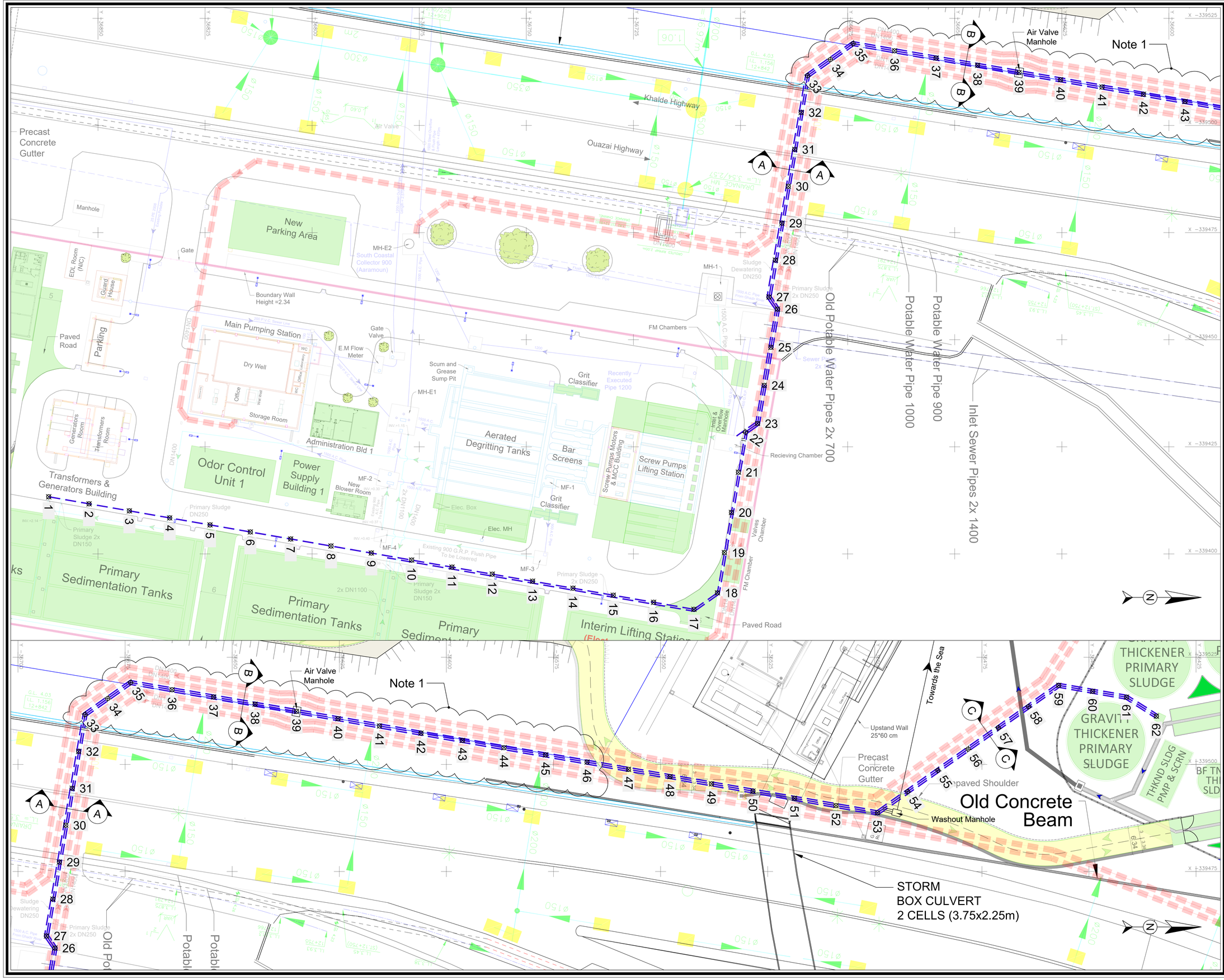


LEGEND:

- Access Road + Bridge (Phase 1)
- DI / Steel (on Highway) DN250 (Phase 1) (Design + Execution)
- Steel DN1400 (Phase 2) (Design Only)

NOTES:

1. The final closure of the waste Landfill Cell 3 shall be applied by the Contractor to the pipe Trench as indicated in Section B-B, restoring the existing structure on site upon completion of pipe trench works.

Diameter (mm)		
Pipe	Washout	Air Valve
250	150	80
1,400	400	2x200

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Expansion and Upgrade of Al-Ghadir Wastewater Treatment Plant Project – Phase I: Design, Build and Operate, Including Sea Outfalls

DAR AL HANDASAH NAZIH TALEB & PARTNERS Founded 1956

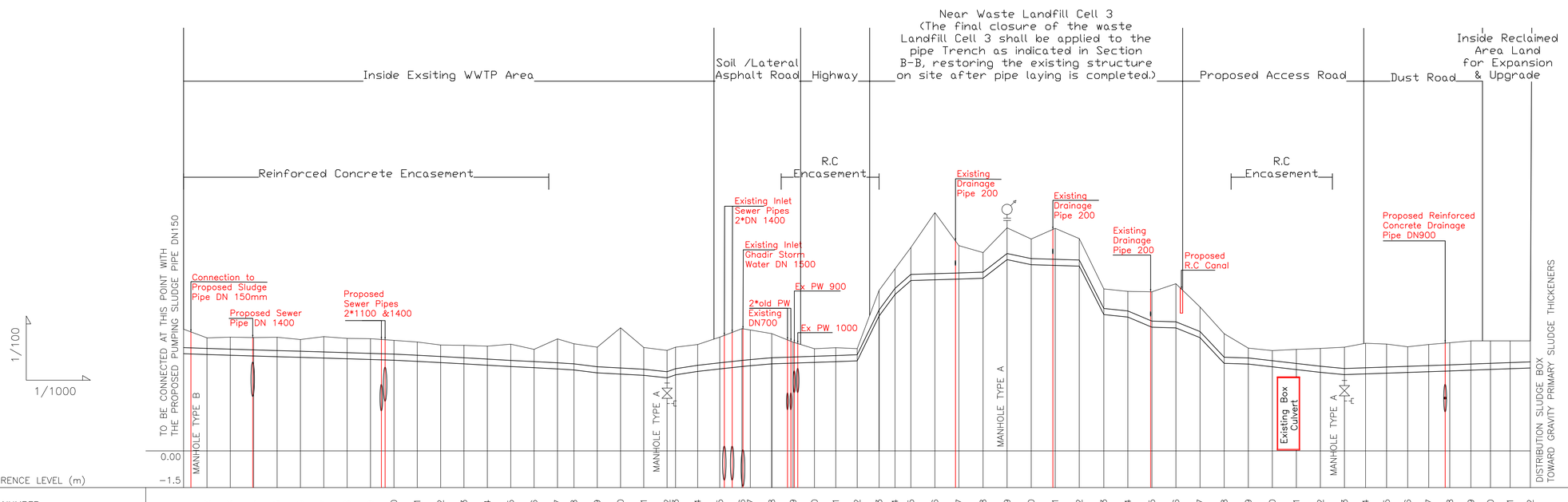
ARTELIA

Connection Between Existing & New Sites

Phase 1 Piping Plan View

DRAWN :	H.I
CHECKED :	S.H
APPROVED :	F.L
DATE :	05 March 2025
SCALE :	1:400
FILE NAME	Con-P1PPV-10

PROJECT	DIVISION	SUB-DIVISION	SHEET	REVISION
L2401DS	Con	P1PPV	10	0



PEG NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
FINAL GROUND LEVEL (m)	4.98	4.62	4.65	4.64	4.65	4.55	4.67	4.60	4.59	4.52	4.45	4.33	4.32	4.28	4.36	4.15	4.58	4.38	4.24	5.03	4.23	4.11	4.24	4.35	4.65	5.00	4.94	4.80	4.45	4.18	4.22	4.18	6.56	7.45	8.31	9.74	8.39	8.11	9.12	8.66	9.10	8.68	6.62	6.52	6.51	6.83	5.88	4.79	4.20	4.10	4.15	4.19	4.24	4.40	4.37	4.26	4.35	4.42	4.50	4.50	4.50
CROWN LEVEL (m)	4.22	4.19	4.16	4.13	4.10	4.07	4.04	4.02	3.99	3.96	3.91	3.86	3.81	3.76	3.70	3.65	3.60	3.56	3.44	3.39	3.33	3.24	3.36	3.50	3.60	3.70	3.73	3.81	3.84	3.87	3.90	3.93	5.76	6.65	7.22	7.25	7.28	7.31	8.07	7.86	7.83	7.80	5.82	5.72	5.31	5.28	4.88	3.83	3.80	3.69	3.57	3.46	3.37	3.40	3.43	3.46	3.49	3.52	3.55	3.58	3.61	3.64
NET DISTANCE (m)	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	7	9.5	9.5	9.5	9.5	3	9.0	9.0	9.0	3	8.7	8.7	8.7	8.7	8.9	7	6	9.8	9.8	9.8	9.9	9.8	9.8	9.8	10.0	9.8	9.8	9.8	9.8	9.9	9.8	9.8	9.8	9.8	9.8	8.6	8.6	8.6	8.6	8.6	8.6	8.0	8.0	8.3
CUMULATIVE DISTANCE (m)	0.00	9.55	19.10	28.65	38.20	47.75	57.30	66.85	76.40	85.95	95.50	105.05	114.60	124.15	133.70	143.25	152.80	159.53	169.05	178.57	188.09	197.61	201.07	210.11	219.15	228.19	231.65	240.38	249.11	257.84	266.57	275.30	284.23	290.75	297.24	307.07	316.90	326.73	336.58	346.41	356.24	366.07	376.09	385.92	395.75	405.58	415.42	425.31	435.14	444.97	454.80	464.63	474.46	483.07	491.68	500.29	508.90	517.51	526.12	534.14	542.16	550.41
HECTOMETER	0											1										2															3																																4										5				
PIEZOMETRIC LEVEL (m)	17.00	16.82	16.65	16.47	16.29	16.12	15.94	15.76	15.59	15.41	15.24	15.06	14.88	14.71	14.53	14.35	14.18	14.05	13.88	13.70	13.53	13.35	13.29	13.12	12.95	12.78	12.72	12.56	12.40	12.24	12.08	11.91	11.75	11.63	11.51	11.33	11.15	10.96	10.78	10.60	10.42	10.24	10.05	9.87	9.69	9.51	9.33	9.14	8.96	8.78	8.60	8.42	8.23	8.08	7.92	7.76	7.60	7.44	7.28	7.13	6.98	6.83
HEAD (m)	12.78	12.63	12.49	12.34	12.19	12.04	11.90	11.75	11.60	11.46	11.33	11.20	11.07	10.95	10.83	10.70	10.58	10.49	10.44	10.31	10.20	10.11	9.93	9.62	9.35	9.08	8.99	8.75	8.56	8.37	8.18	7.98	5.99	4.98	4.29	4.08	3.87	3.65	2.71	2.74	2.59	2.44	4.23	4.15	4.38	4.23	4.45	5.31	5.16	5.09	5.03	4.96	4.86	4.68	4.49	4.30	4.11	3.92	3.73	3.55	3.37	3.19

DIAMETER AND TYPE OF CONDUITS

1 sludge pipe – Phase 1 (DI DN 250)

2 sludge pipes – Phase 1 (DI DN 250)

3 sludge pipes – Phase 1 (DI DN 250) + 4 sewer pipes – Phase 2 (Steel DN 1400)

VALVES AND FITTINGS

150 200 150 200 1/8 1/8 1/8 1/8 1/8 1/8 1/8 1/8 1/8 1/8 1/16

VERTICAL ELBOWS

SPECIAL PIECES

THRUST BLOCKS

10D1 10D1 10D1 10D1 10D1 10D1 10D1 10D1 10D1 10D1 10B1

2 sludge pipes – Phase 1 (DI DN 250) + 2 sewer pipes – Phase 2 (Steel DN 1400)

3 sludge pipes – Phase 1 (DI DN 250) + 2 sewer pipes – Phase 2 (Steel DN 1400)

3 sludge pipes – Phase 1 (Steel DN 250) + 2 sewer pipes – Phase 2 (Steel DN 1400)

3 sludge pipes – Phase 1 (DI DN 250) + 2 sewer pipes – Phase 2 (Steel DN 1400)

3 sludge pipes – Phase 1 (DI DN 250)

* The hydraulic calculations shown on this profile belongs to the pumping sludge pipe (DN 250) shown on plan view – Phase 1

NOTES:

Phase 1 : Design + Execution
Phase 2 : Design Only

Diameter (mm)		
Pipe	Washout	Air Valve
250	150	80
1,400	400	2x200

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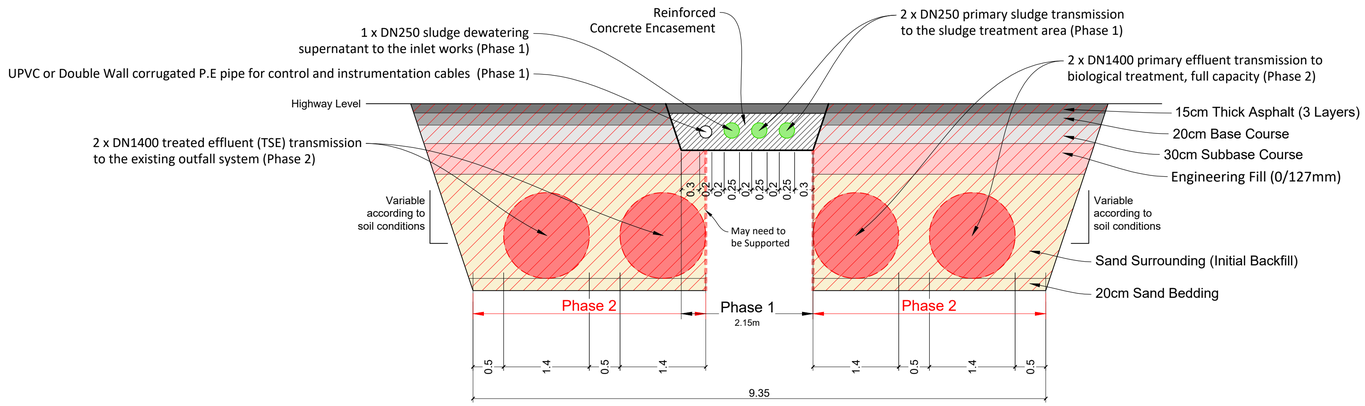
Connection Between Existing & New Sites

Phase 1 Pumping Sludge Pipe Profile

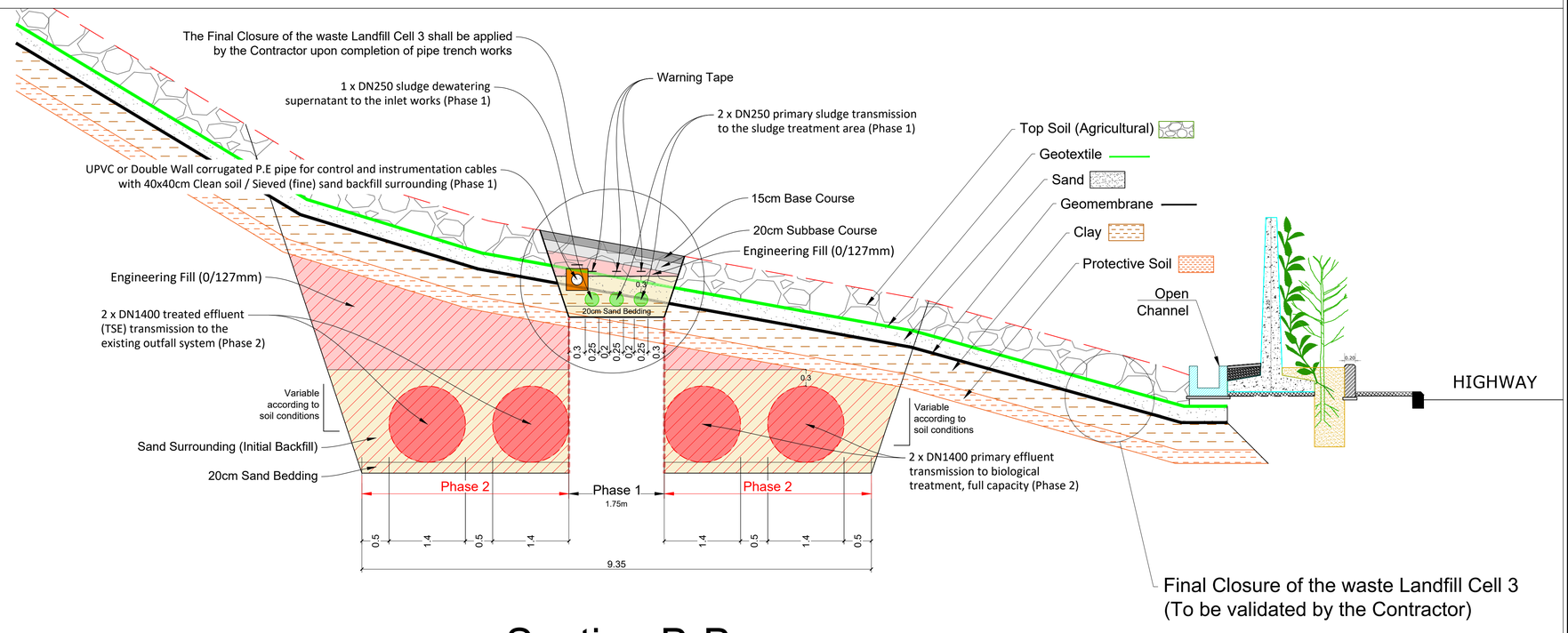
DRAWN :	H.I
CHECKED :	S.H
APPROVED :	F.L
DATE :	05 March 2025
SCALE :	H=1:1,000; V=1:100
FILE NAME	Con-P1PSPr-11

PROJECT	DIVISION	SUB-DIVISION	SHEET	REVISION
L2401DS	Con	P1PSPr	11	0

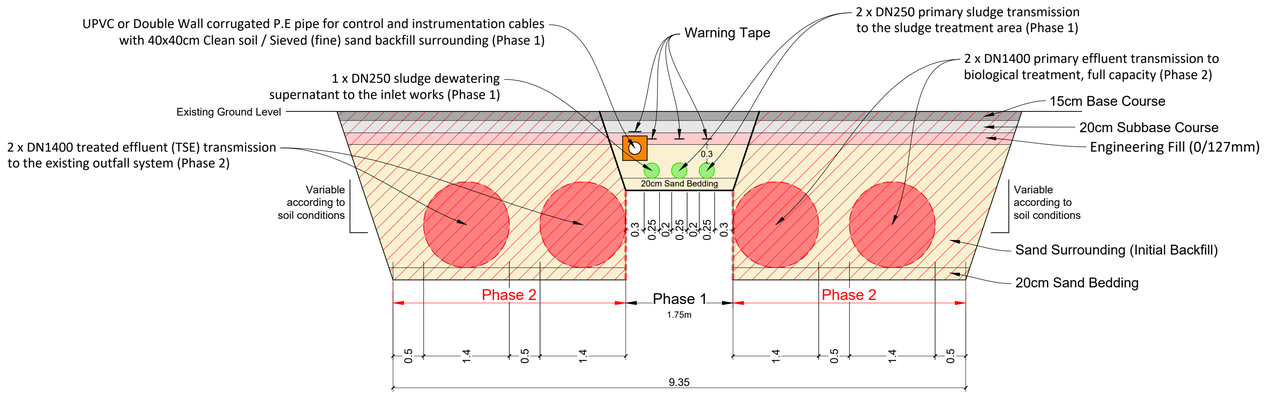
A1 Size



Section A-A



Section B-B



Section C-C

NOTES:

Phase 1 : Design + Execution
Phase 2 : Design Only

- The slopes of the pipe trenches shall be determined by the contractor according to actual soil conditions.
- While Excavating for the pipes of Phase 2, the Contractor should take into consideration support system for the pipes of Phase 1.
- In case of wet trench conditions, the sand and bedding materials shall be replaced with gravel size N°5 and the gravel shall be provided with geotextile as directed by the Engineer.

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Connection Between Existing & New Sites

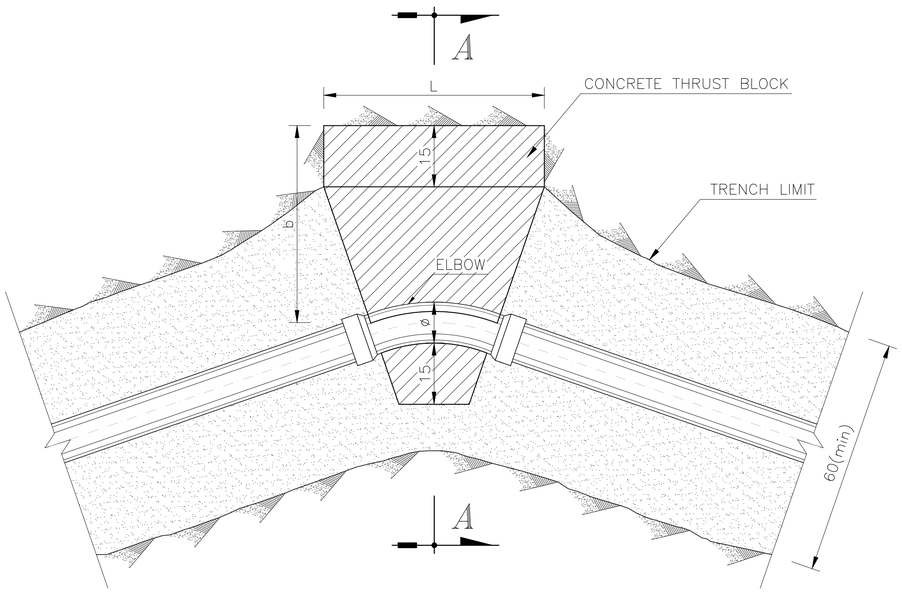
Pipe Trench Sections

DRAWN :	H.I
CHECKED :	S.H
APPROVED :	F.L
DATE :	05 March 2025
SCALE :	1:50
FILE NAME	Con-PTS-12

PROJECT	DIVISION	SUB-DIVISION	SHEET	REVISION
L2401DS	Con	PTS	12	0

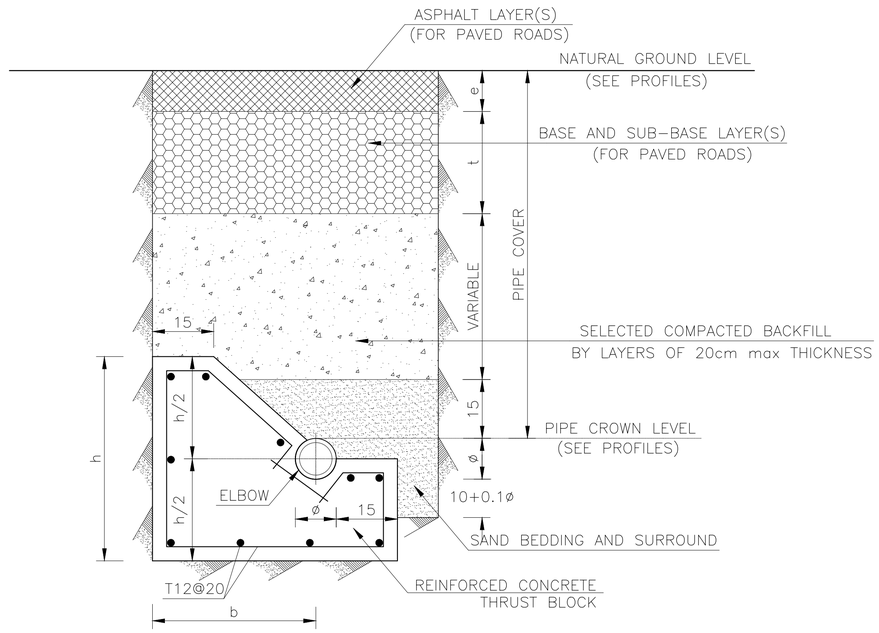
HORIZONTAL ELBOW THRUST BLOCK

(TABLE:1)



PLAN VIEW

NOT TO SCALE



SECTION A–A

NOT TO SCALE

WORKING PRESSURE		PIPE DIAMETER																													
		100				125				150				200				250				300				350				400			
		A	B	D	G	A	B	D	G	A	B	D	G	A	B	D	G	A	B	D	G	A	B	D	G	A	B	D	G	A	B	D	G
50 (1)	L(cm)	30	40	50	70	30	45	60	85	40	50	70	90	45	65	85	110	60	80	100	135	70	90	115	150	75	100	135	175	85	110	150	200
	h(cm)	20	25	30	40	20	25	35	50	25	30	40	55	25	35	50	65	35	40	60	80	40	55	70	90	40	60	80	100	50	65	90	120
	b(cm)	25	30	40	60	25	30	50	70	30	40	60	70	30	50	70	90	50	60	80	110	60	70	90	120	60	80	110	130	70	90	120	160
100 (2)	L(cm)	40	50	70	90	45	60	85	110	50	70	95	125	65	85	115	150	80	100	135	180	90	115	160	205	100	135	180	230	110	150	200	260
	h(cm)	25	30	40	55	25	35	50	65	30	40	55	75	35	50	70	90	40	60	80	110	55	70	95	120	60	80	110	140	65	90	120	150
	b(cm)	30	40	60	70	30	50	70	90	40	60	70	100	50	70	90	120	60	80	110	145	70	90	130	160	80	110	145	185	90	120	160	200
150 (3)	L(cm)	45	60	85	110	55	75	100	125	60	85	110	140	80	100	135	180	90	125	160	220	105	140	190	250	115	160	220	275	135	180	230	300
	h(cm)	25	35	50	65	30	40	60	75	35	50	65	85	40	60	80	110	55	75	95	130	60	85	110	150	70	95	130	160	80	110	140	180
	b(cm)	30	50	70	90	40	60	80	100	50	70	90	110	60	80	110	145	70	100	130	175	80	110	145	200	90	130	175	215	110	145	185	240
200 (4)	L(cm)	50	70	90	125	60	85	110	145	70	95	125	165	85	115	155	200	100	140	180	235	115	160	220	275	135	180	240	310	150	200	270	385
	h(cm)	30	40	55	75	35	50	65	85	40	55	75	100	50	70	90	120	60	85	110	140	70	95	130	160	80	110	140	180	90	120	160	180
	b(cm)	40	60	70	100	50	70	90	110	60	70	100	130	70	90	120	160	80	110	145	185	90	130	175	215	110	145	185	240	120	160	215	305
250 (5)	L(cm)	60	85	100	135	70	90	125	160	85	110	140	180	90	125	165	220	115	150	200	265	135	180	230	300	150	200	270	375	165	220	300	440
	h(cm)	35	50	60	80	40	55	75	95	50	65	85	110	55	75	100	130	70	90	120	150	80	110	140	180	90	120	160	180	100	130	180	190
	b(cm)	50	70	80	110	60	70	100	130	70	90	110	145	70	100	130	175	90	120	160	200	110	145	185	240	120	160	215	290	130	175	240	350
	L1(cm)	25	35	40	55	30	35	50	65	35	45	55	70	35	50	65	90	45	60	80	100	55	70	90	120	60	80	110	145	65	90	120	175
300 (6)	L(cm)	60	85	110	140	85	110	140	180	90	125	160	215	110	145	200	250	130	180	230	300	150	200	270	395	160	220	295	410	180	240	320	490
	h(cm)	35	50	65	85	50	65	85	110	55	75	95	120	65	85	120	150	75	110	140	180	90	120	160	180	95	130	160	190	110	140	180	200
	b(cm)	50	70	90	110	70	90	110	145	70	100	130	160	90	110	160	200	100	145	185	240	120	160	215	305	130	175	215	330	145	185	255	390
350 (7)	L(cm)	70	90	115	155	85	110	140	180	90	125	160	215	110	145	200	250	130	180	230	300	150	200	270	395	170	230	300	470	195	250	365	550
	h(cm)	40	55	70	90	50	65	85	110	55	75	95	120	65	85	120	150	75	110	140	180	90	120	160	180	100	140	180	190	110	150	180	200
	b(cm)	60	70	90	120	70	90	110	145	70	100	130	160	90	110	160	200	100	145	185	240	120	160	215	305	130	185	240	370	145	200	290	430
	L1(cm)	30	35	45	60	35	45	55	70	35	50	65	80	45	55	80	100	50	70	90	120	60	80	110	150	65	90	120	185	70	100	145	215
400 (8)	L(cm)	70	90	125	160	85	110	150	200	95	130	170	220	115	155	205	270	135	180	250	320	160	220	295	410	180	245	330	495	200	270	410	615
	h(cm)	40	55	75	95	50	65	90	120	55	75	100	130	70	90	120	160	80	110	150	180	95	130	160	190	110	140	180	200	120	160	190	200
	b(cm)	60	70	100	130	70	90	120	160	70	100	130	175	90	120	160	215	110	145	200	255	130	175	215	330	145	185	255	390	160	215	330	480

WORKING PRESSURE		PIPE DIAMETER																													
		450				500				600																					
		A	B	D	G	A	B	D	G	A	B	D	G																		
50 (1)	L(cm)	90	125	165	220	100	135	180	230	115	160	210	270																		
	h(cm)	55	75	100	130	60	80	110	140	70	95	120	160																		
	b(cm)	70	90	120	160	70	100	130	175	80	110	145	185																		
100 (2)	L(cm)	125	165	220	300	135	180	240	310	200	215	285	550																		
	h(cm)	75	100	130	180	80	110	140	180	120	120	160	200																		
	b(cm)	90	120	160	200	100	130	175	240	110	145	185	240																		
150 (3)	L(cm)	145	200	265	365	160	220	295	410	180	250	350	550																		
	h(cm)	85	120	150	180	95	130	160	190	110	150	180	200																		
	b(cm)	110	145	185	240	130	175	215	330	145	200	270	430																		
200 (4)	L(cm)	165	220	300	440	180	245	330	490	215	285	420																			
	h(cm)	100	130	180	190	110	140	180	200	120	160	190																			
	b(cm)	130	175	240	350	145	185	255	390	160	215	335																			
250 (5)	L(cm)	180	245	335	500	200	270	400	595	230	300	490																			
	h(cm)	110	140	180	200	120	160	180	200	140	180	200																			
	b(cm)	160	215	320	465	185	240	390																							
	L1(cm)	70	90	130	200	80	110	160	230	90	120	195																			
300 (6)	L(cm)	200	270	390	580	220	300	440	715	250	355	560																			
	h(cm)	120	160	180	200	130	180	190	200	150	180	200																			
	b(cm)	160	215	305	465	175	240	350	480	200	270	450																			
350 (7)	L(cm)	215	285	420	675	230	300	490	840	270	405																				
	h(cm)	120	160	190	200	140	180	200	200	160	180																				
	b(cm)	160	215	335	480	185	240	390	480	215	320																				
	L1(cm)	80	110	170	240	90	120	195	240	110	160																				
400 (8)	L(cm)	220	300	470	780	245	335	525	965	285	425																				
	h(cm)	130	180	190	200	140	180	200	200	160	190																				
	b(cm)	175	240	370	480	185	255	415	480	215	335																				

A : C1/32
B : C1/16
D : C1/8
G : C1/4

EXAMPLE : 4A 1
4 : PIPE DIAMETER
A : ELBOW
1 : PRESSURE

(TABLE: 1)

NOTES

- PIPE COVER = NATURAL GROUND LEVEL } SEE – PIPE CROWN LEVEL } PROFILES
- CALCULATION OF THE THRUST BLOCKS HAS BEEN DONE TAKING INTO CONSIDERATION THE FOLLOWING BASIC DATA VALUES:

SOIL DENSITY	1800 kg/m³
CONCRETE SPECIFIC WEIGHT	2300 kg/m³
SECURITY FACTOR	1.5
SOIL INTERNAL FRICTION ANGLE	25°
SOIL COHESION	500kg/m²
SOIL FRICTION ANGLE 17°	

- THESE VALUES GIVEN ON THE DRAWINGS SHOULD BE JUSTIFIED ON SITE. ANY SUSPICION OF INFERIOR VALUES SHOULD LEAD TO A NEW CALCULATION ADOPTING NEW VALUES REFLECTING THE CONCERNED SOIL CHARACTERISTICS. IN CRITICAL CASES, GEOTECHNICAL INVESTIGATION OR TESTS COULD BE DONE AS REQUESTED BY THE ENGINEER.
- WHERE TRADITIONAL THRUST BLOCKS DIMENSIONS AS ILLUSTRATED AS DWGS №TB401 TO TB405 ARE NOT APPLICABLE DUE TO SITE CONDITIONS, THE CONTRACTOR MUST SUBMIT NEW PROPOSAL TO THE ENGINEER FOR APPROVAL.
- ALL DIMENSIONS ARE IN CENTIMETERS AND OTHER WISE SPECIFIED.

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DAR AL HANDASAH
NAZIH TALEB & PARTNERS
Founded 1956

ARTELIA

Connection Between Existing & New Sites

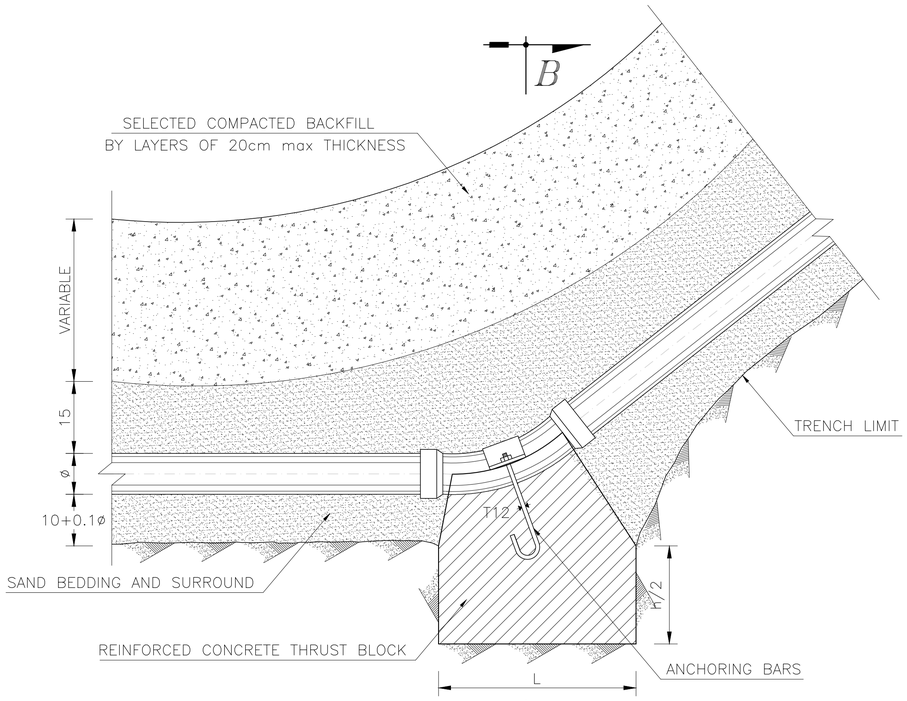
Thrust Blocks & Anchors (1 of 3)

DRAWN :	H.I
CHECKED :	S.H
APPROVED :	F.L
DATE :	05 March 2025
SCALE :	1:750
FILE NAME	Con–TBA1–13

PROJECT	DIVISION	SUB–DIVISION	SHEET	REVISION
L2401DS	Con	TBA1	13	0

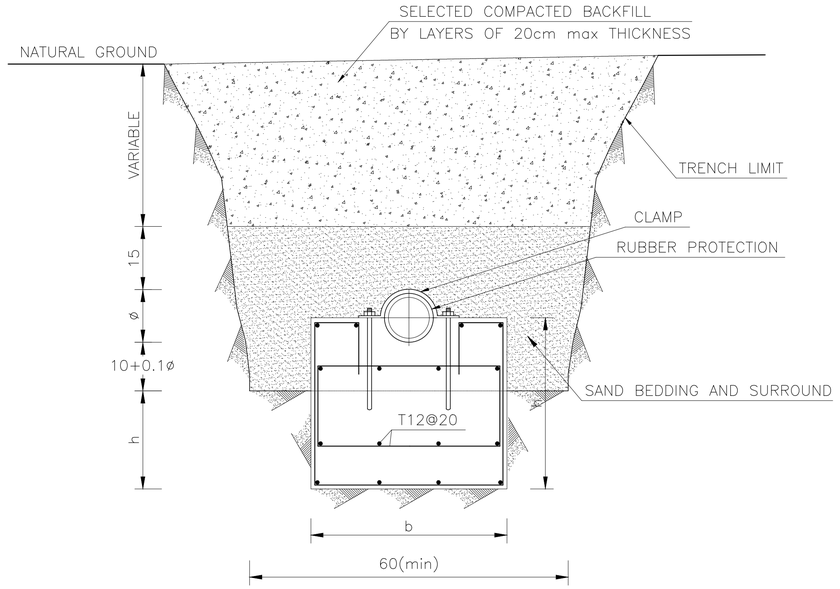
VERTICAL ELBOW THRUST BLOCK (DOWNWARD THRUST)

(TABLE:2)



ELEVATION

NOT TO SCALE



SECTION B–B

NOT TO SCALE

	PIPE DIAMETER																															
	100				125				150				200				250				300				350				400				450				500				600			
	R	S	V	Z	R	S	V	Z	R	S	V	Z	R	S	V	Z	R	S	V	Z	R	S	V	Z	R	S	V	Z	R	S	V	Z	R	S	V	Z	R	S	V	Z
L(cm)	30	30	30	40	30	30	35	50	30	30	40	55	30	40	50	70	30	50	65	85	40	55	75	105	50	60	85	125	50	70	100	140	60	80	110	160	60	85	125	200	70	110	150	220
b(cm)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	30	20	20	30	30	20	20	30	40	20	30	30	60	20	30	40	60	30	30	40	60	30	30	60	80	30	40	60	80
h(cm)	25	25	25	30	25	25	25	40	25	25	30	40	25	30	40	60	25	40	50	70	30	40	60	80	40	50	70	100	40	60	80	110	50	60	90	130	50	70	100	160	60	90	120	175
L(cm)	30	30	40	50	30	35	50	65	30	40	60	75	40	50	70	100	50	65	90	125	55	75	110	150	60	85	130	200	70	100	150	205	80	110	160	230	85	130	200	260	110	155	220	320
b(cm)	20	20	20	20	20	20	20	30	20	20	30	30	20	20	30	40	20	30	30	60	20	30	40	60	30	30	60	80	30	40	60	80	30	40	60	80	30	60	80	90	40	60	80	100
h(cm)	25	25	30	40	25	25	40	50	25	30	50	60	30	40	60	80	40	50	70	100	40	60	90	120	50	70	100	160	60	80	120	160	60	90	130	185	70	100	160	200	90	120	175	255
L(cm)	30	35	50	65	30	45	60	80	35	50	70	95	50	65	85	125	60	80	110	155	70	95	135	200	75	110	160	220	85	125	200	255	100	145	205	295	110	160	230	320	135	200	280	380
b(cm)	20	20	20	30	20	20	30	30	20	20	30	30	20	30	30	60	30	30	40	60	30	30	60	80	30	40	60	80	30	60	80	90	40	60	80	90	40	60	80	100	60	80	90	100
h(cm)	25	25	40	50	25	30	50	60	25	40	60	70	40	50	70	100	50	60	90	120	60	70	110	160	60	90	130	175	70	100	160	200	80	110	160	215	90	130	185	255	110	160	215	305
L(cm)	30	40	55	70	35	50	70	90	40	60	80	110	50	70	105	150	65	90	135	200	75	110	160	220	85	130	200	260	100	150	220	300	110	160	240	340	130	200	270	370	155	225	325	440
b(cm)	20	20	20	30	20	20	30	30	20	30	30	40	20	30	40	60	30	30	60	80	30	40	60	80	30	60	80	90	40	60	80	100	40	60	80	100	60	80	90	100	60	80	100	100
h(cm)	25	30	40	60	25	40	60	70	30	50	60	90	40	60	80	120	50	70	110	160	60	90	130	175	70	100	160	200	80	120	175	240	90	130	185	270	100	160	215	290	120	175	255	350
L(cm)	30	50	60	85	40	55	70	100	50	60	85	125	60	85	115	160	70	100	150	205	85	125	200	250	100	150	215	300	110	160	240	340	135	200	270	375	150	215	305	410	200	255	360	490
b(cm)	20	20	30	30	20	20	30	40	20	30	30	60	30	30	40	60	30	40	60	80	30	60	80	90	40	60	80	100	40	60	80	100	60	80	90	100	60	80	100	100	80	90	100	100
h(cm)	25	40	50	70	30	40	60	80	40	50	70	100	50	70	90	130	60	80	120	160	70	100	160	200	80	120	160	240	90	130	185	270	110	160	215	290	120	160	240	330	160	200	290	390
L(cm)	35	50	70	90	45	60	85	110	50	70	100	135	65	90	135	200	80	110	160	225	95	135	200	270	110	160	230	320	125	200	270	360	145	210	300	410	160	230	340	460	200	285	400	540
b(cm)	20	20	30	30	20	30	30	40	20	30	40	60	30	30	60	80	30	40	60	80	30	60	80	90	40	60	80	100	60	80	90	100	60	80	100	100	60	80	100	100	80	90	100	100
h(cm)	25	40	60	70	30	50	70	90	40	60	80	110	50	70	100	160	60	90	130	175	70	110	160	215	90	130	185	255	100	160	215	290	110	160	240	330	130	185	270	370	160	215	320	430
L(cm)	40	50	70	100	50	60	85	125	55	70	105	150	70	100	140	200	85	125	200	250	100	150	220	300	120	200	250	350	135	200	295	400	155	225	330	440	175	250	360	485	215	310	430	580
b(cm)	20	20	30	40	20	30	30	60	20	30	40	60	30	40	60	80	30	60	80	90	40	60	80	100	40	80	90	100	60	80	90	100	60	80	100	100	60	90	100	100	80	100	100	100
h(cm)	30	40	60	80	40	50	70	100	40	60	80	120	60	80	110	160	70	100	160	200	80	120	175	240	90	160	200	270	110	160	215	320	120	175	255	350	130	200	290	385	160	240	335	465
L(cm)	40	60	75	110	50	70	95	135	60	80	110	160	70	105	150	220	90	135	200	270	110	160	230	320	130	200	270	375	150	220	315	420	170	245	350	470	200	270	380	520	225	330	460	635
b(cm)	20	30	30	40	20	30	30	60	30	30	40	60	30	40	60	80	30	60	80	90	40	60	80	100	60	80	90	100	60	80	100	100	60	80	100	100	80	90	100	100	80	100	100	100
h(cm)	30	50	60	90	40	60	70	110	50	60	90	130	60	80	120	175	70	110	160	215	90	130	185	255	100	160	215	290	120	175	240	335	130	185	270	370	160	215	305	415	175	255	370	480

EXAMPLE : 4V1
4 : PIPE DIAMETER
V : ELBOW
1 : PRESSURE

(TABLE: 2)

NOTES

- PIPE COVER = NATURAL GROUND LEVEL } SEE
  – PIPE CROWN LEVEL } PROFILES
- CALCULATION OF THE THRUST BLOCKS HAS BEEN DONE TAKING INTO CONSIDERATION THE FOLLOWING BASIC DATA VALUES:

SOIL DENSITY	1800 kg/m³
CONCRETE SPECIFIC WEIGHT	2300 kg/m³
SECURITY FACTOR	1.5
SOIL INTERNAL FRICTION ANGLE	25°
SOIL COHESION	500kg/m²
SOIL FRICTION ANGLE 17°	

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LEBANESE REPUBLIC
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

Expansion and Upgrade of Al-Ghadir Wastewater Treatment Plant Project – Phase I: Design, Build and Operate, Including Sea Outfalls

DAR AL HANDASAH
NAZIH TALEB & PARTNERS
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ARTELIA

Connection Between Existing & New Sites

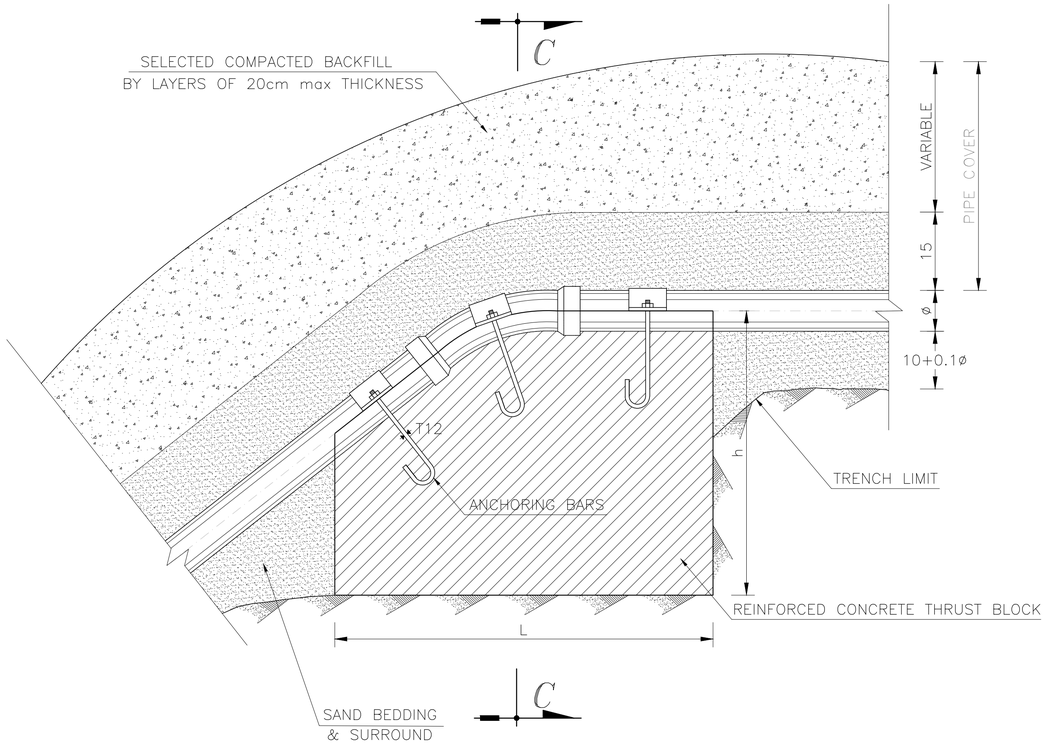
Thrust Blocks & Anchors (2 of 3)

DRAWN :	H.I
CHECKED :	S.H
APPROVED :	F.L
DATE :	05 March 2025
SCALE :	1:750
FILE NAME	Con-TBA2-14

PROJECT	DIVISION	SUB-DIVISION	SHEET	REVISION
L2401DS	Con	TBA2	14	0

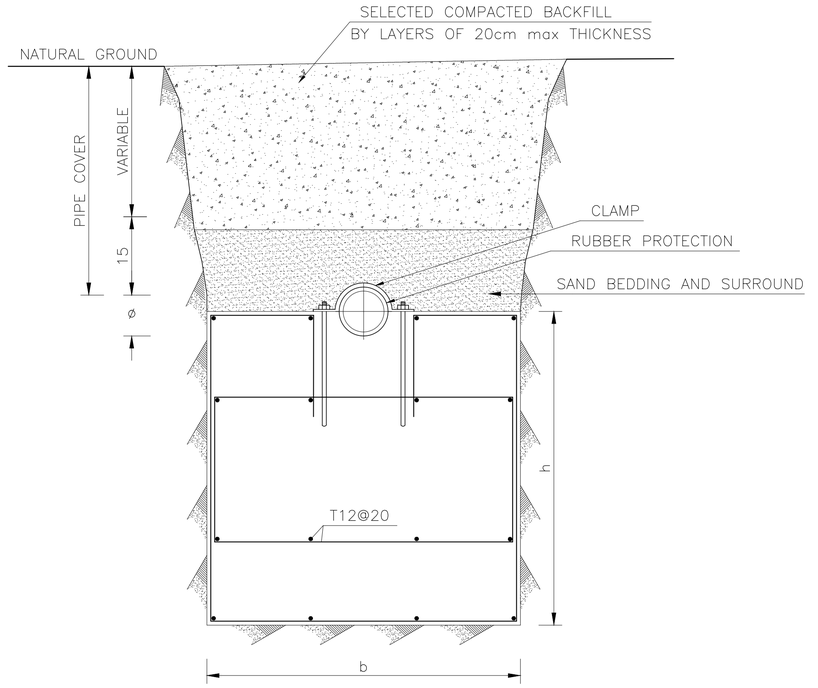
VERTICAL ELBOW THRUST BLOCK (UPWARD THRUST)

(TABLE:3)



ELEVATION

NOT TO SCALE



SECTION C–C

NOT TO SCALE

WORKING PRESSURE		PIPE DIAMETER																																							
		100			125			150			200			250			300			350			400			450			500			600		
		K	L	N	K	L	N	K	L	N	K	L	N	K	L	N	K	L	N	K	L	N	K	L	N	K	L	N	K	L	N	K	L	N
50 (1)	L(cm)	50	65	85	60	70	90	70	85	100	85	100	125	90	110	135	100	125	155	110	135	175	120	150	185	125	160	200	135	175	220	150	200	245
	b(cm)	30	35	50	35	40	55	40	50	60	50	60	75	55	65	80	60	75	90	65	80	100	70	90	110	75	95	120	80	100	130	90	120	140
	h(cm)	40	50	70	50	60	70	60	70	80	70	80	100	70	90	110	80	100	120	90	110	130	90	120	145	100	130	160	110	130	175	120	160	185
100 (2)	L(cm)	65	85	100	70	90	115	85	100	125	100	125	150	110	140	180	125	160	200	135	180	220	150	185	230	160	200	250	175	220	270	200	250	300
	b(cm)	35	50	60	40	55	70	50	60	75	60	75	90	65	85	110	75	95	120	80	110	130	90	110	140	95	120	150	100	130	160	120	150	180
	h(cm)	50	70	80	60	70	90	70	80	100	80	100	120	90	110	145	100	130	160	110	145	175	120	145	185	130	160	200	130	175	215	160	200	240
150 (3)	L(cm)	75	90	115	85	105	135	95	115	150	110	135	180	125	160	200	140	180	220	160	200	250	175	220	270	180	230	300	200	250	310	220	285	365
	b(cm)	40	55	70	50	60	80	55	70	90	65	80	110	75	95	120	85	110	130	95	120	150	100	130	160	110	140	180	120	150	180	130	160	180
	h(cm)	60	70	90	70	80	110	70	90	120	90	110	145	100	130	160	110	145	175	130	160	200	130	175	215	145	185	240	160	200	240	175	215	290
200 (4)	L(cm)	85	100	125	90	115	140	100	125	160	125	150	195	140	180	220	160	200	250	180	220	270	190	230	300	200	250	320	220	270	360	250	300	410
	b(cm)	50	60	75	55	70	85	60	75	95	75	90	110	85	110	130	95	120	150	110	130	160	110	140	180	120	150	180	130	160	180	150	180	190
	h(cm)	70	80	100	70	90	110	80	100	130	100	120	145	110	145	175	130	160	200	145	175	215	145	185	240	160	200	255	175	215	290	200	240	330
250 (5)	L(cm)	85	110	135	100	125	155	110	135	175	135	160	205	150	190	230	165	220	270	180	230	300	200	250	320	220	270	360	230	300	400	270	340	460
	b(cm)	50	65	80	60	75	90	65	80	100	80	95	120	90	110	140	100	130	160	110	140	180	120	150	180	130	160	180	140	180	180	160	180	190
	h(cm)	70	90	110	80	100	120	90	110	130	110	130	160	120	145	185	130	175	215	145	185	240	160	200	255	175	215	290	185	240	320	215	270	370
300 (6)	L(cm)	90	115	145	105	135	160	115	150	180	135	180	220	160	200	250	180	225	295	200	250	315	220	270	360	230	300	395	250	315	420	285	375	490
	b(cm)	55	70	85	60	80	95	70	90	110	80	110	130	95	120	150	110	130	160	120	150	180	130	160	180	140	180	180	150	180	190	160	180	200
	h(cm)	70	90	110	80	110	130	90	120	145	110	145	175	130	160	200	145	175	215	160	200	240	175	215	290	185	240	305	200	240	335	215	290	390
350 (7)	L(cm)	100	125	150	110	135	180	125	150	200	150	180	230	165	220	270	190	230	300	210	270	340	230	300	380	250	300	410	270	340	460	300	400	535
	b(cm)	60	75	90	65	80	110	75	90	120	90	110	140	100	130	160	110	140	180	120	160	180	140	180	180	150	180	190	160	180	190	180	180	200
	h(cm)	80	100	120	90	110	145	100	120	160	120	145	185	130	175	215	145	185	240	160	215	270	185	240	305	200	240	330	215	270	370	240	320	415
400 (8)	L(cm)	100	125	160	115	145	180	125	160	200	150	200	240	180	220	275	200	250	310	220	270	360	230	300	405	250	325	440	270	360	490	300	415	565
	b(cm)	60	75	95	70	85	110	75	95	120	90	120	140	110	130	160	120	150	180	130	160	180	140	180	180	150	180	190	160	180	200	180	190	200
	h(cm)	80	100	130	90	110	145	100	130	160	120	160	185	145	175	215	160	200	240	175	215	290	185	240	320	200	255	350	215	290	390	240	330	450

K : C1/32
L : C1/16
N : C1/8

EXAMPLE : 5L2
5 : PIPE DIAMETER
L : ELBOW
2 : PRESSURE

(TABLE: 3)

NOTES

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SECURITY FACTOR	1.5
SOIL INTERNAL FRICTION ANGLE	25°
SOIL COHESION	500kg/m²
SOIL FRICTION ANGLE	17°

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LEBANESE REPUBLIC
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

Expansion and Upgrade of Al-Ghadir Wastewater Treatment Plant Project – Phase I: Design, Build and Operate, Including Sea Outfalls

DAR AL HANDASAH NAZIH TALEB & PARTNERS Founded 1956

ARTELIA

Connection Between Existing & New Sites

Thrust Blocks & Anchors (3 of 3)

DRAWN :	H.I
CHECKED :	S.H
APPROVED :	F.L
DATE :	05 March 2025
SCALE :	1:750
FILE NAME	Con-TBA3-15

PROJECT	DIVISION	SUB-DIVISION	SHEET	REVISION
L2401DS	Con	TBA3	15	0

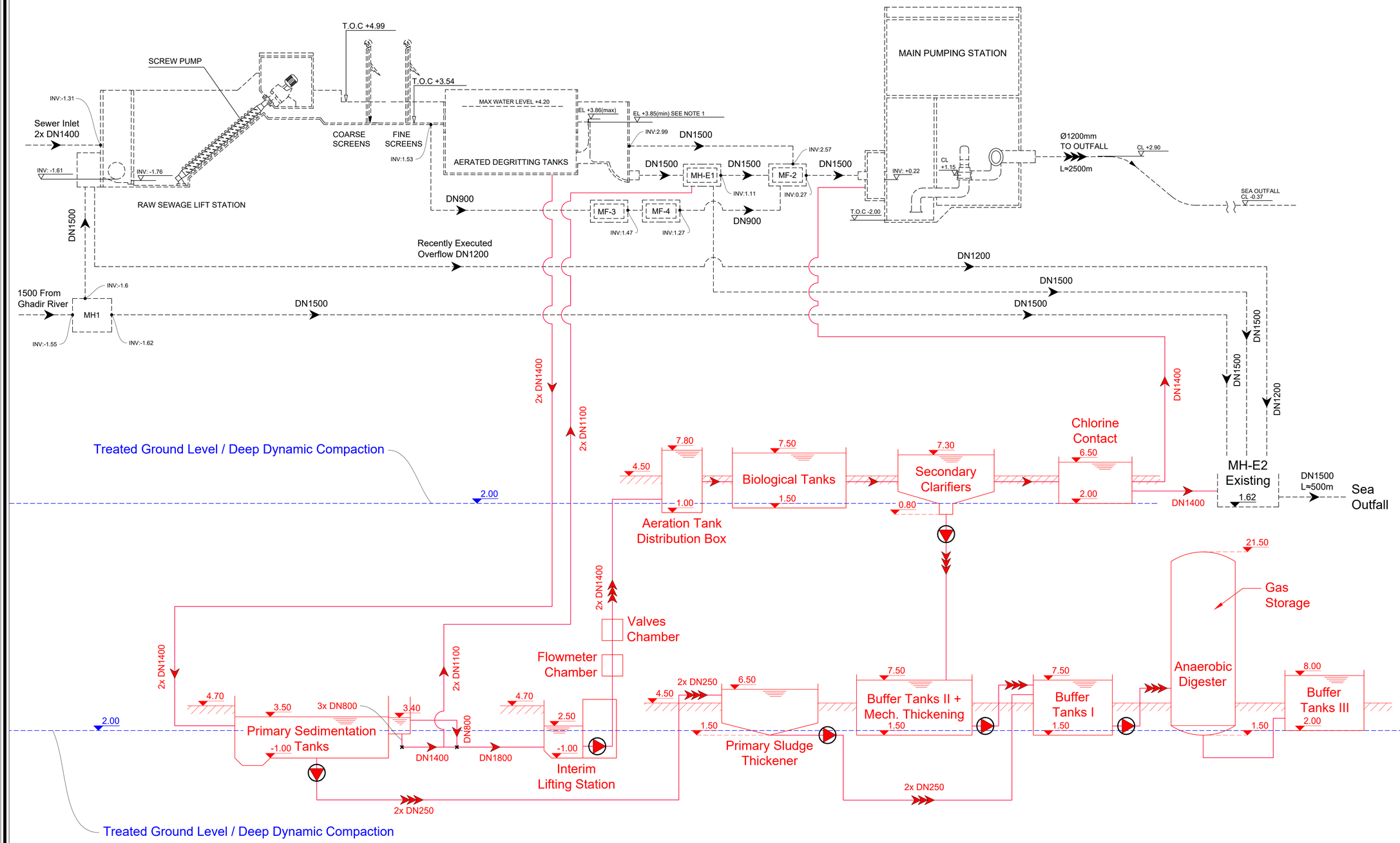
Technical Drawings & Schematics

LEGEND:

Dashed Black : Existing

Red : Proposed

INV : Pipe Invert Level



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Technical Drawings & Schematics

Hydraulic Profile

DRAWN :	H.I
CHECKED :	S.H
APPROVED :	F.L
DATE :	05 March 2025
SCALE :	-
FILE NAME	Sc-HP-01

PROJECT	DIVISION	SUB-DIVISION	SHEET	REVISION
L2401DS	Sc	HP	01	0

OCU I

OCU IV

OCU II

Screening:
- 40mm screens: 5 (existing)
- 6mm screens: 5 (new)

Primary Settling Tanks (PSTs):
- 12 Lamella Tanks
- Tank Surface: ~2,880 m²

Intermediate Lifting Station:
- 12 (+6) dry type pumps
- Pump Capacity: 1,590 m³/h at 15.0 m head

Mixed Liquor Internal Recirculation (IR)

Anoxic Tanks:
- 12 tanks
- Tank volume: 5,187 m³

Aeration Tanks:
- 12 tanks
- Tank volume: 25,662 m³

Secondary Settling Tanks (SSTs):
- 12 circular tanks
(D = 43.0 m)

De-chlorination:
- $NaHSO_3$ solution (38% ww)

Chlorination:
- 3 meandric tanks
- NaOCl solution (15% ww)

Discharge to sea by gravity via the existing emergency outfall (500 m) and/or Existing Main Pumping Station Phase II

Aerated Grit/Scum Removal:
- 5 Tanks (4 existing, 1 new)
- Tank volume: 200 m³

Recirculated Activated Sludge (RAS)

Surplus Activated Sludge (SAS)

Lifting Station:
- 6 (+1) screw pumps (existing) capacity: 0.44 m³/s at 5.3 m
- 6 (+1) screw pumps (new) capacity: 0.44 m³/s at 5.3 m

Mechanical Thickening Unit:
-6 (+1) drum thickeners
- Thickener capacity: 90 m³/h
- Polyelectrolyte preparation & dosing unit

Buffer Tank II: Ø22m

Biogas Steel Tank:
- 1 spherical tank
- Volume: 4,500 m³
(D = 23.0 m)

Anaerobic Digestion:
- 4 circular digesters
(D = 23.5 m)
(2 for Ph I, 2 for Ph 2)
- Digester volume: 8,675 m³

CHP for Energy Recovery:
- 3 CHP engines
(2 for Ph I, 1 for Ph 2)
- Engine's electrical output each: 888 kW

When CHP engines are not in operation:
Enclosed Gas Flaring Station
(1 for Ph I, 1 for Ph 2)

Gravity Thickening:
- 3 circular tanks
(D = 18.0 m)

Buffer Tanks III:
- 2 circular tanks
(1 for Ph I, 1 for Ph II)
(D = 35.0 m)

Buffer Tanks I:
- 2 circular tanks
(1 for Ph I, 1 for Ph II)
(D = 8.0 m)

Sludge Screening:
- 3mm sludge screens: 3

Mechanical Dewatering:
- 5 (+1) Dewatering Centrifuges (3+1 for Ph I, 2 for Ph II)
- Centrifuge capacity: 60 m³/h
- Polyelectrolyte preparation & dosing unit

Sludge Storage Silos:
(2 for Ph I, 2 for Ph II)
(L=10m, W=7.5m)

Final Disposal
(e.g. composting, land application, incineration, etc)

Phase I.a Discharge Route

Phase I.b Discharge Route

Discharge to the sea via the existing long sea outfall (2,500 m)
Phase I

Existing Pumping Station (Upgraded):
- 3 (+1) dry type pumps
- Pump Capacity: 4,680 m³/h at 35.0 m head

OCU III

LEGEND:
Dashed Black : Existing
Green : Phase I
Blue : Phase I + II
Red : Phase II
OCU : Odor Control Unit

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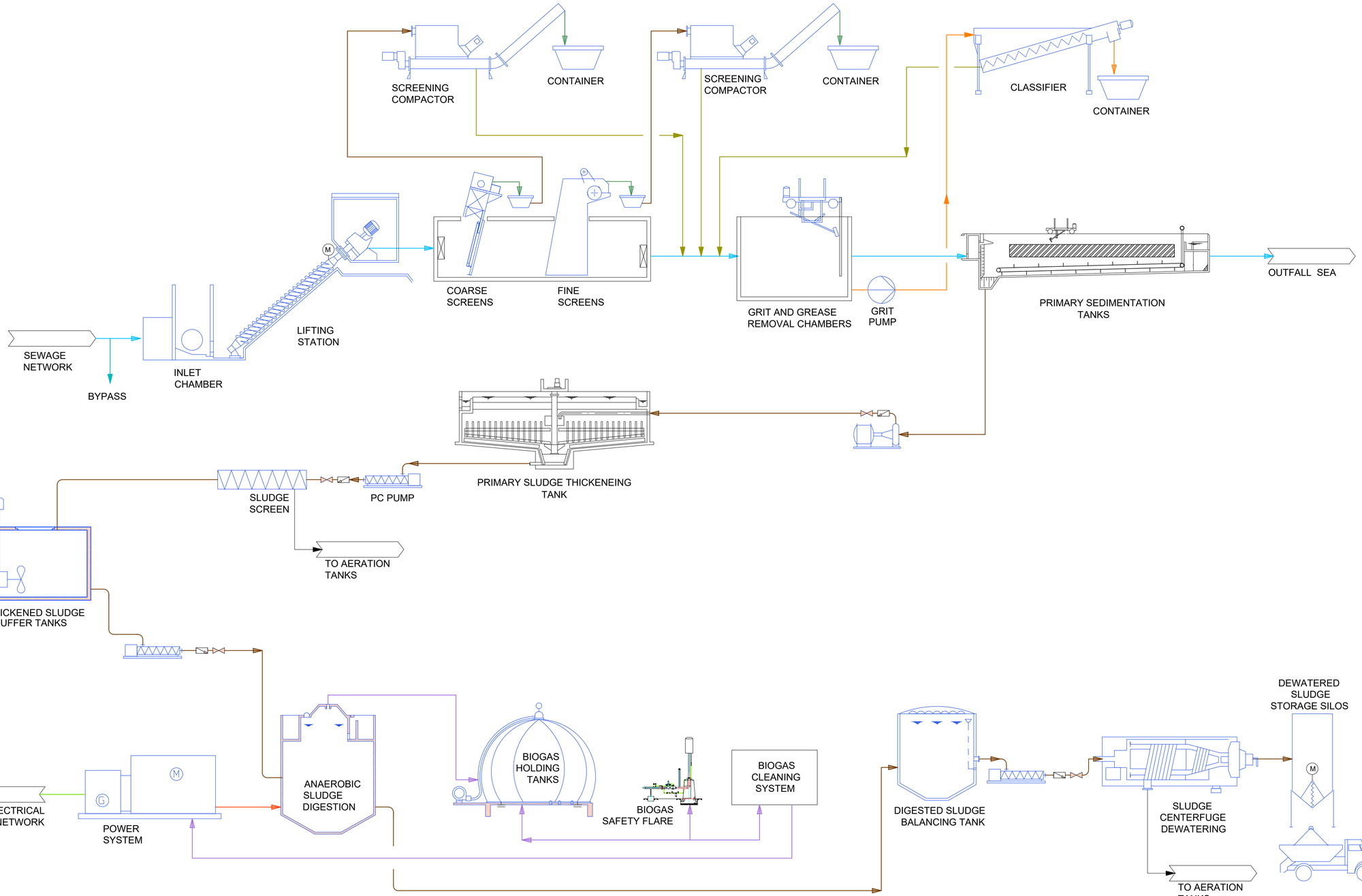
ARTELIA

Technical Drawings & Schematics

Process Flow Diagram

DRAWN :	H.J
CHECKED :	S.H
APPROVED :	F.L
DATE :	05 March 2025
SCALE :	–
FILE NAME	Sc-PF-02

PROJECT	DIVISION	SUB-DIVISION	SHEET	REVISION
L2401DS	Sc	PF	02	0



LEGEND:

- Water line
- Sludge line
- Greases
- Grit
- Backflows
- By-pass
- Supernantant
- Centrate
- Waste
- Electrical
- Heat
- Biogas
- Air
- Chemical

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Expansion and Upgrade of Al-Ghadir Wastewater Treatment Plant Project – Phase I: Design, Build and Operate, Including Sea Outfalls

DAR AL HANDASAH NAZIH TALEB & PARTNERS Founded 1956

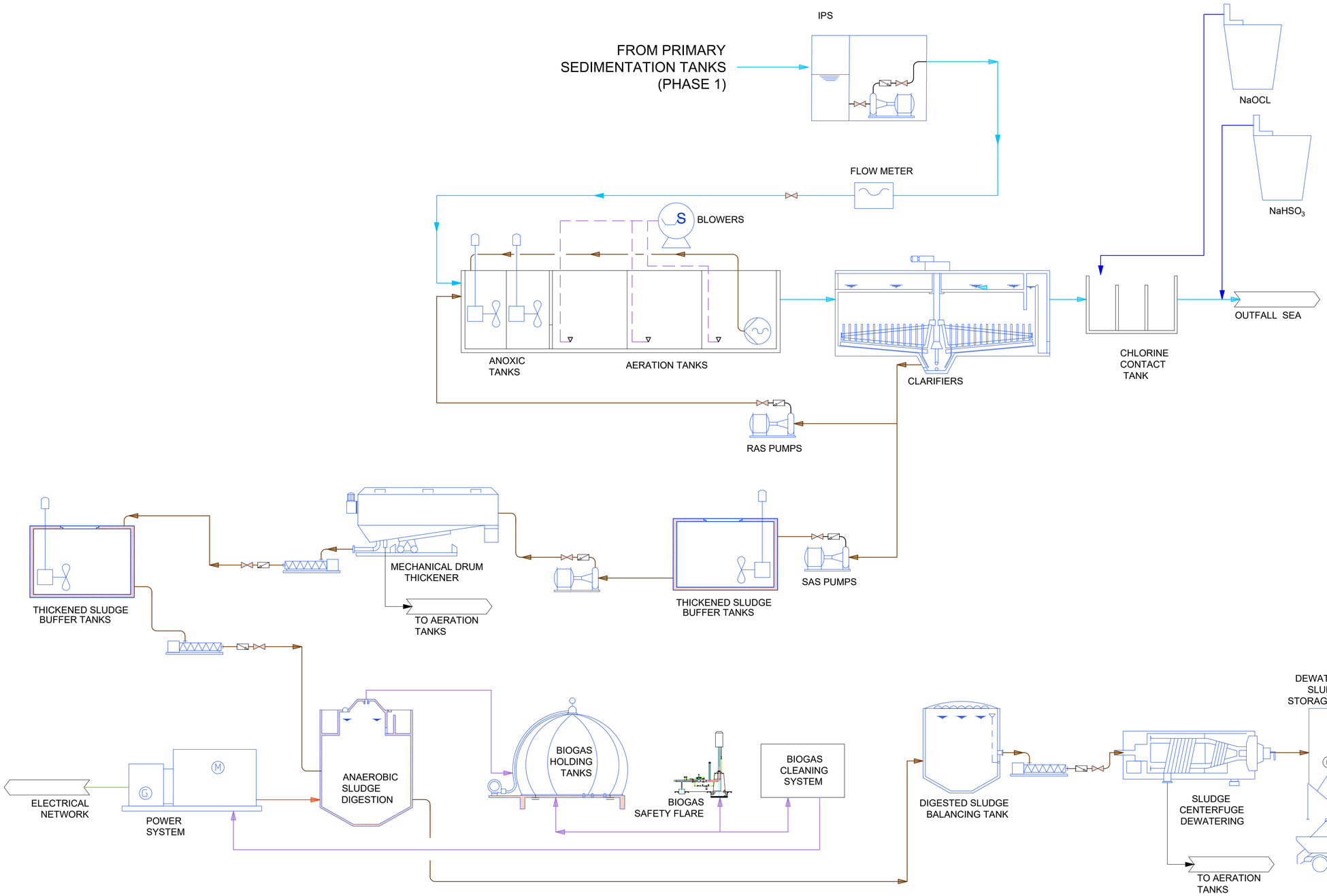
ARTELIA

Technical Drawings & Schematics

Process & Instrumentation Diagram - Phase 1 -

DRAWN :	H.I
CHECKED :	S.H
APPROVED :	F.L
DATE :	05 March 2025
SCALE :	-
FILE NAME	Sc-PID1-03

PROJECT	DIVISION	SUB-DIVISION	SHEET	REVISION
L2401DS	Sc	PID1	03	0



LEGEND:

- Water line
- Sludge line
- Greases
- Grit
- Backflows
- By-pass
- Supernantant
- Centrate
- Waste
- Electrical
- Heat
- Biogas
- Air
- Chemical

LEBANESE REPUBLIC
COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

Expansion and Upgrade of Al-Ghadir Wastewater Treatment Plant Project – Phase I: Design, Build and Operate, Including Sea Outfalls

DAR AL HANDASAH
NAZIH TALEB & PARTNERS
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Technical Drawings & Schematics

Process & Instrumentation Diagram - Phase 2 -

DRAWN :	H.I
CHECKED :	S.H
APPROVED :	F.L
DATE :	05 March 2025
SCALE :	-
FILE NAME	
Sc-PID2-04	

PROJECT	DIVISION	SUB-DIVISION	SHEET	REVISION
L2401DS	Sc	PID2	04	0