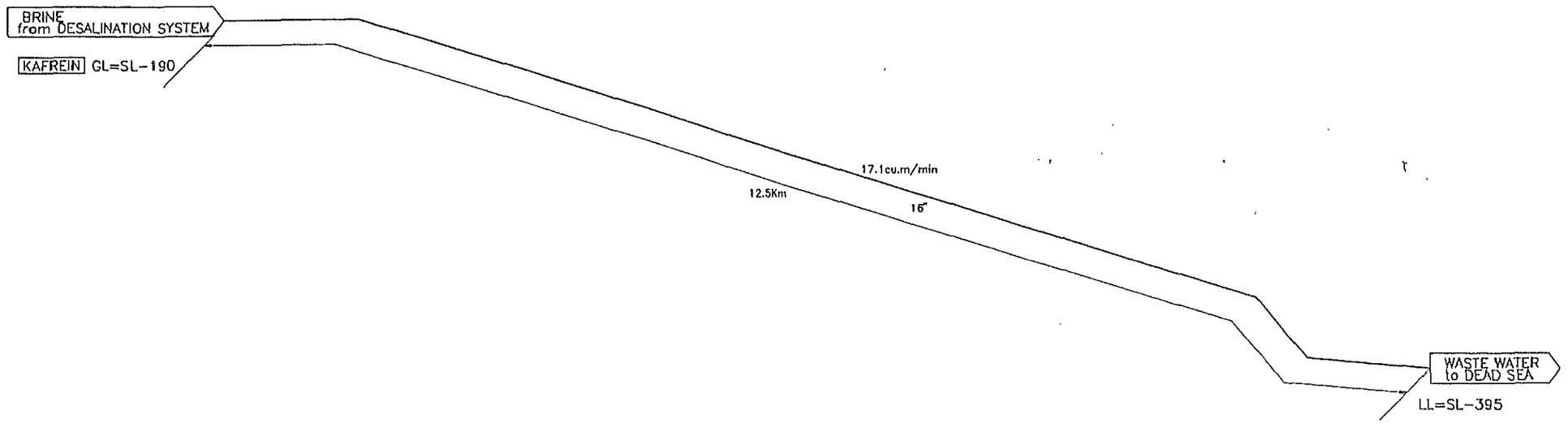
Plan C C-4-3 Schematic Flow of Water Highlift Pump Line (Plan C 3/4)



Plan C C-4-4 Schematic Flow of Water Highlift Pump Line (Plan C 4/4)



Plan C C-5 Profile of Water Highlift Pump Line (Plan C)



NOTE*1: DRAIN NOZZLES AND VALVES SHALL BE FURNISHED TO THE DEAD SPACE WHERE THE WATER CAN BE ACCUMULATED.

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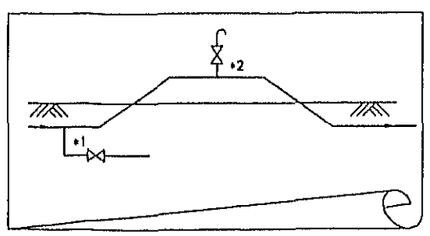
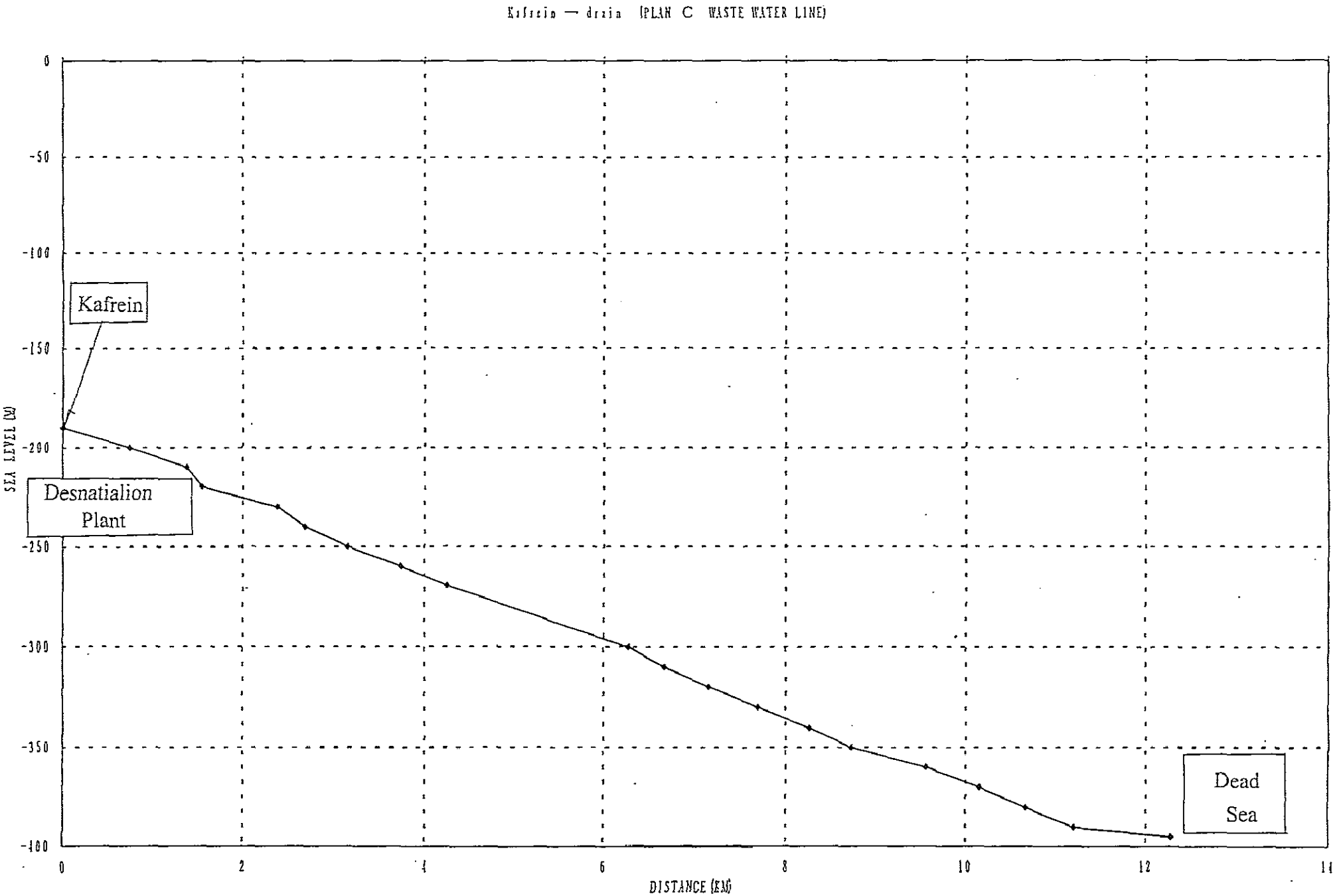
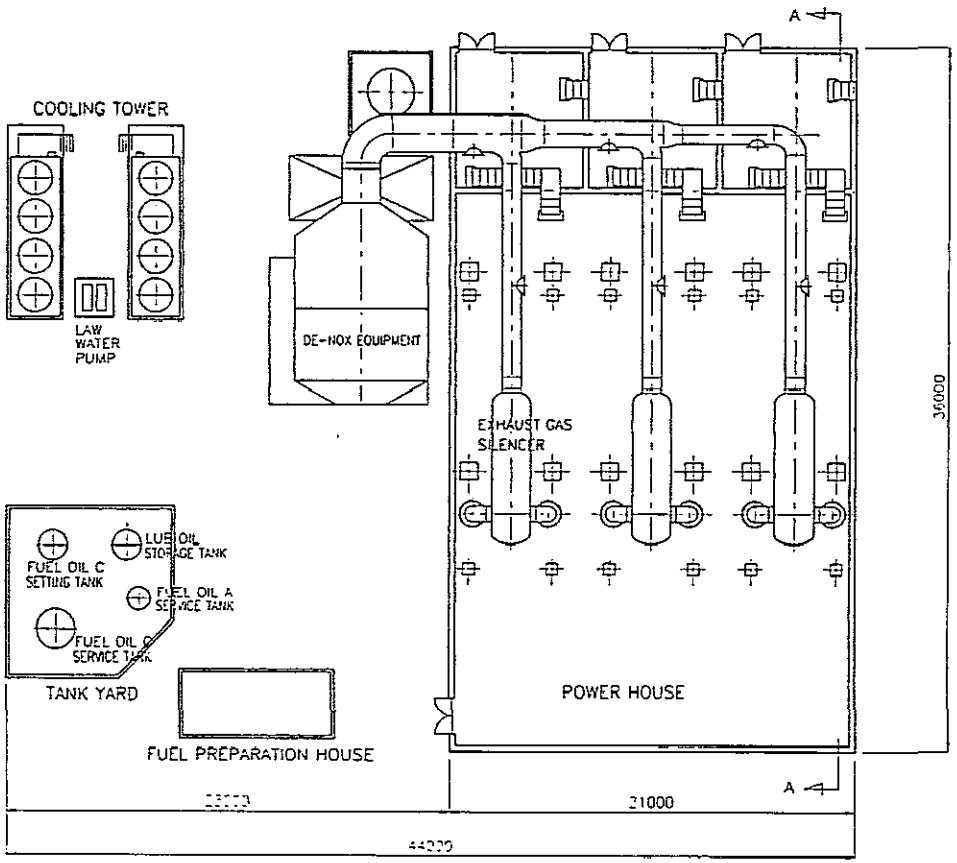


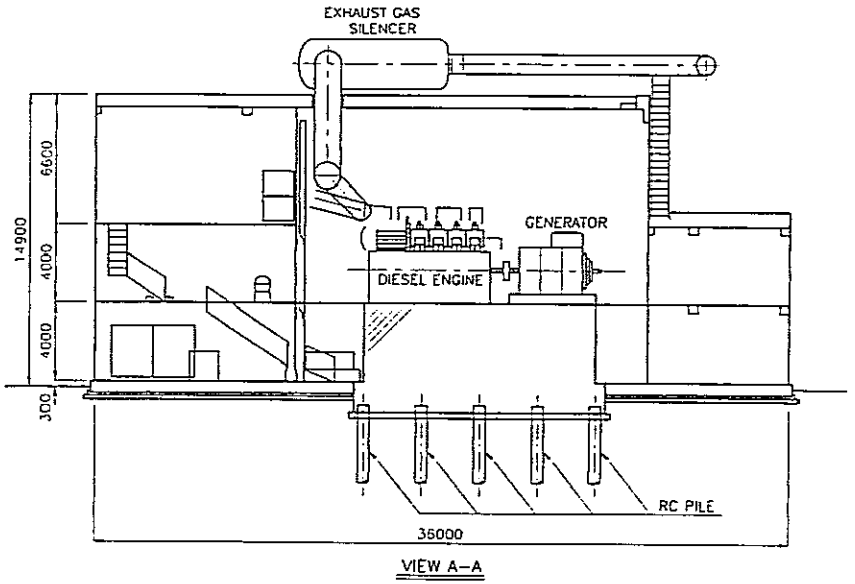
Plan C C-6 Brine Discharge Line (Plan C)

96



Plan C C–7 Profile of Brine Discharge Line (Plan C)





Plan C C–8 Power Station (Plan C)

C-9 Equipment List (Plan-C)

No.	Item	Q'ty	Main Material	Specification	
001	Well Pump	45	SCS13	126m³/hr x 70mH	45Kw
002	pH Adjust Basin	1	RC	300m³ with Agitator	75Kw
003	Intake Basin	1	RC	1000m³	
004	Intake Basin Blower	1+1	FC	20m³/min x 0.5kg/cm²	30Kw
005	Intake Pump	1+1	SCS13	6000m³/hr x 15mH	450Kw
006	Degasifier	8	SS/Rubber Lining	ϕ=4.0m, H=4m	770m³/hr
007	Degasifier Blower	8+1	FC	250Nm³/min x 250mmH_2O	15Kw
008	H_2SO_4 Tank	2	SS	500m³	
009	H_2SO_4 Pump (Main)	2+1	SUS318	0-100L/min	2.2Kw
010	H_2SO_4 Pump (Control)	2+1	SUS318	0-10L/min	0.4Kw
011	Coagulation Basin	1	RC	300m³ with Agitator	75Kw
012	$FeCl_3$ Tank	1	FRP	300m³	
013	$FeCl_3$ Pump	1+1	PVC	0-5L/min	0.2Kw
014	NaOH Pump (1)	1+1	PVC	0-10L/min	0.2Kw
015	Raw Water Basin	1	RC	8000m³	
016	Raw Water Basin Blower	1+1	FC	1000Nm³/min x 0.5kg/cm²	75Kw
017	Dual Media Filter Pump	2+1	SCS13	3000m³/hr x 30mH	330Kw
018	Dual Media Filter	18	SS/Rubber Lining	Horizontal Type	ϕ=3.2m x 11mL
019	NaOCl Tank	1	FRP	75m³	
020	NaOCl Pump (1)	1+1	PVC	0-10L/min	0.2Kw
021	NaOCl Pump (2)	1+1	PVC	0-3L/min	0.2Kw
022	Back Washing Pump	2+1	SCS13	1200m³/hr x 15mH	75Kw
023	Blower	1+1	FC	32Nm³/min x 0.5kg/cm²	45Kw
024	Filtered Water Basin	1	RC	6000m³	
025	RO Feed Pump	16+2	SCS13	380m³/hr x 30mH	55Kw
026	SBS Tank	1	FRP	15m³ with Agitator	3.7Kw
027	SBS Pump	16+2	PVC	0-200mL/min	0.1Kw
028	Inhibitor Tank	1	FRP	30m³ with Agitator	7.5Kw
029	Inhibitor Pump	16+2	PVC	0-300mL/min	0.1Kw
030	Filter	16	SUS304	380m³/hr	
031	RO HP Pump	16+2	SCS14	380m³/hr x 300mH	530Kw
032	RO Element	7200	POLYAMIDE	8B x 1m	
033	RO Vessel	1440	FRP/SUS316	5 Elements/Vessel	
034	Product Water Basin	1	RC	12000m³	
035	Brine Basin	1	RC	1500m³	
036	Discharge Basin	1	RC	1500m³	
037	Discharge Pump	1+1	SCS13	2000m³/hr x 30mH	320Kw
038	Cleaning Tank	2	FRP	30m³ with Agitator	7.5Kw
039	Cleaning Pump	2+1	SCS13	380m³/hr x 30mH	55Kw
040	Waste Water Basin	1	RC	1500m³	
041	Waste Water Pump	1+1	SCS13	750m³/hr x 20mH	75Kw
042	Waste Water Blower	1+1	FC	1500Nm³/hr x 0.5kg/cm²	45Kw
043	NaOH Tank	1	SS	200m³ with Agitator	55Kw
044	NaOH Pump (2)	1+1	PVC	0-20L/min	0.4Kw
045	NaOH Pump (3)	1+1	SCS13	3m³/hr x 35mH	2.2Kw
046	Product Water Lift Pump	3x4*	SCS13	35m³/min x 310mH	2,700Kw

* 4 stage water lift from Kafrein to National Park Pump Station

Part II: Strategy of the Brackish Groundwater Development

2. Estimated Quantities of the Work for Alternative Plans

(1) Civil Work for Raw Water Collection and Treated Water Transfer Pipelines

Plan	Item	Rated Diameter (mm)	Length (m)	Outer Diameter (mm)	Excavation			Pipe Volume	Wadi Crossing Concrete	Road Crossing Concrete	Backfill				Residual Earth		
					Net Earth (m^3) A	Surface Earth (m^3) B	Total (m^3) A+B	(m^3) C	(m^3) D	(m^3) E	Length (m) F	Earth G	Sand (m^3) H=A-C-D-E-G	Total (m^3) I=G+H	Net Earth (m^3) J=A-G	Surface Earth (m^3) K	Total (m^3) L=J+K
A	Collection	ϕ 200	8,500	ϕ 216.3	17,142	0	17,142	312			8,500	6,783	10,047	16,830	10,359	0	10,359
		ϕ 600	13,000	ϕ 609.6	47,386	110	47,496	3,792		100	12,886	14,338	29,156	43,494	33,048	110	33,158
	Transfer	ϕ 400	200	ϕ 406.4	546	0	546	26			200	190	330	520	356	0	356
		ϕ 450	30,000	ϕ 457.2	79,754	9,107	88,861	4,923	133	141	23,715	23,496	51,061	74,557	56,258	9,107	65,365
		ϕ 500	300	ϕ 508.0	947	0	947	61			300	309	577	886	638	0	638
		ϕ 600	5,000	ϕ 609.6	18,061	0	18,061	1,459			5,000	5,563	11,039	16,602	12,498	0	12,498
	Subtotal		57,000		163,836	9,217	173,053	10,573	133	241	50,601	50,679	102,210	152,889	113,157	9,217	122,374
B	Collection	ϕ 200	1,400	ϕ 216.3	2,823	0	2,823	51			1,400	1,117	1,655	2,772	1,706	0	1,706
		ϕ 400	4,000	ϕ 406.4	11,109	50	11,159	519		40	3,943	3,746	6,804	10,550	7,363	50	7,413
	Transfer	ϕ 250	300	ϕ 267.4	659	0	659	17			300	252	390	642	407	0	407
		ϕ 400	35,000	ϕ 406.4	87,515	8,691	96,206	4,538	125	132	28,715	27,283	55,437	82,720	60,232	8,691	68,923
	Subtotal		40,700		102,106	8,741	110,847	5,125	125	172	34,358	32,398	64,286	96,684	69,708	8,741	78,449
C	Collection	ϕ 200	19,700	ϕ 216.3	39,729	0	39,729	724			19,700	15,721	23,284	39,005	24,008	0	24,008
		ϕ 800	23,900	ϕ 812.8	110,854	120	110,974	12,395		122	23,786	30,333	68,004	98,337	80,521	120	80,641
	Transfer	ϕ 250	300	ϕ 267.4	659	0	659	17			300	252	390	642	407	0	407
		ϕ 600	41,000	ϕ 609.6	139,115	10,501	149,616	11,960	158	301	34,563	38,458	88,238	126,696	100,657	10,501	111,158
		ϕ 1000	32,000	ϕ 1016.0	134,456	49,554	184,010	25,930	457	218	9,639	13,859	93,992	107,851	120,597	49,554	170,151
	Subtotal		116,900		424,813	60,175	484,988	51,026	615	641	87,988	98,623	273,908	372,531	326,190	60,175	386,365
D	Collection	ϕ 200	2,500	ϕ 216.3	5,042	0	5,042	92			2,500	1,995	2,955	4,950	3,047	0	3,047
		ϕ 400	2,500	ϕ 406.4	7,014	50	7,064	324		40	2,443	2,321	4,329	6,650	4,693	50	4,743
	Transfer	ϕ 200	300	ϕ 216.3	605	0	605	11			300	239	355	594	366	0	366
		ϕ 400	41,000	ϕ 406.4	104,400	8,826	113,226	5,316	125	238	34,563	32,839	65,882	98,721	71,561	8,826	80,387
	Subtotal		46,300		117,061	8,876	125,937	5,743	125	278	39,806	37,394	73,521	110,915	79,667	8,876	88,543
E	Collection	ϕ 200	28,200	ϕ 216.3	56,871	0	56,871	1,036			28,200	22,505	33,330	55,835	34,366	0	34,366
		ϕ 600	13,000	ϕ 609.6	47,386	110	47,496	3,792		100	12,886	14,338	29,156	43,494	33,048	110	33,158
		ϕ 800	23,900	ϕ 812.8	110,854	120	110,974	12,395		122	23,786	30,333	68,004	98,337	80,521	120	80,641
	Transfer	ϕ 250	300	ϕ 267.4	659	0	659	17			300	252	390	642	407	0	407
		ϕ 400	200	ϕ 406.4	546	0	546	26			200	190	330	520	356	0	356
		ϕ 450	30,000	ϕ 457.2	79,754	9,107	88,861	4,923	133	141	23,715	23,496	51,061	74,557	56,258	9,107	65,365
		ϕ 500	300	ϕ 508.0	947	0	947	61			300	309	577	886	638	0	638
		ϕ 600	46,000	ϕ 609.6	157,176	10,501	167,677	13,419	158	301	39,563	44,021	99,277	143,298	113,155	10,501	123,656
		ϕ 1000	32,000	ϕ 1016.0	134,456	49,554	184,010	25,930	457	218	9,639	13,859	93,992	107,851	120,597	49,554	170,151
	Subtotal		173,900		588,649	69,392	658,041	61,599	748	882	138,589	149,303	376,117	525,420	439,346	69,392	508,738

(2) Civil Work for Brine Discharge Lines

Plan	Item	Rated Diameter (mm)	Length (m)	Outer Diameter (mm)	Excavation			Pipe Volume (m^3) C	Wadi Crossing Concrete (m^3) D	Road Crossing Concrete (m^3) E	Backfill				Residual Earth		
					Net Earth (m^3) A	Surface Earth (m^3) B	Total (m^3) A+B				Length (m) F	Earth G	Sand (m^3) H=A-C-D-E-G	Total (m^3) I=G+H	Net Earth (m^3) J=A-G	Surface Earth (m^3) K	Total (m^3) L=J+K
A	Common Line	ϕ 650	24,500	ϕ 660.4	91,702	5,987	97,689	8,388	67	651	20,759	23,942	58,654	82,596	67,760	5,987	73,747
		ϕ 900	25,000	ϕ 914.4	125,734	7,029	132,763	16,409	126	757	21,297	28,890	79,552	108,442	96,844	7,029	103,873
		ϕ 1200	55,500	ϕ 1219.2	377,823	16,158	393,981	64,761	266	1,269	48,550	77,697	233,830	311,527	300,126	16,158	316,284
	Subtotal		105,000		595,259	29,174	624,433	89,558	459	2,677	90,606	130,529	372,036	502,565	464,730	29,174	493,904
A	Independent Line	ϕ 400	3,500	ϕ 406.4	9,555	0	9,555	454			3,500	3,325	5,776	9,101	6,230	0	6,230
		ϕ 500	55,000	ϕ 508.0	167,383	10,209	177,592	11,142	166	863	47,974	43,867	111,345	155,212	123,516	10,209	133,725
	Subtotal		58,500		176,938	10,209	187,147	11,596	166	863	51,474	47,192	117,121	164,313	129,746	10,209	139,955
B		ϕ 400	3,500	ϕ 406.4	9,555	0	9,555	454			3,500	3,325	5,776	9,101	6,230		6,230
		ϕ 500	55,000	ϕ 508.0	167,383	10,209	177,592	11,142	166	863	47,974	43,867	111,345	155,212	123,516	10,209	133,725
	Subtotal		58,500		176,938	10,209	187,147	11,596	166	863	51,474	47,192	117,121	164,313	129,746	10,209	139,955
C		ϕ 650	12,500	ϕ 660.4	48,225	19	48,244	4,280		18	12,481	14,395	29,532	43,927	33,830	19	33,849
	Subtotal		12,500		48,225	19	48,244	4,280	0	18	12,481	14,395	29,532	43,927	33,830	19	33,849
D		ϕ 300 (UPVC-VP)	300	ϕ 318.0	1,186	0	1,186	24			300	264	898	1,162	922	0	922
	Subtotal		300		1,186	0	1,186	24	0	0	300	264	898	1,162	922	0	922
E	Common Line	ϕ 650	24,500	ϕ 660.4	91,702	5,987	97,689	8,388	67	651	20,759	23,942	58,654	82,596	67,760	5,987	73,747
		ϕ 900	25,000	914.4	125,734	7,029	132,763	16,409	126	757	21,297	28,890	79,552	108,442	96,844	7,029	103,873
		ϕ 1200	55,500	1219.2	377,823	16,158	393,981	64,761	266	1,269	48,550	77,697	233,830	311,527	300,126	16,158	316,284
	Others	ϕ 650	12,500	660.4	48,225	19	48,244	4,280		18	12,481	14,395	29,532	43,927	33,830	19	33,849
	Subtotal		24,500		643,484	29,193	672,677	93,838	459	2,695	103,087	144,924	401,568	546,492	498,560	29,193	527,753
E	Independent Line	ϕ 650	58,500	ϕ 660.4	218,265	11,503	229,768	20,028	166	863	51,474	59,366	137,842	197,208	158,899	11,503	170,402
	Others	ϕ 650	12,500	ϕ 660.4	48,225	19	48,244	4,280			12,481	14,395	29,550	43,945	33,830	19	33,849
	Subtotal		71,000		266,490	11,522	278,012	24,308	166	863	63,955	73,761	167,392	241,153	192,729	11,522	204,251

(3) Manholes

Plan	Item	Rated Diameter (mm)	Length					Outer Diameter (mm)	Number of Manholes (Nr)
			Common (m)	Wadi Crossing (m)	Road Crossing (m)	Town Area (m)	Total (m)		
A	Collection	ϕ 200	8,500				8,500	ϕ 216.3	
		ϕ 600	12,886		114		13,000	ϕ 609.6	
	Transfer	ϕ 400	200				200	ϕ 406.4	
		ϕ 450	23,715	95	190	6,000	30,000	ϕ 457.2	5
		ϕ 500	300				300	ϕ 508.0	
		ϕ 600	5,000				5,000	ϕ 609.6	
	Subtotal		50,601	95	304	6,000	57,000		
B	Collection	ϕ 200	1,400				1,400	ϕ 216.3	
		ϕ 400	3,943		57		4,000	ϕ 406.4	
	Transfer	ϕ 250	300				300	ϕ 267.4	
		ϕ 400	28,715	95	190	6,000	35,000	ϕ 406.4	5
	Subtotal		34,358	95	247	6,000	40,700		
C	Collection	ϕ 200	19,700				19,700	ϕ 216.3	
		ϕ 800	23,786		114		23,900	ϕ 812.8	
	Transfer	ϕ 250	300				300	ϕ 267.4	
		ϕ 600	34,563	95	342	6,000	41,000	ϕ 609.6	6
		ϕ 1000	9,639	190	171	22,000	32,000	ϕ 1016.0	5
	Subtotal		87,988	285	627	28,000	116,900		
D	Collection	ϕ 200	2,500				2,500	ϕ 216.3	
		ϕ 400	2,443		57		2,500	ϕ 406.4	
	Transfer	ϕ 200	300				300	ϕ 216.3	
		ϕ 400	34,563	95	342	6,000	41,000	ϕ 406.4	6
	Subtotal		39,806	95	399	6,000	46,300		
E	Collection	ϕ 200	28,200				28,200	ϕ 216.3	
		ϕ 600	12,886		114		13,000	ϕ 609.6	
		ϕ 800	23,786		114		23,900	ϕ 812.8	4
	Transfer	ϕ 250	300				300	ϕ 267.4	
		ϕ 400	200				200	ϕ 406.4	
		ϕ 450	23,715	95	190	6,000	30,000	ϕ 457.2	4
		ϕ 500	300				300	ϕ 508.0	
		ϕ 600	39,563	95	342	6,000	46,000	ϕ 609.6	6
		ϕ 1000	9,639	190	171	22,000	32,000	ϕ 1016.0	5
	Subtotal		138,589	380	931	34,000	173,900		
A	Common Line	ϕ 650	20,759	38	703	3,000	24,500	ϕ 660.4	4
		ϕ 900	21,297	57	646	3,000	25,000	ϕ 914.4	4
		ϕ 1200	48,550	95	855	6,000	55,500	ϕ 1219.2	7
	Subtotal		90,606	190	2,204	12,000	105,000		
A	Independent Line	ϕ 400	3,500				3,500	ϕ 406.4	
		ϕ 500	47,974	95	931	6,000	55,000	ϕ 508.0	7
	Subtotal		51,474	95	931	6,000	58,500		
B		ϕ 400	3,500				3,500	ϕ 406.4	
		ϕ 500	47,974	95	931	6,000	55,000	ϕ 508.0	7
	Subtotal		51,474	95	931	6,000	58,500		
C		ϕ 650	12,481		19		12,500	ϕ 660.4	2
	Subtotal		12,481	0	19	0	12,500		
D		ϕ 300 (UPVC-VP)	300				300 0	ϕ 318.0	
	Subtotal		300	0	0	0	300		
E	Common Line	ϕ 650	20,759	38	703	3,000	24,500	ϕ 660.4	4
		ϕ 900	21,297	57	646	3,000	25,000	ϕ 914.4	4
		ϕ 1200	48,550	95	855	6,000	55,500	ϕ 1219.2	7
	Others	ϕ 650	12,481		19		12,500	ϕ 660.4	2
	Subtotal		103,087	190	2,223	12,000	117,500		
E	Independent Line	ϕ 650	51,474	95	931	6,000	58,500	ϕ 660.4	7
	Others	ϕ 650	12,481		19		12,500	ϕ 660.4	2
	Subtotal		63,955	95	950	6,000	71,000		

(4) SUMMARY OF QUANTITIES (Plan-A and B/D)

Plan	Description	Excavation	Backfill	Residual Earth	Gravel Leveling	Concrete Leveling	Frame Work	Concrete Body	Iron and Steel Work	Sand and Gravel Work	Expans. Joint A	Expans. Joint B
		(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^2)	(m^3)	(T)	(m^3)	(m^2)	(m^2)
A	PRODUCT WATER BASIN	9,982	934	9,048	920	306	5,914	3,874	387	586	68	26
	OTHER WATER BASIN	12,488	1,287	11,201	1,140	380	13,049	4,927	492	722	40	25
	CHEMICAL TANK	627	57	570	143	48	367	461	37		15	
	SAND FILTER	2,163	116	2,047	515	172	345	1,592	127			34
	DESALI PLANT BUILDING	7,475	260	7,215	1,811	603	337	5,182	414			160
	(1) PUMP ROOM											
	(2) DESALI PLANT											
	(3) OFFICE/ELEC. ROOM											
	(4) PARKING & OTHERS											
	PUMP STATION-A	668	191	477	43	14	802	308	30			
	(5 T TRAVEL. CRANE)											
	MISCELLANEOUS WORKS											
	TOTAL	33,403	2,845	30,558	4,572	1,523	20,814	16,344	1,487	1,308	123	245
B&D	PRODUCT WATER BASIN	3,710	449	3,261	333	111	3,520	1,503	150	209	15	5
	OTHER WATER BASIN	2,925	514	2,411	250	83	3,805	1,298	129	150		
	CHEMICAL TANK	182	68	114	32	13	202	93	8			
	SAND FILTER	336	45	291	74	24	98	249	20			
	DESALI PLANT BUILDING	1,568	114	1,454	370	123	151	1,052	84			15
	(1) PUMP ROOM											
	(2) DESALI PLANT											
	(3) OFFICE/ELEC. ROOM											
	(4) PARKING & OTHERS											
	PUMP STATION-A	366	131	235	19	6	369	146	14			
	MISCELLANEOUS WORKS											
	TOTAL	9,087	1,321	7,766	1,078	360	8,145	4,341	405	359	15	20

(4) Continued

Plan	Description	Building	Concrete Block -Wall	Manhole	Ladder	Sump	Ventila.	Asphalt Paving	Turfing	Electrical Pole	Gate
		(m^2)	(m^2)	(Nr)	(Nr)	(Nr)	(Nr)	(m^2)	(m^2)	(Nr)	(Nr)
A	PRODUCT WATER BASIN			2	2	2					
	OTHER WATER BASIN			5	5	7					
	CHEMICAL TANK				1	1					
	SAND FILTER										
	DESALI PLANT BUILDING										
	(1) PUMP ROOM	800									
	(2) DESALI PLANT	6,000									
	(3) OFFICE/ELEC. ROOM	700									
	(4) PARKING & OTHERS										
	PUMP STATION-A	187	406								
	(5 T TRAVEL. CRANE)										
	MISCELLANEOUS WORKS										
	TOTAL	7,687	406	7	8	10	0	0	0	0	0
B&D	PRODUCT WATER BASIN			2	2	2					
	OTHER WATER BASIN			5	5	6					
	CHEMICAL TANK				1	1					
	SAND FILTER										
	DESALI PLANT BUILDING										
	(1) PUMP ROOM	170									
	(2) DESALI PLANT	1,206									
	(3) OFFICE/ELEC. ROOM	600									
	(4) PARKING & OTHERS	180									
	PUMP STATION-A	102	115								
	MISCELLANEOUS WORKS							2,880	2,430	12	2
	TOTAL	2,258	115	7	8	9	0	2,880	2,430	12	2

(5) SUMMARY OF QUANTITIES (Plan-C and E)

Plan	Description	Excavation	Backfill	Residual Earth	Gravel Leveling	Concrete Leveling	Frame Work	Concrete Body	Iron and Steel Work	Sand and Gravel Work	Expans. Joint A	Expans. Joint B
		(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^2)	(m^3)	(T)	(m^3)	(m^2)	(m^2)
C	PRODUCT WATER BASIN	10,467	1,010	9,457	962	320	6,259	4,093	409	612	66	25
	OTHER WATER BASIN	18,478	1,593	16,885	1,713	571	18,255	7,063	706	1,096	78	34
	CHEMICAL TANK	877	75	802	202	67	465	658	53		16	
	SAND FILTER	3,614	161	3,453	868	289	525	2,667	213			28
	DESALI PLANT BUILDING	9,214	287	8,927	2,240	746	753	6,428	514			
	(1) PUMP ROOM											
	(2) DESALI PLANT											
	(3) OFFICE/ELEC. ROOM											
	(4) PARKING & OTHERS											
	PUMP STATION-A (10 T TRAVEL. CRANE)	668	191	477	43	14	802	308	30			
	PUMP STATION-B (10 T TRAVEL. CRANE)	3,084	882	2,202	198	66	3,702	1,422	141			
	WATER BASIN OF PS-B	2,994	624	2,370	240	78	3,411	1,305	129	147		
	POWER HOUSE (19200KW)											
	MISCELLANEOUS WORKS											
	TOTAL	49,396	4,823	44,573	6,466	2,151	34,172	23,944	2,195	1,855	160	87
E	PRODUCT WATER BASIN	20,449	1,944	18,505	1,882	626	12,173	7,967	796	1,198	134	51
	OTHER WATER BASIN	30,966	2,880	28,086	2,853	951	31,304	11,990	1,198	1,818	118	59
	CHEMICAL TANK	1,504	132	1,372	345	115	832	1,119	90		31	
	SAND FILTER	5,777	277	5,500	1,383	461	870	4,259	340			62
	DESALI PLANT BUILDING	16,689	547	16,142	4,051	1,349	1,090	11,610	928			160
	(1) PUMP ROOM											
	(2) DESALI PLANT											
	(3) OFFICE/ELEC. ROOM											
	(4) PARKING & OTHERS											
	PUMP STATION-A (10 T TRAVEL. CRANE)	1,336	382	954	86	28	1,604	616	60			
	PUMP STATION-B (10 T TRAVEL. CRANE)	3,084	882	2,202	198	66	3,702	1,422	141			
	WATER BASIN OF PS-B	2,994	624	2,370	240	78	3,411	1,305	129	147		
	POWER HOUSE (19200KW)											
	MISCELLANEOUS WORKS											
	TOTAL	82,799	7,668	75,131	11,038	3,674	54,986	40,288	3,682	3,163	283	332

(5) Continued

Plan	Description	Building	Concrete Block	Manhole	Ladder	Sump	Ventila.	Asphalt Paving	Turfing	Electrical Pole	Gate
		(m^2)	(m^2)	(Nr)	(Nr)	(Nr)	(Nr)	(m^2)	(m^2)	(Nr)	(Nr)
C	PRODUCT WATER BASIN										
	OTHER WATER BASIN			5	5	7					
	CHEMICAL TANK				1	1					
	SAND FILTER										
	DESALI PLANT BUILDING										
	(1) PUMP ROOM	800									
	(2) DESALI PLANT	6,000									
	(3) OFFICE/ELEC. ROOM	700									
	(4) PARKING & OTHERS										
	PUMP STATION-A	187	406								
	(10 T TRAVEL. CRANE)										
	PUMP STATION-B	825	1,608								
	(10 T TRAVEL. CRANE)										
	WATER BASIN OF PS-B			3	3	9					
	POWER HOUSE (19200KW)		2,268								
	MISCELLANEOUS WORKS										
	TOTAL	8,512	4,282	8	9	17	0	0	0	0	0
E	PRODUCT WATER BASIN			2	2	2					
	OTHER WATER BASIN			10	10	14					
	CHEMICAL TANK				2	2					
	SAND FILTER										
	DESALI PLANT BUILDING										
	(1) PUMP ROOM	1,600									
	(2) DESALI PLANT	12,000									
	(3) OFFICE/ELEC. ROOM	1,400									
	(4) PARKING & OTHERS										
	PUMP STATION-A	374	812								
	(10 T TRAVEL. CRANE)										
	PUMP STATION-B		1,608								
	(10 T TRAVEL. CRANE)										
	WATER BASIN OF PS-B			3	3	9					
	POWER HOUSE (19200KW)		2,268								
	MISCELLANEOUS WORKS										
	TOTAL	15,374	4,688	15	17	27	0	0	0	0	0