

資料 7.9

配水管網計算

1 配水管網計算

配水管網の水理計算は、EPANET ver2.0 を用い、下記条件で行った。

- ・ 管路の流量公式：ヘーゼン・ウィリアムズ式
- ・ 流速係数：110
- ・ 最小残存水圧：時間最大時 50kPa 以上、消火時 0kPa 以上(負圧とならないこと)
- ・ 時間係数：1.30
- ・ 消火時の条件：各系統において最も条件が悪い(負圧発生が考えられる)と想定される消火栓予定地で単口消火栓(0.5m³/min)1 栓分を流水

既存施設から配水される区域と新規施設から配水される区域それぞれにおいて時間最大配水量時、消火時において最少残存水圧を確保できるように計画する。配水管網モデル、管網計算データおよび計算結果を以下に示す。

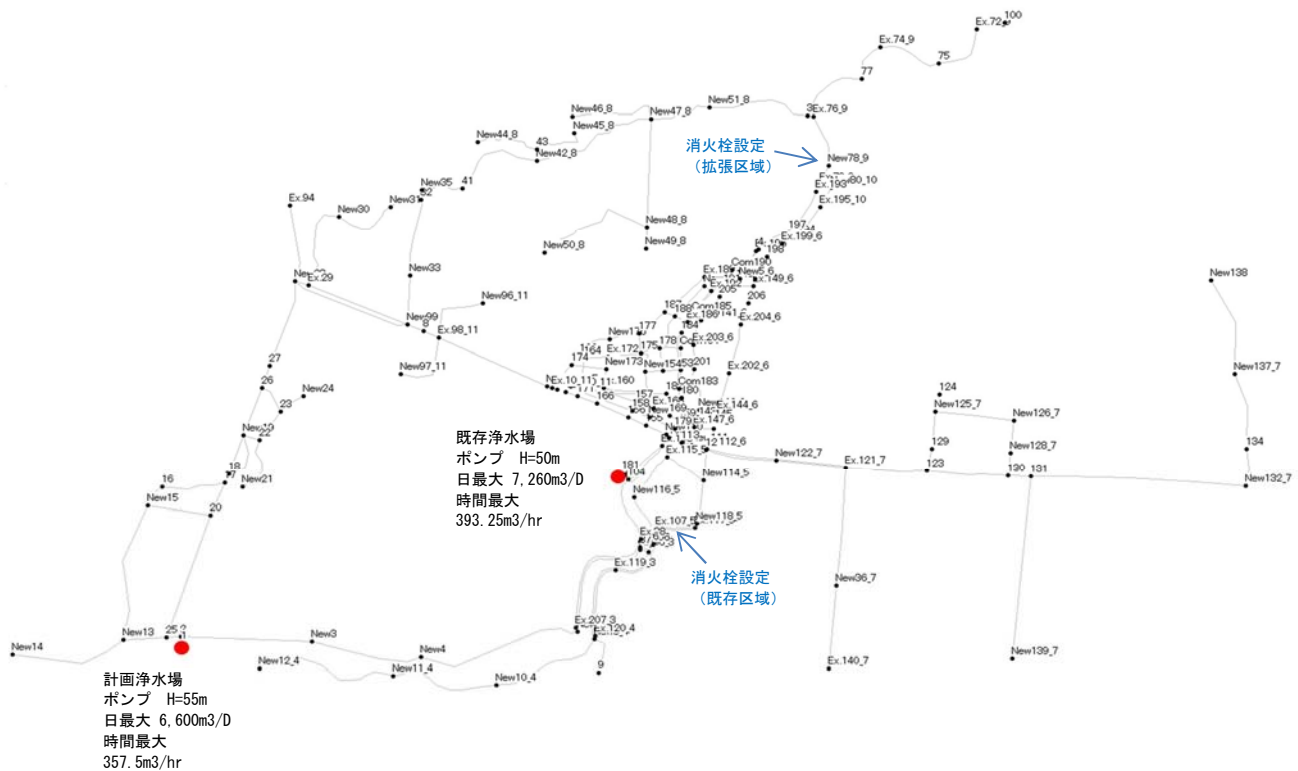


図 4 配水管網モデル

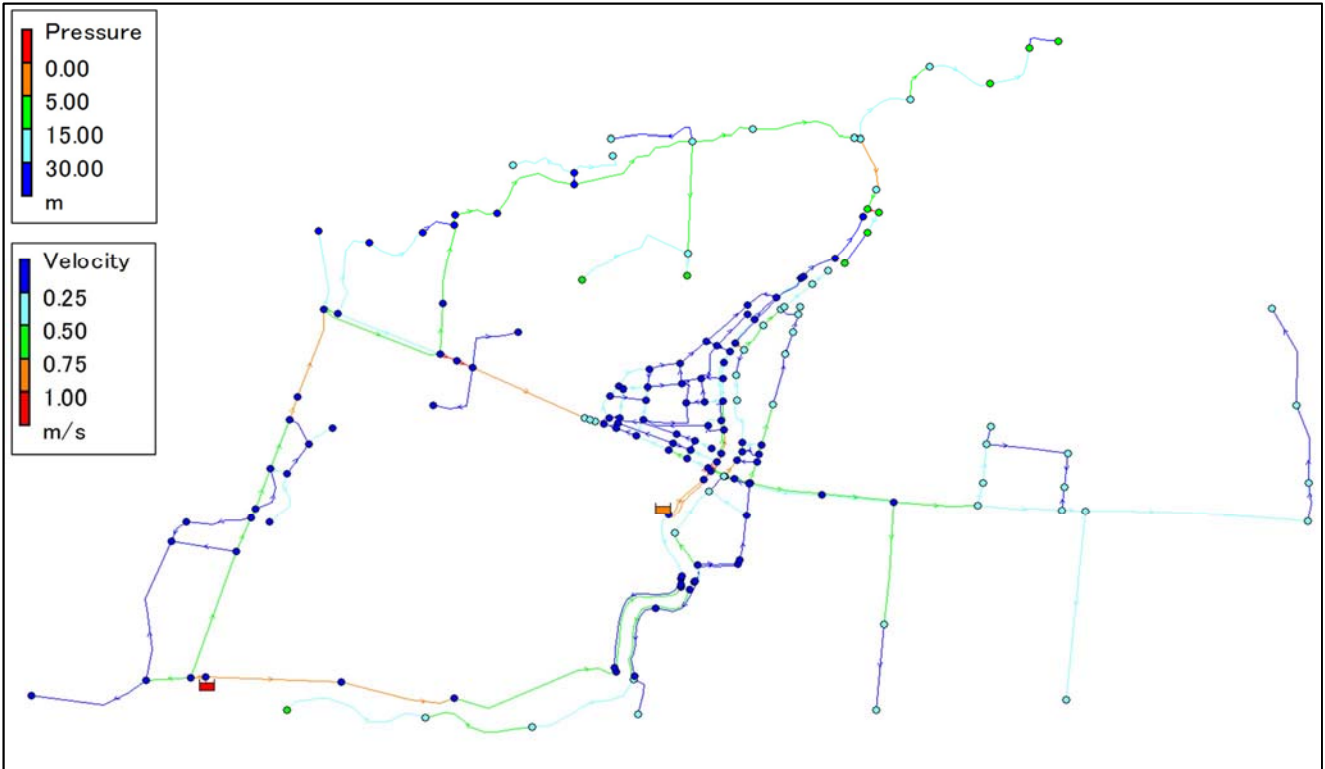


圖 5 管網計算結果 (時間最大配水量時)

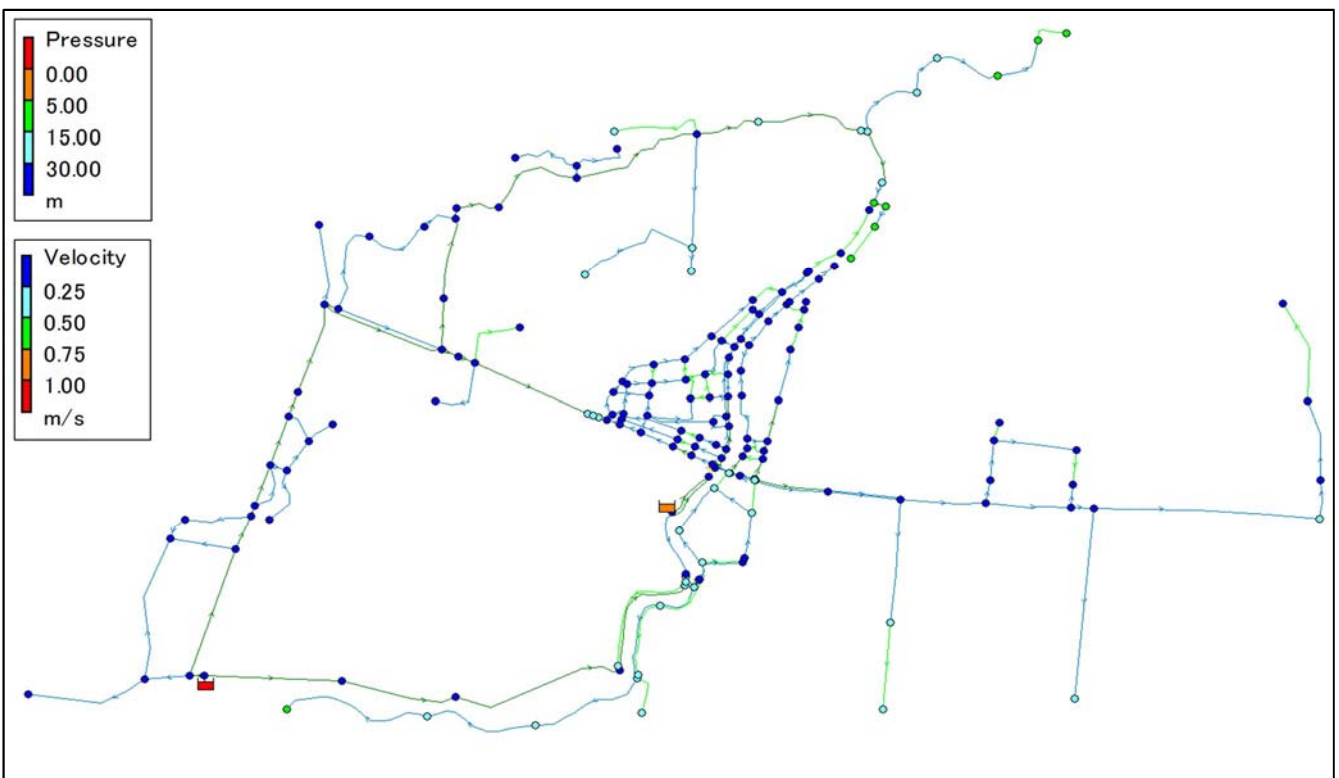


圖 6 管網計算結果 (消火時)

管網計算データおよび計算結果（交点） -1

NodeID	Elevation m	Peak Demand		Extinction Demand	
		Demand LPS	Pressure m	Demand LPS	Pressure m
2	18.2	0.00	49.53	0.00	49.56
New3	17.8	1.43	44.95	1.10	44.04
New4	17.6	2.76	41.34	2.12	39.55
New5_3	17.1	0.39	37.32	0.30	34.07
New6_3	17.9	0.39	33.24	0.30	28.87
7	17.9	0.00	32.92	0.00	28.44
New8_4	17.2	3.18	28.08	2.45	25.73
9	17.0	0.00	28.28	0.00	25.93
New10_4	17.5	1.51	25.54	1.16	24.05
New11_4	17.3	3.20	16.38	2.46	18.50
New12_4	17.5	1.48	10.18	1.14	14.61
New13	19.8	2.02	44.78	1.55	45.85
New14	20.0	1.05	42.01	0.81	44.07
New15	16.6	2.30	45.67	1.77	47.26
16	16.6	0.00	46.09	0.00	47.46
17	16.7	0.00	47.09	0.00	47.90
18	16.9	0.00	46.68	0.00	47.53
New19	16.6	1.18	46.13	0.91	47.15
20	17.4	0.00	47.13	0.00	47.80
New21	16.0	0.53	42.41	0.41	45.02
22	15.9	0.00	45.18	0.00	46.76
23	15.9	0.00	44.69	0.00	46.41
New24	15.5	0.75	42.69	0.58	45.33
25	18.6	0.00	48.67	0.00	48.79
26	16.5	0.00	45.26	0.00	46.46
27	15.5	0.00	45.30	0.00	46.67
New28	17.1	2.46	40.11	1.89	42.14
Ex. 29	17.7	1.34	38.70	1.03	40.87
New30	15.5	0.53	36.82	0.41	39.32
New31	15.0	1.90	35.22	1.46	37.74
32	14.5	0.00	35.60	0.00	37.98
New33	14.7	0.19	37.86	0.15	40.35
New35	14.7	2.39	35.06	1.84	37.42
41	14.7	0.00	33.87	0.00	36.10
New42_8	13.6	1.37	32.26	1.05	34.19
43	13.5	0.00	32.10	0.00	34.13
New44_8	13.5	0.53	29.14	0.41	32.30
New45_8	13.5	0.53	29.75	0.41	32.68
New46_8	14.0	0.53	28.21	0.41	29.85
New47_8	14.0	1.94	28.79	1.49	30.21
New48_8	13.9	1.05	16.74	0.81	22.83
New49_8	14.0	0.95	13.71	0.73	20.93
New50_8	14.0	0.53	11.13	0.41	19.35
New51_8	13.5	1.38	26.25	1.06	26.71
Ex. 72_9	14.5	3.67	9.63	2.82	12.55
Ex. 74_9	14.4	0.82	16.56	0.63	16.86
75	14.1	0.00	13.33	0.00	14.98
Ex. 76_9	14.8	1.75	20.28	9.68	18.99
77	14.2	0.00	20.08	0.00	19.10
New78_9	15.0	2.82	15.38	2.17	15.90
Ex. 79_9	15.2	1.33	13.98	1.02	14.96

管網計算データおよび計算結果（交点） -2

NodeID	Elevation m	Peak Demand		Extinction Demand	
		Demand LPS	Pressure m	Demand LPS	Pressure m
New80_10	16.6	6.19	8.78	4.76	11.22
Ex. 94	16.1	0.92	31.16	0.71	37.02
New95_11	16.5	2.74	18.50	2.11	28.42
New96_11	14.5	0.25	33.40	0.19	38.36
New97_11	15.0	0.66	31.47	0.51	36.98
Ex. 98_11	16.8	3.81	31.20	2.93	36.12
New99	15.6	6.97	38.53	5.36	41.09
100	13.7	0.00	10.43	0.00	13.35
104	16.5	0.00	44.53	0.00	44.90
105	17.9	0.00	33.11	0.00	28.72
106	17.9	0.00	32.85	0.00	28.27
Ex. 107_5	16.9	1.25	33.67	9.29	28.78
Ex. 108	17.7	3.00	40.69	2.31	42.08
109	17.8	0.00	37.63	0.00	40.16
New110	16.7	0.19	36.11	0.15	39.65
New111	18.2	0.39	33.82	0.30	37.66
Ex. 112_6	18.2	0.68	33.41	0.52	37.41
113	18.2	0.00	33.15	0.00	37.25
New114_5	15.5	0.98	34.05	0.75	29.56
Ex. 115_5	17.7	2.46	25.74	1.89	23.60
New116_5	16.2	1.21	29.47	0.93	26.47
Ex. 117_5	15.4	2.87	35.03	2.21	30.20
New118_5	15.4	0.44	34.92	0.34	30.13
Ex. 119_3	16.9	0.73	33.58	0.56	29.10
Ex. 120_4	17.2	0.23	33.26	0.18	28.79
Ex. 121_7	16.4	3.13	30.42	2.41	36.26
New122_7	15.7	1.75	33.28	1.35	38.29
123	16.2	0.00	27.97	0.00	34.83
124	14.0	0.00	28.85	0.00	36.22
New125_7	14.5	0.95	28.35	0.73	35.72
New126_7	15.3	1.03	26.93	0.79	34.54
New128_7	15.8	1.77	26.41	1.36	34.03
129	15.1	0.00	28.57	0.00	35.63
130	16.9	0.00	25.55	0.00	33.07
131	17.0	0.00	25.12	0.00	32.77
New132_7	19.6	0.68	20.05	0.52	28.65
134	17.8	0.00	21.47	0.00	30.22
New137_7	16.8	0.83	21.69	0.64	30.74
New138	15.6	0.64	22.68	0.49	31.81
New139_7	18.4	5.01	21.25	3.85	29.85
Ex. 140_7	18.5	0.43	18.92	0.33	28.38
New141_6	15.6	0.47	29.99	0.36	36.31
New142_6	15.6	0.86	31.82	0.66	37.43
143	15.6	0.00	32.43	0.00	37.80
Ex. 144_6	14.8	1.20	31.83	0.92	37.75
145	14.6	0.00	33.28	0.00	38.72
146	14.9	0.00	33.89	0.00	38.98
Ex. 147_6	15.6	1.88	33.08	1.45	38.21
148	16.2	0.00	25.28	0.00	33.18
Ex. 149_6	14.2	0.53	27.27	0.41	35.17
150	14.2	0.00	27.27	0.00	35.17

管網計算データおよび計算結果 (交点) -3

NodeID	Elevation m	Peak Demand		Extinction Demand	
		Demand LPS	Pressure m	Demand LPS	Pressure m
Com151	15.5	5.82	32.36	4.48	37.80
152	16.0	0.00	32.33	0.00	37.59
Ex. 153	16.0	4.64	31.91	3.57	37.33
New154	15.0	1.75	32.89	1.35	38.32
155	16.5	0.00	36.14	0.00	39.74
156	16.4	0.00	34.72	0.00	38.91
157	15.5	0.00	34.62	0.00	39.19
158	16.0	0.00	34.42	0.00	38.88
159	16.2	0.00	34.53	0.00	38.87
Ex. 160	16.3	1.77	32.68	1.36	37.69
161	16.5	0.00	33.13	0.00	37.89
162	15.5	0.00	33.16	0.00	38.30
163	15.3	0.00	34.25	0.00	39.04
164	15.5	0.00	33.26	0.00	38.35
165	16.0	0.00	33.62	0.00	38.38
166	16.5	0.00	33.46	0.00	38.09
New167	16.4	1.82	34.01	1.40	38.47
Ex. 168	15.6	5.59	34.54	4.30	39.10
169	16.0	0.00	34.51	0.00	38.93
170	16.0	0.00	33.73	0.00	38.45
171	16.5	0.00	33.23	0.00	37.95
Ex. 172	16.0	4.13	32.04	3.18	37.41
New173	16.0	2.04	32.37	1.57	37.61
174	15.3	0.00	33.57	0.00	38.62
175	14.6	0.00	33.26	0.00	38.70
New176	16.2	1.66	31.87	1.28	37.23
177	14.6	0.00	33.24	0.00	38.69
178	14.6	0.00	33.26	0.00	38.70
179	16.2	0.00	35.32	0.00	39.35
180	16.2	0.00	33.32	0.00	38.12
182	16.0	0.00	33.32	0.00	38.20
Com183	16.2	5.82	32.33	4.48	37.51
184	15.5	0.00	32.16	0.00	37.68
Com185	16.0	5.82	31.21	4.48	36.90
Ex. 186	15.6	3.00	31.81	2.31	37.42
187	14.1	0.00	33.40	0.00	38.98
188	14.5	0.00	32.97	0.00	38.56
Ex. 189	14.1	2.08	32.49	1.60	38.42
Com190	15.3	8.58	31.30	6.60	37.23
New191	15.0	0.39	32.26	0.30	37.93
Ex. 192	15.3	1.86	31.52	1.43	37.36
Ex. 193	15.0	1.05	31.96	0.81	37.75
194	16.0	0.00	8.32	0.00	11.17
Ex. 195_10	15.9	3.37	8.42	2.59	11.27
Ex. 196	15.1	0.62	31.93	0.48	37.69
197	14.9	0.00	32.10	0.00	37.87
198	15.8	0.00	24.80	0.00	33.04
Ex. 199_6	15.8	1.99	24.45	1.53	32.82
Com200_11	16.5	7.83	17.92	6.02	28.07
201	16.4	0.00	29.63	0.00	35.78
Ex. 202_6	14.2	3.21	28.14	2.47	35.71

管網計算データおよび計算結果（交点） -4

NodeID	Elevation m	Peak Demand		Extinction Demand	
		Demand LPS	Pressure m	Demand LPS	Pressure m
Ex. 203_6	16.5	4.22	28.79	3.25	35.22
Ex. 204_6	14.0	1.70	27.49	1.31	35.38
205	16.0	0.00	27.31	0.00	34.50
206	14.0	0.00	27.48	0.00	35.38
Ex. 207_3	17.1	0.82	33.47	0.63	29.25
New36_7	18.5	3.98	19.01	3.06	28.44
37	17.9	0.00	33.13	0.00	28.73
Ex. 38	17.9	2.94	40.67	2.26	41.99
3	14.8	0.00	20.53	0.00	19.33
4	15.1	0.00	31.93	0.00	37.69
New5_6	16.2	2.11	25.03	1.62	33.02
6	0.0	0.00	50.57	0.00	45.68
Ex. 10_11	16.5	4.89	18.09	3.76	28.17
8	16.1	0.00	34.94	0.00	38.69
10	18.2	0.00	33.36	0.00	37.38
11	18.2	0.00	25.24	0.00	23.10
12	18.2	0.00	31.35	0.00	26.86

管網計算データおよび計算結果 (管路) -1

LinkID	Node1 (Junction)	Node2 (Junction)	Diameter mm	Length m	Rough ness	Peak Demand		Extinction Demand	
						Flow LPS	Velocity m/s	Flow LPS	Velocity m/s
Pipe 1	1	2	400	131	111	98.80	0.79	92.67	0.74
Pipe 2	2	New3	200	1,783	150	25.32	0.81	27.81	0.89
Pipe 3	New3	New4	200	1,520	150	23.89	0.76	26.71	0.85
Pipe 4	New4	New5_3	200	2,263	150	21.14	0.67	24.59	0.78
Pipe 5	25	2	350	200	111	-73.48	0.76	-64.85	0.67
Pipe 6	25	New13	100	582	111	3.97	0.51	3.14	0.40
Pipe 7	New13	New14	75	1,602	111	1.05	0.24	0.81	0.18
Pipe 8	New13	New15	75	1,928	111	0.90	0.20	0.78	0.18
Pipe 9	New15	16	75	328	111	-0.93	0.21	-0.63	0.14
Pipe 10	16	17	75	870	111	-0.93	0.21	-0.63	0.14
Pipe 11	17	20	350	489	130	-69.03	0.72	-61.35	0.64
Pipe 12	20	25	350	1,769	130	-69.51	0.72	-61.71	0.64
Pipe 13	New15	20	50	859	111	-0.47	0.24	-0.36	0.18
Pipe 14	17	18	350	139	130	68.11	0.71	60.72	0.63
Pipe 15	18	New19	350	575	130	67.80	0.70	60.45	0.63
Pipe 16	New19	26	350	688	130	66.11	0.69	59.17	0.61
Pipe 17	26	27	300	327	130	65.64	0.93	58.82	0.83
Pipe 18	26	23	50	442	111	0.47	0.24	0.34	0.18
Pipe 19	23	New24	50	386	111	0.75	0.38	0.58	0.30
Pipe 20	23	22	50	484	111	-0.28	0.14	-0.24	0.12
Pipe 21	New19	22	50	231	111	0.81	0.41	0.65	0.33
Pipe 22	22	New21	50	815	111	0.53	0.27	0.41	0.21
Pipe 23	18	New19	50	702	111	0.31	0.16	0.28	0.14
Pipe 24	27	New28	300	1,217	130	65.64	0.93	58.82	0.83
Pipe 25	New28	Ex. 29	150	189	110	11.01	0.62	9.94	0.56
Pipe 26	New28	Ex. 94	50	1,081	110	0.92	0.47	0.71	0.36
Pipe 27	Ex. 29	New30	100	1,257	111	3.28	0.42	3.14	0.40
Pipe 28	New30	New31	100	899	111	2.75	0.35	2.73	0.35
Pipe 29	32	New33	250	1,073	111	-30.30	0.62	-31.02	0.63
Pipe 30	Ex. 29	New99	150	1,445	110	6.39	0.36	5.77	0.33
Pipe 32	Ex. 98_11	New95_11	150	1,611	110	15.46	0.87	11.89	0.67
Pipe 33	Ex. 98_11	New96_11	75	942	111	0.25	0.06	0.19	0.04
Pipe 34	Ex. 98_11	New97_11	63	946	110	0.66	0.21	0.51	0.16
Pipe 41	New35	32	250	140	111	-31.15	0.63	-32.29	0.66
Pipe 42	New31	32	100	471	111	0.85	0.11	1.27	0.16
Pipe 43	New35	41	250	571	111	28.76	0.59	30.45	0.62
Pipe 44	41	New42_8	250	1,302	111	28.76	0.59	30.45	0.62
Pipe 45	New42_8	43	75	158	111	1.07	0.24	0.82	0.19
Pipe 46	New44_8	43	50	905	111	-0.53	0.27	-0.41	0.21
Pipe 47	43	New45_8	50	719	111	0.53	0.27	0.41	0.21
Pipe 48	New42_8	New47_8	250	1,739	111	26.33	0.54	28.58	0.58
Pipe 49	New46_8	New47_8	75	1,276	111	-0.53	0.12	-0.41	0.09
Pipe 50	New47_8	New48_8	75	1,489	111	2.54	0.57	1.95	0.44
Pipe 51	New48_8	New49_8	50	307	111	0.95	0.48	0.73	0.37
Pipe 52	New50_8	New48_8	50	1,679	111	-0.53	0.27	-0.41	0.21
Pipe 53	New47_8	New51_8	200	856	111	21.32	0.68	24.73	0.79
Pipe 55	Ex. 76_9	New78_9	150	728	110	13.70	0.78	10.54	0.60
Pipe 82	100	Ex. 72_9	100	489	110	0.00	0.00	0.00	0.00
Pipe 83	Ex. 72_9	75	100	815	110	-3.67	0.47	-2.82	0.36
Pipe 86	Ex. 74_9	75	100	872	110	3.67	0.47	2.82	0.36
Pipe 87	77	Ex. 74_9	100	564	110	4.49	0.57	3.45	0.44

管網計算データおよび計算結果 (管路) -2

LinkID	Node1 (Junction)	Node2 (Junction)	Diameter mm	Length m	Rough ness	Peak Demand		Extinction Demand	
						Flow LPS	Velocity m/s	Flow LPS	Velocity m/s
Pipe 88	Ex. 76_9	77	150	983	110	4.49	0.25	3.45	0.20
Pipe 101	New5_3	New6_3	200	1,701	150	20.75	0.66	24.29	0.77
Pipe 102	New6_3	7	200	127	111	17.53	0.56	20.72	0.66
Pipe 103	7	New8_4	150	1,764	111	9.37	0.53	7.21	0.41
Pipe 104	New8_4	9	50	552	111	0.00	0.00	0.00	0.00
Pipe 105	New8_4	New10_4	150	1,538	111	6.19	0.35	4.76	0.27
Pipe 106	New10_4	New11_4	100	1,495	111	4.68	0.60	3.60	0.46
Pipe 107	New11_4	New12_4	75	1,987	111	1.48	0.34	1.14	0.26
Pipe 109	104	Ex. 108	250	681	110	39.90	0.81	30.69	0.63
Pipe 110	Ex. 108	109	250	144	110	98.10	2.00	75.46	1.54
Pipe 111	Ex. 108	104	300	749	110	-61.20	0.87	-47.08	0.67
Pipe 112	New110	109	250	128	110	-98.10	2.00	-75.46	1.54
Pipe 113	New110	New111	250	380	110	28.54	0.58	21.96	0.45
Pipe 114	New110	113	100	247	110	4.49	0.57	3.45	0.44
Pipe 116	Ex. 115_5	New114_5	50	593	110	-0.98	0.50	-0.75	0.38
Pipe 118	New111	Ex. 112_6	250	201	110	28.15	0.57	21.66	0.44
Pipe 119	Ex. 115_5	New116_5	75	731	110	-1.48	0.33	-1.14	0.26
Pipe 120	New116_5	Ex. 107_5	75	530	110	-2.69	0.61	-2.07	0.47
Pipe 121	Ex. 107_5	Ex. 117_5	50	530	110	0.13	0.07	0.10	0.05
Pipe 122	Ex. 117_5	New118_5	100	58	110	2.40	0.31	1.84	0.23
Pipe 123	New118_5	New114_5	100	610	110	1.96	0.25	1.50	0.19
Pipe 127	Ex. 119_3	106	100	799	110	-0.96	0.12	-0.74	0.09
Pipe 128	Ex. 120_4	Ex. 119_3	100	1,062	110	-0.23	0.03	-0.18	0.02
Pipe 130	New122_7	Ex. 121_7	150	944	110	7.83	0.44	6.02	0.34
Pipe 132	Ex. 121_7	123	150	1,111	150	10.89	0.62	8.38	0.47
Pipe 134	123	130	150	1,111	150	8.66	0.49	6.66	0.38
Pipe 135	130	131	150	302	150	7.15	0.40	5.50	0.31
Pipe 136	131	New132_7	100	2,922	150	2.14	0.27	1.65	0.21
Pipe 138	131	New139_7	150	2,517	111	5.01	0.28	3.85	0.22
Pipe 139	130	New128_7	100	308	111	1.51	0.19	1.16	0.15
Pipe 140	New128_7	New126_7	100	457	111	-0.26	0.03	-0.20	0.03
Pipe 142	124	New125_7	100	242	111	0.00	0.00	0.00	0.00
Pipe 143	New125_7	129	100	518	111	-2.24	0.29	-1.72	0.22
Pipe 146	New125_7	New126_7	100	1,076	111	1.29	0.16	0.99	0.13
Pipe 148	134	New132_7	100	522	111	-1.47	0.19	-1.13	0.14
Pipe 149	134	New137_7	100	1,064	111	1.47	0.19	1.13	0.14
Pipe 151	New138	New137_7	100	1,368	111	-0.64	0.08	-0.49	0.06
Pipe 152	Ex. 112_6	146	100	295	110	5.83	0.74	4.48	0.57
Pipe 153	146	145	100	101	110	5.65	0.72	4.35	0.55
Pipe 154	145	Ex. 144_6	100	130	110	5.85	0.75	4.50	0.57
Pipe 156	Ex. 149_6	150	100	101	110	0.00	0.00	0.00	0.00
Pipe 157	148	Ex. 149_6	100	253	110	0.29	0.04	0.22	0.03
Pipe 160	New142_6	143	100	125	110	-4.04	0.51	-3.11	0.40
Pipe 161	143	Ex. 147_6	100	124	110	-4.24	0.54	-3.26	0.42
Pipe 162	Ex. 147_6	113	100	269	110	-5.95	0.76	-4.58	0.58
Pipe 163	New142_6	Ex. 144_6	50	264	110	0.50	0.26	0.39	0.20
Pipe 164	143	145	50	263	110	0.20	0.10	0.15	0.08
Pipe 165	Ex. 147_6	146	50	264	110	-0.17	0.09	-0.13	0.07
Pipe 166	113	Ex. 112_6	100	343	110	-1.46	0.19	-1.13	0.14
Pipe 167	New154	Ex. 153	150	245	110	-1.50	0.09	-1.16	0.07
Pipe 168	Ex. 153	152	150	235	110	-6.80	0.38	-5.23	0.30

管網計算データおよび計算結果 (管路) -3

LinkID	Node1 (Junction)	Node2 (Junction)	Diameter mm	Length m	Rough ness	Peak Demand		Extinction Demand	
						Flow LPS	Velocity m/s	Flow LPS	Velocity m/s
Pipe 169	164	165	100	388	110	-2.65	0.34	-2.04	0.26
Pipe 170	161	163	150	118	110	3.90	0.22	3.00	0.17
Pipe 171	163	165	150	142	110	-3.37	0.19	-2.59	0.15
Pipe 172	165	157	150	805	110	-3.88	0.22	-2.98	0.17
Pipe 173	Ex. 160	166	100	230	110	-3.77	0.48	-2.90	0.37
Pipe 175	166	156	150	465	110	-8.18	0.46	-6.29	0.36
Pipe 176	156	155	150	263	110	-12.90	0.73	-9.92	0.56
Pipe 177	155	New110	250	299	110	-14.27	0.29	-10.98	0.22
Pipe 178	156	158	100	108	110	4.72	0.60	3.63	0.46
Pipe 179	158	157	100	129	110	2.74	0.35	2.10	0.27
Pipe 180	157	Ex. 168	150	256	110	-1.14	0.06	-0.88	0.05
Pipe 181	Ex. 168	169	150	239	110	-6.32	0.36	-4.87	0.28
Pipe 182	169	159	150	146	110	-6.32	0.36	-4.87	0.28
Pipe 184	155	New167	50	116	110	1.37	0.70	1.06	0.54
Pipe 185	New167	Ex. 168	50	136	110	0.41	0.21	0.31	0.16
Pipe 186	158	New167	100	248	110	0.35	0.04	0.27	0.03
Pipe 187	161	171	150	174	110	-3.90	0.22	-3.00	0.17
Pipe 188	171	166	150	288	110	-4.41	0.25	-3.39	0.19
Pipe 189	162	174	150	177	110	-5.48	0.31	-4.21	0.24
Pipe 190	174	163	150	340	110	-7.27	0.41	-5.59	0.32
Pipe 191	174	New173	100	470	110	1.79	0.23	1.38	0.18
Pipe 192	164	Ex. 172	100	323	110	2.65	0.34	2.04	0.26
Pipe 193	Ex. 172	175	100	444	110	1.07	0.14	0.82	0.10
Pipe 194	Ex. 172	New173	100	167	110	-2.46	0.31	-1.89	0.24
Pipe 195	New173	Ex. 160	100	265	110	-2.71	0.35	-2.09	0.27
Pipe 196	New176	162	150	498	110	-5.48	0.31	-4.21	0.24
Pipe 197	New176	Ex. 172	50	241	110	0.09	0.05	0.07	0.04
Pipe 198	177	175	100	265	110	-0.49	0.06	-0.38	0.05
Pipe 199	New176	177	150	411	110	3.73	0.21	2.87	0.16
Pipe 201	Ex. 160	New154	50	853	110	0.32	0.16	0.25	0.12
Pipe 202	175	178	200	265	110	0.64	0.02	0.49	0.02
Pipe 203	178	Com151	200	292	110	-0.10	0.00	-0.08	0.00
Pipe 204	178	Ex. 153	100	312	110	-0.65	0.08	-0.50	0.06
Pipe 205	175	New154	50	338	110	-0.07	0.03	-0.05	0.03
Pipe 206	Com151	152	250	296	110	-24.49	0.50	-18.84	0.38
Pipe 207	New167	179	50	381	110	-0.50	0.26	-0.38	0.19
Pipe 208	New110	179	250	214	110	50.60	1.03	38.92	0.79
Pipe 209	179	159	250	134	110	50.10	1.02	38.54	0.79
Pipe 210	Ex. 160	182	100	866	110	-1.03	0.13	-0.79	0.10
Pipe 211	182	180	150	270	110	-4.27	0.24	-3.28	0.19
Pipe 212	159	180	250	316	110	39.69	0.81	30.53	0.62
Pipe 213	180	152	250	383	110	35.43	0.72	27.25	0.56
Pipe 214	182	Com183	100	244	110	3.24	0.41	2.49	0.32
Pipe 215	152	Com183	100	268	110	-1.49	0.19	-1.15	0.15
Pipe 216	Com183	159	100	446	110	-4.08	0.52	-3.14	0.40
Pipe 217	177	187	150	458	110	4.22	0.24	3.25	0.18
Pipe 219	184	Com151	250	216	110	-18.57	0.38	-14.28	0.29
Pipe 220	184	152	150	537	110	-5.63	0.32	-4.33	0.25
Pipe 221	Com185	Ex. 186	250	133	110	-23.86	0.49	-18.36	0.37
Pipe 222	Ex. 186	184	250	161	110	-24.20	0.49	-18.61	0.38
Pipe 223	187	188	150	149	110	2.27	0.13	1.74	0.10

管網計算データおよび計算結果 (管路) -4

LinkID	Node1 (Junction)	Node2 (Junction)	Diameter mm	Length m	Rough ness	Peak Demand		Extinction Demand	
						Flow LPS	Velocity m/s	Flow LPS	Velocity m/s
Pipe 224	188	Ex. 186	150	185	110	2.67	0.15	2.05	0.12
Pipe 225	188	178	100	584	110	-1.39	0.18	-1.07	0.14
Pipe 226	Com185	New141_6	100	143	110	6.40	0.81	4.92	0.63
Pipe 227	Com185	Ex. 192	150	405	110	4.88	0.28	3.75	0.21
Pipe 228	Ex. 192	Com190	150	414	110	3.62	0.20	2.78	0.16
Pipe 229	Com190	Ex. 189	100	440	110	0.12	0.02	0.10	0.01
Pipe 230	Ex. 189	187	100	718	110	-1.96	0.25	-1.50	0.19
Pipe 231	188	New191	100	570	110	0.99	0.13	0.76	0.10
Pipe 232	New191	Ex. 192	50	107	110	0.60	0.30	0.46	0.23
Pipe 233	Com190	Ex. 196	150	420	110	-5.09	0.29	-3.91	0.22
Pipe 235	197	Ex. 193	150	678	110	1.05	0.06	0.81	0.05
Pipe 236	New80_10	Ex. 195_10	100	307	110	3.37	0.43	2.59	0.33
Pipe 237	Ex. 195_10	194	100	511	110	0.00	0.00	0.00	0.00
Pipe 242	Ex. 144_6	Ex. 202_6	100	562	110	5.16	0.66	3.97	0.51
Pipe 243	201	New142_6	100	615	110	-2.68	0.34	-2.06	0.26
Pipe 245	Ex. 202_6	Ex. 204_6	100	684	110	1.95	0.25	1.50	0.19
Pipe 247	New141_6	Ex. 203_6	100	362	110	1.55	0.20	1.19	0.15
Pipe 248	Ex. 203_6	201	100	326	110	-2.68	0.34	-2.06	0.26
Pipe 249	Ex. 204_6	206	100	303	110	0.25	0.03	0.19	0.02
Pipe 250	New141_6	205	100	405	110	4.38	0.56	3.37	0.43
Pipe 251	205	148	100	324	110	4.38	0.56	3.37	0.43
Pipe 252	Ex. 149_6	206	100	251	110	-0.25	0.03	-0.19	0.02
Pipe 253	Ex. 207_3	105	100	1,762	110	-0.82	0.10	-0.63	0.08
Pipe 257	165	170	100	72	110	-2.14	0.27	-1.65	0.21
Pipe 258	170	171	100	72	110	-0.51	0.07	-0.40	0.05
Pipe 259	170	158	100	775	110	-1.63	0.21	-1.25	0.16
Pipe 264	181	104	300	103	110	104.04	1.47	80.03	1.13
Pipe 108	New28	New99	300	1,655	130	51.25	0.73	46.29	0.65
Pipe 155	New99	New33	250	678	111	30.49	0.62	31.17	0.64
Pipe 35	Ex. 121_7	New36_7	100	1,635	110	4.41	0.56	3.39	0.43
Pipe 36	New36_7	Ex. 140_7	100	1,139	110	0.43	0.05	0.33	0.04
Pipe 37	Com185	Ex. 196	250	1,235	110	6.77	0.14	5.20	0.11
Pipe 60	105	37	100	72	110	-0.82	0.10	-0.63	0.08
Pipe 61	37	106	100	208	110	2.01	0.26	2.65	0.34
Pipe 62	New6_3	37	100	43	110	2.83	0.36	3.28	0.42
Pipe 63	104	Ex. 38	100	917	110	2.94	0.37	2.26	0.29
Pipe 58	New51_8	3	200	1,413	111	19.94	0.63	23.67	0.75
Pipe 66	4	197	150	494	110	1.05	0.06	0.81	0.05
Pipe 67	New5_6	198	100	482	110	1.99	0.25	1.53	0.19
Pipe 69	6	Ex. 107_5	50	229	110	0.00	0.00	0.00	0.00
Pipe 73	New78_9	Ex. 79_9	150	284	110	10.88	0.62	8.37	0.47
Pipe 75	198	Ex. 199_6	100	272	110	1.99	0.25	1.53	0.19
Pipe 77	Ex. 79_9	New80_10	100	159	110	9.56	1.22	7.35	0.94
Pipe 78	New95_11	Ex. 10_11	150	73	110	12.71	0.72	9.78	0.55
Pipe 54	3	Ex. 76_9	200	79	111	19.94	0.63	23.67	0.75
Pipe 59	123	129	100	313	111	2.24	0.29	1.72	0.22
Pipe 38	Ex. 10_11	Com200_11	150	75	110	7.83	0.44	6.02	0.34
Pipe 39	8	Ex. 98_11	150	230	110	20.18	1.14	15.52	0.88
Pipe 40	10	New122_7	150	958	150	11.66	0.66	8.97	0.51
Pipe 64	10	New122_7	150	963	110	8.53	0.48	6.56	0.37
Pipe 65	11	Ex. 115_5	100	279	110	0.00	0.00	0.00	0.00

管網計算データおよび計算結果 (管路) -5

LinkID	Node1 (Junction)	Node2 (Junction)	Diameter mm	Length m	Rough ness	Peak Demand		Extinction Demand	
						Flow LPS	Velocity m/s	Flow LPS	Velocity m/s
Pipe 68	New114_5	12	100	429	110	0.00	0.00	0.00	0.00
Pipe 81	New99	8	150	234	110	20.18	1.14	15.52	0.88
Pipe 92	Ex. 112_6	10	150	12	110	10.42	0.59	8.02	0.45
Pipe 93	Ex. 112_6	10	150	13	110	9.77	0.55	7.51	0.43
Pipe 31	Ex. 196	4	150	37	110	1.05	0.06	0.81	0.05
Pipe 56	148	New5_6	100	50	110	4.09	0.52	3.15	0.40
Pipe 70	106	Ex. 107_5	200	250	111	9.20	0.29	15.41	0.49
Pipe 71	Ex. 107_5	Ex. 117_5	200	539	111	5.14	0.16	3.95	0.13
Pipe 72	7	106	200	114	111	8.16	0.26	13.51	0.43
Pipe 74	New122_7	Ex. 121_7	150	957	150	10.60	0.60	8.16	0.46

資料 7.10

貧困世帯数の想定

1 貧困世帯数の想定

1-1 計画給水区域における貧困世帯数

2010年および2011年のカンボジア計画省（Ministry of Planning）が実施した” Identification of Poor Household Programme” の貧困層データをもとに、次式により推定する。2025年の計画給水区域における貧困世帯数（レベル1）は1,248世帯と推定される。

$$\text{貧困世帯数(F)} = \sum \{ \text{ビレッジ別貧困層の割合(C)} \times \text{ビレッジ別世帯数(E)} \}$$

ビレッジ別世帯数: 2025年給水人口 ÷ 世帯構成人数 4.91*

*世帯構成人員: 給水人口 75,033 ÷ 給水戸数 15,282 (2025年時)

1-2 無償の機材供与対象となる貧困層世帯数

無償の機材供与対象となる貧困層世帯数は、2025年の計画給水区域内における貧困世帯数1,248世帯から接続済の貧困世帯数の991世帯を控除し、257世帯と見込まれる。

表6 計画給水区域内の貧困世帯数の算出

Commune	VillageName	(B*) Poor 1 Households	(C)=(B*)/(A) Rate of Total Poor	(D) 2025 year population	(E)=(D)/4.91 2025 year population	Poor Households	Poor Households (Urban)	Poor Households (Rural)
07_Snam Preah	Svay Att	18	16.2%	549	112	19		19
07_Snam Preah	Kam Peanh Svay	14	10.3%	742	152	16		16
07_Snam Preah	Dang Keab Kdam	23	17.3%	523	107	19		19
8_Snam Preah	Ang Doung Sambour	16	10.2%	40	9	1		1
9_Snam Preah	Snam Preah	8	4.2%	58	12	1		1
01_Anlong Vil	Toul Cha	230	19.1%	492	101	20		20
01_Anlong Vil	Ou Bakon	12	18.2%	417	85	16		16
01_Anlong Vil	Wat Por 1	13	15.7%	643	131	21		21
01_Anlong Vil	Wat Por 2	4	7.8%	327	67	6		6
01_Anlong Vil	Kancheut Baydak	10	16.1%	451	92	15		15
01_Anlong Vil	Ang long Vil	4	7.0%	262	54	4		4
01_Anlong Vil	Preak Ta Voung	21	23.3%	560	114	27		27
01_Anlong Vil	Kampong Kra bey	7	12.5%	263	54	7		7
01_Anlong Vil	Phlouy Kra bey	5	8.8%	298	61	6		6
01_Anlong Vil	Preak Ta Kong	11	18.3%	0	0			
01_Anlong Vil	Koah Kra sang	14	20.6%	0	0			
01_Anlong Vil	Preak Chheur Trav	25	26.9%	0	0			
01_Anlong Vil	Chey Chom mas	28	29.2%	0	0			
01_Anlong Vil	Boeung Chhouk	22	20.8%	0	0			
01_Anlong Vil	Kbal Ro meas	11	12.1%	0	0			
03_Kandieng	Kandieng Knoung	8	12.1%	321	66			
03_Kandieng	Kandieng	12	16.7%	352	72			
03_Kandieng	Station	17	15.0%	270	55			
03_Kandieng	Yous	7	10.3%	63	13			
03_Kandieng	Keo Vi chey	13	15.1%	6	2			
03_Kandieng	Prey Kdey leu	9	20.9%	45	10			
03_Kandieng	Prey Kdey Kandal	9	16.7%	38	8			
03_Kandieng	Kampong Roka	8	15.1%	0	0			
03_Kandieng	Svay Yeang	15	19.5%	0	0			
03_Kandieng	Bong Kol	16	12.7%	0	0			
03_Kandieng	Steoung Leu	14	15.4%	0	0			
03_Kandieng	Steoung Krom	14	16.9%	0	0			
03_Kandieng	Kampong Krasang leu	3	3.9%	0	0			
03_Kandieng	Kampong Krasang Kron	11	11.2%	0	0			
03_Kandieng	Boeung Chhouk	18	11.1%	0	0			
03_Kandieng	Prey Kdey Krom	12	12.5%	0	0	0		0
07_Svay Luong	Boeung Kranh	13	10.7%	328	67			
07_Svay Luong	Rong Machine	2	2.6%	157	32			

資料7.10 貧困世帯数の想定

Commune	VillageName	(B) Poor 1 Households	(C)=(B)/(A) Rate of Total Poor	(D) 2025 year population	(E)=(D)/4.91 2025 year population	Poor Households	Poor Households (Urban)	Poor Households (Rural)
07_Svay Luong	Svay Luong	3	5.0%	232	48			
07_Svay Luong	Svay Chan	4	3.8%	130	27			
07_Svay Luong	Plouv portivong	22	30.1%	160	33			
07_Svay Luong	Svay Cham bok	23	28.8%	391	80	23		23
07_Svay Luong	Por Leung	4	4.6%	0	0			
07_Svay Luong	Ko Kor	3	5.5%	0	0			
07_Svay Luong	San lot	5	7.8%	0	0			
07_Svay Luong	Svay Yeang	16	15.1%	0	0			
09_Veal	Kbal Hong	14	9.8%	869	178	18		18
09_Veal	Bralay Thom	68	35.2%	998	204	72		72
09_Veal	Veal	8	6.7%	513	105	8		8
09_Veal	Por Kambor	23	15.4%	669	137	22		22
09_Veal	Kancheut Baydak	4	4.4%	385	79	4		4
09_Veal	Por Damnak	9	5.6%	692	141	8		8
09_Veal	Boeung Ya	13	11.4%	508	104	12		12
09_Veal	Ta Sdey	26	28.3%	440	90	26		26
09_Veal	Toul Pon Ro	9	11.1%	462	95	11		11
10_Kaoh Chum	Bridge	17	8.9%	1073	219	20		20
10_Kaoh Chum	Dong Ron	24	14.6%	1062	217	32		32
10_Kaoh Chum	Ang long hab	11	6.4%	862	176	12		12
01_Chanraeun Phal	Leav	56	32.0%	672	137	44		44
01_Chanraeun Phal	Au Toung	32	17.3%	1423	290	51		51
01_Chanraeun Phal	Svay Meas	10	8.3%	658	135	12		12
03_Lolok Sa	Por ta koy	8	3.1%	1422	290	9		9
03_Lolok Sa	Preak Sdey	9	3.4%	1478	302	11		11
03_Lolok Sa	Lolork sa	3	2.8%	536	110	4		4
03_Lolok Sa	Phsar Leu	2	2.0%	631	129	3		3
03_Lolok Sa	Phum Kok	33	15.3%	1223	250	39		39
03_Lolok Sa	Wat Loung	13	6.2%	1364	278	18		18
03_Lolok Sa	Chhom rom siem	13	10.4%	1020	208	22		22
04_Phteah Prey	Peal nheak 1	44	2.5%	3298	672	18		18
04_Phteah Prey	Peal nheak 2	44	2.5%	3404	694	18		18
04_Phteah Prey	Khal Hong	44	2.5%	1355	276	8		8
04_Phteah Prey	North banana plantation	4	0.9%	3266	666	6		6
04_Phteah Prey	South banana plantation	4	1.5%	1025	209	4		4
04_Phteah Prey	Ou Sdav	1	0.7%	785	160	2		2
04_Phteah Prey	Ra	4	1.3%	1608	328	5		5
04_Phteah Prey	Thnort Threat	8	4.4%	1100	225	10		10
04_Phteah Prey	Kork	19	10.9%	887	181	20		20
04_Phteah Prey	Dong ka	4	2.0%	1158	236	5		5
05_Prey Nhi	Bak roteas	25	10.4%	1652	337	36		36
05_Prey Nhi	Doung Chhroum	3	2.4%	639	131	4		4
05_Prey Nhi	Bralay Thom	4	3.9%	449	92	4		4
05_Prey Nhi	Kbal saen thmor	1	1.1%	437	89	1		1
05_Prey Nhi	Man chear	27	13.9%	1450	296	42		42
05_Prey Nhi	Krang Ta Sen	24	15.1%	423	87	13		13
05_Prey Nhi	Sala Kom rou	14	13.5%	790	161	22		22
05_Prey Nhi	Sras Srong	8	10.3%	300	62	7		7
06_Roleab	Por Andat	4	3.3%	730	149	5		5
06_Roleab	Thnori Bombeak	7	6.5%	725	148	10		10
06_Roleab	Concrete bridge	182	6.3%	1267	259	17		17
06_Roleab	Chhloun kat	7	4.7%	712	146	7		7
06_Roleab	Steung Toch	7	5.0%	763	156	8		8
06_Roleab	Japan road	9	4.4%	1093	223	10		10
06_Roleab	Preak Ori mal	26	5.3%	2711	553	30		30
06_Roleab	Soriya leu	1	1.4%	486	99	2		2
06_Roleab	Soriya krom	6	7.2%	365	75	6		6
06_Roleab	Preak Tnout	2	1.1%	996	203	3		3
06_Roleab	Toul Makak	15	4.7%	1474	301	15		15
06_Roleab	Roleab	56	9.3%	4	1	1		1

資料7.10 貧困世帯数の想定

Commune	VillageName	(B*) Poor 1 Households	(C)=(B*)/(A) Rate of Total Poor	(D) 2025 year population	(E)=(D)/4.91 2025 year population	Poor Households	Poor Households (Urban)	Poor Households (Rural)
07_Svay At	Kran Pomlak	5	2.6%	1143	233	6	6	
07_Svay At	Trang	6	6.3%	514	105	7	7	
07_Svay At	Station	28	8.8%	1742	355	32	32	
07_Svay At	Ou Sdav	20	11.0%	1151	235	26	26	
07_Svay At	Svat At	43	20.7%	1477	301	63	63	
08_Bateay Dei	Ou Bakon leu	7	11.1%	398	82	10	10	
08_Bateay Dei	Ou Bakon Krom	12	10.1%	479	98	10	10	
08_Bateay Dei	Ou Bakon Kandal	8	13.8%	256	53	8	8	
08_Bateay Dei	Keo Sovann leu	4	3.7%	680	139	6	6	
08_Bateay Dei	Keo Sovann krom	4	5.6%	339	70	4	4	
08_Bateay Dei	Kbal Hong	10	11.4%	695	142	17	17	
08_Bateay Dei	Bondous Sandaek	15	11.9%	548	112	14	14	
08_Bateay Dei	Ouek Slam	9	5.4%	764	156	9	9	
08_Bateay Dei	Banteay dey leu	5	3.2%	724	148	5	5	
08_Bateay Dei	Banteay dey krom	6	5.0%	592	121	7	7	
08_Bateay Dei	Keo Mony	13	10.7%	652	133	15	15	
08_Bateay Dei	Ta Koy	9	11.1%	453	93	11	11	
Total		1990	10.6% (Average)	75035	15329	1248	983	265

資料 7.11

水道事業全体 基本情報チェックシート

水道事業全体 基本情報チェックシート

上水道案件 セクター／水道事業体 基本情報チェックシート

国名：カンボジア 水道事業体名：プルサット水道局

	指標・情報	重要度	数値・情報	単位	出典
セクター概要					
1	国家人口	★★	1,630	万人	2018年、IMF
	一人当たりGDP	★★	1,485	USD/人	2018年、IMF
2	年間降水量	☆	1,410	mm/年	MOWRAM, 1996-2016
	気候帯	☆	熱帯モンスーン		Statistic Yearbook 2008 カンボジア国計画省
3	改善された水源へのアクセス率	★★	75	%	JMP2017
4	水道セクターのガバナンス	★★	都市部への水供給は、工業・手工芸省工業総局水道部が管轄しており、各州の工業・手工芸局の下部組織である水道局が実際の水供給に係る運営・維持管理を行っている。 全24州のうち、プノンペン市及びシエムリアップ市の水供給は水道公社、12州の州都が公営水道(水道局)、それ以外は民間企業が水供給を行っている。 農村部への水道供給は農村開発省技術総局農村給水局が所管している。		カンボジア国上水道セクター情報収集・確認調査、2010年6月
5	主要な開発方針、開発課題	★★	カンボジア国政府は、水道セクターの国家方針として、「国民が安全な水の供給を受け、衛生施設を有し、安全で衛生的かつ環境に適応した生活環境を享受する」を掲げている。 MIHによれば、2025年の目標として、都市部での安全な水にアクセスできる人の割合を100%としている。 水道法等の関連法律がなく、現在その制定を進めている。 工業手工芸省から飲料水に関する水質基準が出されている。		National Policy on Water Supply and Sanitation, 2003 国家戦略開発計画(NSDP, 2014-2018)
水道事業体の概要					
1	水道事業体の形態、監督・規制体制	★★	プルサット州都市部への水供給は、プルサット州工業・手工芸局の管轄下にあるプルサット水道局が行っている。		カンボジア国水道事業人材育成プロジェクト・フェーズ3、モニタリング報告書、2014年5月
2	当該水道事業体の計画給水区域	☆	3区(Bakan, Kandieng, Krong Pursat)、13コミューン、97ビレッジ		
3	水源	★★	表流水:プルサット川		
4	水源開発余力	☆	Dhannak Ampilから下流の最小流量: 6.67m ³ /sec 取水量:0.09m ³ /sec 下流への必要環境流量:4.48m ³ /sec		
5	水道普及率	★★	37.8 (2018年、(給水人口(都市部内)33,658人+給水人口(都市部外)4,003人)/管理区域内人口99,691人)	%	

	指標・情報	重要度	数値・情報	単位	出典
6	給水人口	★★	37,661(2018年)		
7	一日平均給水量	★★	5,607(2018年)	m ³ /日	
8	一人一日平均給水量	★★	100(2013年～2018年の平均値)	リットル/人 /日	
9	給水時間	★★	24(2016年)		
10	漏水率	★★	11.3	%	
11	財務規模、収支	★★	<2018年度> 総収益:3,189百万リエル(88.69百万円) 総費用:2,783百万リエル(77.39百万円)(原価 償却費込) 純利益:406百万リエル(11.30百万円)		
12	水道料金水準	★★	1,600リエル/m ³ (0.40USD/m ³)	円またはUSD /m ³	
13	料金徴収率	☆	100 (2017年)	%	
14	メーター設置率	☆	100 (2017年)	%	
15	1,000接続当たりの職員数	☆	5.2 (2017年)	人/1,000栓	
16	施設の状況、施設の運 転・維持管理状況	★★	上水道施設は2007年にADBが改修事業を行 うとともに、プルサット水道局が自己で拡張を 行って2017年現在の給水能力は7,260m ³ /日と なっている。 施設の運営維持管理については、技術協力プロ ジェクト「水道事業人材育成プロジェクト・フェー ズ3」の実施により、基本的な技術力をプルサッ ト水道局は有している。		
17	水道事業体の業務目標と課 題	★★	プルサット水道事業に係る中長期計画はなく、 毎年、水道局が年次事業計画(Business Plan) を策定し、プルサット州工業・手工芸局(DIH)の 承認を受け、DIHから工業手工芸省(MIH)大臣 宛てに提出されている。 近年年間100戸の接続が進捗しているが、上水 施設の拡張に伴い維持管理職員の増員が更に 必要となる。無収水率は10%程度で、途上国と しては低い値を示している。		

資料 7.10

貧困世帯数の想定

1 貧困世帯数の想定

1-1 計画給水区域における貧困世帯数

2010年および2011年のカンボジア計画省（Ministry of Planning）が実施した” Identification of Poor Household Programme” の貧困層データをもとに、次式により推定する。2025年の計画給水区域における貧困世帯数（レベル1）は1,248世帯と推定される。

$$\text{貧困世帯数(F)} = \sum \{ \text{ビレッジ別貧困層の割合(C)} \times \text{ビレッジ別世帯数(E)} \}$$

ビレッジ別世帯数: 2025年給水人口 ÷ 世帯構成人数 4.91*

*世帯構成人員: 給水人口 75,033 ÷ 給水戸数 15,282 (2025年時)

1-2 無償の機材供与対象となる貧困層世帯数

無償の機材供与対象となる貧困層世帯数は、2025年の計画給水区域内における貧困世帯数1,248世帯から接続済の貧困世帯数の991世帯を控除し、257世帯と見込まれる。

表6 計画給水区域内の貧困世帯数の算出

Commune	VillageName	(B*) Poor 1 Households	(C)=(B*)/(A) Rate of Total Poor	(D) 2025 year population	(E)=(D)/4.91 2025 year population	Poor Households	Poor Households (Urban)	Poor Households (Rural)
07_Snam Preah	Svay Att	18	16.2%	549	112	19		19
07_Snam Preah	Kam Peanh Svay	14	10.3%	742	152	16		16
07_Snam Preah	Dang Keab Kdam	23	17.3%	523	107	19		19
8_Snam Preah	Ang Doung Sambour	16	10.2%	40	9	1		1
9_Snam Preah	Snam Preah	8	4.2%	58	12	1		1
01_Anlong Vil	Toul Cha	230	19.1%	492	101	20		20
01_Anlong Vil	Ou Bakon	12	18.2%	417	85	16		16
01_Anlong Vil	Wat Por 1	13	15.7%	643	131	21		21
01_Anlong Vil	Wat Por 2	4	7.8%	327	67	6		6
01_Anlong Vil	Kancheut Baydak	10	16.1%	451	92	15		15
01_Anlong Vil	Ang long Vil	4	7.0%	262	54	4		4
01_Anlong Vil	Preak Ta Voung	21	23.3%	560	114	27		27
01_Anlong Vil	Kampong Kra bey	7	12.5%	263	54	7		7
01_Anlong Vil	Phlouy Kra bey	5	8.8%	298	61	6		6
01_Anlong Vil	Preak Ta Kong	11	18.3%	0	0			
01_Anlong Vil	Koah Kra sang	14	20.6%	0	0			
01_Anlong Vil	Preak Chheur Trav	25	26.9%	0	0			
01_Anlong Vil	Chey Chom mas	28	29.2%	0	0			
01_Anlong Vil	Boeung Chhouk	22	20.8%	0	0			
01_Anlong Vil	Kbal Ro meas	11	12.1%	0	0			
03_Kandieng	Kandieng Knoung	8	12.1%	321	66			
03_Kandieng	Kandieng	12	16.7%	352	72			
03_Kandieng	Station	17	15.0%	270	55			
03_Kandieng	Yous	7	10.3%	63	13			
03_Kandieng	Keo Vi chey	13	15.1%	6	2			
03_Kandieng	Prey Kdey leu	9	20.9%	45	10			
03_Kandieng	Prey Kdey Kandal	9	16.7%	38	8			
03_Kandieng	Kampong Roka	8	15.1%	0	0			
03_Kandieng	Svay Yeang	15	19.5%	0	0			
03_Kandieng	Bong Kol	16	12.7%	0	0			
03_Kandieng	Steoung Leu	14	15.4%	0	0			
03_Kandieng	Steoung Krom	14	16.9%	0	0			
03_Kandieng	Kampong Krasang leu	3	3.9%	0	0			
03_Kandieng	Kampong Krasang Kron	11	11.2%	0	0			
03_Kandieng	Boeung Chhouk	18	11.1%	0	0			
03_Kandieng	Prey Kdey Krom	12	12.5%	0	0	0		0
07_Svay Luong	Boeung Kranh	13	10.7%	328	67			
07_Svay Luong	Rong Machine	2	2.6%	157	32			

資料7.10 貧困世帯数の想定

Commune	VillageName	(B) Poor 1 Households	(C)=(B)/(A) Rate of Total Poor	(D) 2025 year population	(E)=(D)/4.91 2025 year population	Poor Households	Poor Households (Urban)	Poor Households (Rural)
07_Svay Luong	Svay Luong	3	5.0%	232	48			
07_Svay Luong	Svay Chan	4	3.8%	130	27			
07_Svay Luong	Plouv portivong	22	30.1%	160	33			
07_Svay Luong	Svay Cham bok	23	28.8%	391	80	23		23
07_Svay Luong	Por Leumg	4	4.6%	0	0			
07_Svay Luong	Ko Kor	3	5.5%	0	0			
07_Svay Luong	San lot	5	7.8%	0	0			
07_Svay Luong	Svay Yeang	16	15.1%	0	0			
09_Veal	Kbal Hong	14	9.8%	869	178	18		18
09_Veal	Bralay Thom	68	35.2%	998	204	72		72
09_Veal	Veal	8	6.7%	513	105	8		8
09_Veal	Por Kambor	23	15.4%	669	137	22		22
09_Veal	Kancheut Baydak	4	4.4%	385	79	4		4
09_Veal	Por Damnak	9	5.6%	692	141	8		8
09_Veal	Boeung Ya	13	11.4%	508	104	12		12
09_Veal	Ta Sdey	26	28.3%	440	90	26		26
09_Veal	Toul Pon Ro	9	11.1%	462	95	11		11
10_Kaoh Chum	Bridge	17	8.9%	1073	219	20		20
10_Kaoh Chum	Dong Ron	24	14.6%	1062	217	32		32
10_Kaoh Chum	Ang long hab	11	6.4%	862	176	12		12
01_Chanraeun Phal	Leav	56	32.0%	672	137	44		44
01_Chanraeun Phal	Au Toung	32	17.3%	1423	290	51		51
01_Chanraeun Phal	Svay Meas	10	8.3%	658	135	12		12
03_Lolok Sa	Por ta koy	8	3.1%	1422	290	9		9
03_Lolok Sa	Preak Sdey	9	3.4%	1478	302	11		11
03_Lolok Sa	Lolork sa	3	2.8%	536	110	4		4
03_Lolok Sa	Phsar Leu	2	2.0%	631	129	3		3
03_Lolok Sa	Phum Kok	33	15.3%	1223	250	39		39
03_Lolok Sa	Wat Loung	13	6.2%	1364	278	18		18
03_Lolok Sa	Chhom rom siem	13	10.4%	1020	208	22		22
04_Phteah Prey	Peal nheak 1	44	2.5%	3298	672	18		18
04_Phteah Prey	Peal nheak 2	44	2.5%	3404	694	18		18
04_Phteah Prey	Khal Hong	44	2.5%	1355	276	8		8
04_Phteah Prey	North banana plantation	4	0.9%	3266	666	6		6
04_Phteah Prey	South banana plantation	4	1.5%	1025	209	4		4
04_Phteah Prey	Ou Sdav	1	0.7%	785	160	2		2
04_Phteah Prey	Ra	4	1.3%	1608	328	5		5
04_Phteah Prey	Thnort Threat	8	4.4%	1100	225	10		10
04_Phteah Prey	Kork	19	10.9%	887	181	20		20
04_Phteah Prey	Dong ka	4	2.0%	1158	236	5		5
05_Prey Nhi	Bak roteas	25	10.4%	1652	337	36		36
05_Prey Nhi	Doung Chhroum	3	2.4%	639	131	4		4
05_Prey Nhi	Bralay Thom	4	3.9%	449	92	4		4
05_Prey Nhi	Kbal saen thmor	1	1.1%	437	89	1		1
05_Prey Nhi	Man chear	27	13.9%	1450	296	42		42
05_Prey Nhi	Krang Ta Sen	24	15.1%	423	87	13		13
05_Prey Nhi	Sala Kom rou	14	13.5%	790	161	22		22
05_Prey Nhi	Sras Srong	8	10.3%	300	62	7		7
06_Roleab	Por Andat	4	3.3%	730	149	5		5
06_Roleab	Thnori Bombeak	7	6.5%	725	148	10		10
06_Roleab	Concrete bridge	182	6.3%	1267	259	17		17
06_Roleab	Chhloun kat	7	4.7%	712	146	7		7
06_Roleab	Steung Toch	7	5.0%	763	156	8		8
06_Roleab	Japan road	9	4.4%	1093	223	10		10
06_Roleab	Preak Ori mal	26	5.3%	2711	553	30		30
06_Roleab	Soriya leu	1	1.4%	486	99	2		2
06_Roleab	Soriya krom	6	7.2%	365	75	6		6
06_Roleab	Preak Tnout	2	1.1%	996	203	3		3
06_Roleab	Toul Makak	15	4.7%	1474	301	15		15
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資料7.10 貧困世帯数の想定

Commune	VillageName	(B*) Poor 1 Households	(C)=(B*)/(A) Rate of Total Poor	(D) 2025 year population	(E)=(D)/4.91 2025 year population	Poor Households	Poor Households (Urban)	Poor Households (Rural)
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08_Bateay Dei	Ouek Slam	9	5.4%	764	156	9	9	
08_Bateay Dei	Banteay dey leu	5	3.2%	724	148	5	5	
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08_Bateay Dei	Keo Mony	13	10.7%	652	133	15	15	
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資料 7.11

水道事業全体 基本情報チェックシート

水道事業全体 基本情報チェックシート

上水道案件 セクター／水道事業体 基本情報チェックシート

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	指標・情報	重要度	数値・情報	単位	出典
セクター概要					
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	一人当たりGDP	★★	1,485	USD/人	2018年、IMF
2	年間降水量	☆	1,410	mm/年	MOWRAM, 1996-2016
	気候帯	☆	熱帯モンスーン		Statistic Yearbook 2008 カンボジア国計画省
3	改善された水源へのアクセス率	★★	75	%	JMP2017
4	水道セクターのガバナンス	★★	都市部への水供給は、工業・手工芸省工業総局水道部が管轄しており、各州の工業・手工芸局の下部組織である水道局が実際の水供給に係る運営・維持管理を行っている。 全24州のうち、プノンペン市及びシエムリアップ市の水供給は水道公社、12州の州都が公営水道(水道局)、それ以外は民間企業が水供給を行っている。 農村部への水道供給は農村開発省技術総局農村給水局が所管している。		カンボジア国上水道セクター情報収集・確認調査、2010年6月
5	主要な開発方針、開発課題	★★	カンボジア国政府は、水道セクターの国家方針として、「国民が安全な水の供給を受け、衛生施設を有し、安全で衛生的かつ環境に適応した生活環境を享受する」を掲げている。 MIHによれば、2025年の目標として、都市部での安全な水にアクセスできる人の割合を100%としている。 水道法等の関連法律がなく、現在その制定を進めている。 工業手工芸省から飲料水に関する水質基準が出されている。		National Policy on Water Supply and Sanitation, 2003 国家戦略開発計画(NSDP, 2014-2018)
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1	水道事業体の形態、監督・規制体制	★★	プルサット州都市部への水供給は、プルサット州工業・手工芸局の管轄下にあるプルサット水道局が行っている。		カンボジア国水道事業人材育成プロジェクト・フェーズ3、モニタリング報告書、2014年5月
2	当該水道事業体の計画給水区域	☆	3区(Bakan, Kandieng, Krong Pursat)、13コミューン、97ビレッジ		
3	水源	★★	表流水:プルサット川		
4	水源開発余力	☆	Dhannak Ampilから下流の最小流量: 6.67m ³ /sec 取水量:0.09m ³ /sec 下流への必要環境流量:4.48m ³ /sec		
5	水道普及率	★★	37.8 (2018年、(給水人口(都市部内)33,658人+給水人口(都市部外)4,003人)/管理区域内人口99,691人)	%	

	指標・情報	重要度	数値・情報	単位	出典
6	給水人口	★★	37,661(2018年)		
7	一日平均給水量	★★	5,607(2018年)	m ³ /日	
8	一人一日平均給水量	★★	100(2013年～2018年の平均値)	リットル/人 /日	
9	給水時間	★★	24(2016年)		
10	漏水率	★★	11.3	%	
11	財務規模、収支	★★	<2018年度> 総収益:3,189百万リエル(88.69百万円) 総費用:2,783百万リエル(77.39百万円)(原価 償却費込) 純利益:406百万リエル(11.30百万円)		
12	水道料金水準	★★	1,600リエル/m ³ (0.40USD/m ³)	円またはUSD /m ³	
13	料金徴収率	☆	100 (2017年)	%	
14	メーター設置率	☆	100 (2017年)	%	
15	1,000接続当たりの職員数	☆	5.2 (2017年)	人/1,000栓	
16	施設の状況、施設の運 転・維持管理状況	★★	上水道施設は2007年にADBが改修事業を行 うとともに、プルサット水道局が自己で拡張を 行って2017年現在の給水能力は7,260m ³ /日と なっている。 施設の運営維持管理については、技術協力プロ ジェクト「水道事業人材育成プロジェクト・フェー ズ3」の実施により、基本的な技術力をプルサッ ト水道局は有している。		
17	水道事業体の業務目標と課 題	★★	プルサット水道事業に係る中長期計画はなく、 毎年、水道局が年次事業計画(Business Plan) を策定し、プルサット州工業・手工芸局(DIH)の 承認を受け、DIHから工業手工芸省(MIH)大臣 宛てに提出されている。 近年年間100戸の接続が進捗しているが、上水 施設の拡張に伴い維持管理職員の増員が更に 必要となる。無収水率は10%程度で、途上国と しては低い値を示している。		

資料 7.12

プルサット無償対象範囲
（給水区域の検討）

2 プルサット無償対象範囲（給水区域の検討）

(1) 目的

プルサットにおける無償資金協力の計画範囲の基本事項となる給水区域を検討するため、先方政府から要請された拡張区域について、先方政府の優先度を踏まえて全域から狭めた区域（ケース 1～5）及び事業投資効率性を重視した区域（ケース 6, 7）の複数ケースを設定した。

ケースごとに、2025年の将来水需要予測結果から拡張に伴う増加給水量を概算し、これを給水するのに必要な取水施設、導水施設、浄水施設及び配水施設から給水管接続の概略施設計画を行った。さらに、これに要する概算事業費及び維持管理費を算定し、費用対効果分析による事業規模及び事業実施の妥当性を比較・検討した。

(2) 検討項目及び条件

検討項目及び条件を下表に示す。

	項目	条件
1	給水区域	先方政府の優先給水区域を考慮した拡張区域、投資効率性を重視した拡張区域
2	給水人口・ 一日最大給水量	給水区域拡張に伴う増加給水人口、増加一日最大給水量(2025年)
3	概略施設計画	増加一日最大給水量に対応する取水、導水、浄水、配水施設、給水管の概略施設計画
4	概算事業費	概略施設計画に基づく同規模類似案件等を参考にした概算事業費 設計監理費(工事費の10%含む)
5	維持管理費	概略施設計画、実績を参考に算定した年間の人件費、電力費、薬品費、修繕費(機械電気設備対象) -人件費:運転維持要員5人と想定し、2016年実績平均人件費318,800円/人/年を乗じ算定 -電力費:設備諸元から積み上げた年間使用量に現状単価19.21円/kWhを乗じ算定 -薬品費:凝集剤、消毒等の推定薬品使用量現地調査で得られた薬品別単価を乗じて算定 修繕費:機械電気設備費の1%計上
6	費用対効果分析	総費用(C)は初期整備費、耐用年数に基づく更新費及び維持管理費、事業により生み出される効果(総便益(B))は水道料金収入とし、初期整備完了後50年間を算定期間として現在価値し、費用便益比B/Cを比較した。 水道料金収入:供給単価38円/m ³ (1400KHR/m ³)×概算有収水量 -総費用(C)=Σ(年度別現在価値化費用) -総便益(B)=Σ(年度別現在価値化便益) -費用便益比=(B)/(C)

(1～3:表2参照、4～6:表1参照)

(3) 検討結果及び考察

検討結果を表1に示す。プルサットにおける無償資金協力の計画範囲の基本事項となる給水区域は、事業投資効果の高いケース6を軸とした方針とすることが望ましい。理由は以下のとおりである。

- 水道普及率の現状37.3%に対し、将来2025年約70%以上と見込まれるのはケース1、ケース2、ケース6及びケース7である。
- 先方から要請された拡張区域全域(ケース1)やケース1より範囲を狭めた案(ケース2)を対象とすることは、その事業費と想定無償資金予算と比較すれば非常に難しいと考えられる。
- 水道施設の初期整備を無償資金協力対象と仮定した場合、 $B/C > 1$ となるのはケース1、ケース2、ケース6及びケース7である。
- 給水人口当たり配水管延長(m/人)($\phi 75$ 以上)は、ケース6が3.4m/人(1.5m/人)と最も少なく、事業費に占める割合の大きい配水管布設が効率的であり、事業投資効果が高いといえる。

表-1 給水区域検討のための検討結果

	ケース 1	ケース 2	ケース 3	ケース 4	ケース 5	ケース 6	ケース 7	
	先方政府の優先給水区域を考慮した拡張区域(案)					投資効率性を重視した拡張区域(案)		
各検討項目の比較								
給水人口(千人)*1	62.1	48.0	35.0	26.6	23.2	37.3	41.2	
水道普及率(%)*2	93.4	80.0	67.6	59.6	56.4	69.8	73.5	
一日最大給水量(m ³ /日)*1	11,000	8,500	6,200	4,700.0	4,100	6,600	7,300	
給水管接続数(箇所)*1	13,020	10,060	7,340	5,560.0	4,850	7,810	8,640	
配水管延長(km)(φ75以上)*3	224.0 (121.0)	167.3 (83.3)	124.0 (66.0)	96.7 (48.7)	81.3 (37.3)	128.1 (57.1)	144.1 (68.1)	
給水人口当たり配水管延長(m/人)(φ75以上)*4	3.6 (1.9)	3.5 (1.7)	3.5 (1.9)	3.6 (1.8)	3.5 (1.6)	3.4 (1.5)	3.5 (1.7)	
B/Cの検討及び比較								
(a)全事業費、(b)初期整備を無償資金協力対象と仮定した場合、(a)-(b)先方負担額								
総費用	事業費(億円)*5 (カンボジア側負担額)	(a) 56.3 (b) 7.5	(a) 47.4 (b) 7.0	(a) 40.7 (b) 6.6	(a) 36.1 (b) 6.3	(a) 33.7 (b) 6.2	(a) 41.6 (b) 6.7	(a) 44.0 (b) 6.8
	維持管理費(億円)*6	10.9 10.9	8.5 8.5	7.9 7.9	6.2 6.2	6.0 6.0	7.7 7.7	7.9 7.9
	合計(億円) (C)	67.2 18.4	56.0 15.6	48.6 14.5	42.3 12.5	39.7 12.2	49.3 14.4	51.9 14.7
総便益	水道料金収入(億円)*7	25.5 25.5	19.7 19.7	14.4 14.4	10.9 10.9	9.5 9.5	15.3 15.3	16.9 16.9
	合計(円) (B)	25.5 25.5	19.7 19.7	14.4 14.4	10.9 10.9	9.5 9.5	15.3 15.3	16.9 16.9
	費用便益比 (B/C)	0.38 1.39	0.35 1.27	0.30 0.99	0.26 0.87	0.24 0.78	0.31 1.06	0.33 1.15
参考給水管接続費(億円)	1.6	1.2	0.9	0.7	0.6	1.0	1.1	
評価						◎		

注)*1 給水区域拡張に伴う増加給水人口(既存給水区域含む)、増加一日最大給水量及び増加給水管接続数(2016年～2025年)

*2(現在給水人口 36.3千人(2016年)+増加給水人口(2016年～2025年)拡張後の給水区域内人口 105.4千人(2025年)、現在水道普及率 37.7%(2016年)

*3 給水区域拡張(既存給水区域含む)に伴う概略配水管延長(φ50含む)、()内はφ75以上

*4 配水管延長/給水人口、()内は配水管延長(φ75以上)/給水人口

*5 事業費:初期整備(一日最大給水量に相当する取水施設、導水施設、浄水施設、配水施設の整備一式、給水管接続費含む、用地費非計上)及び機械電気設備の耐用年数(16年)に基づく更新

*6 維持管理費:初期整備完了後の人件費、電力費、薬品費及び修繕費

*7 水道料金収入: 初期整備完了後の収入

黄色ハイライト: ◎ 橙ハイライト: ○ 灰色ハイライト: ×

備考)費用の算定期間: 初期整備完了後 50年間、初期整備期間及び初期整備費: 2年、初期整備完了まで均等割り、費用及び便益の現在価値化: 割引率 4%、1KHR=¥0.02744、1USD=¥112.185(2017/7)

【参考図】

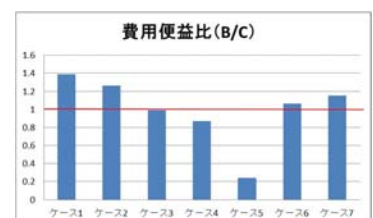
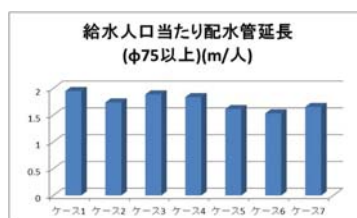
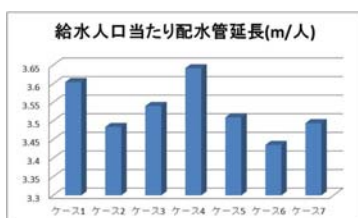
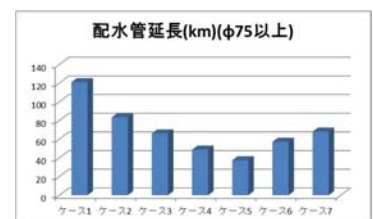
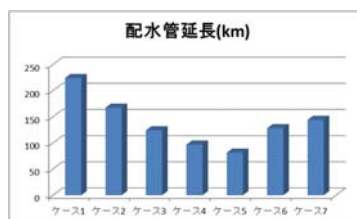
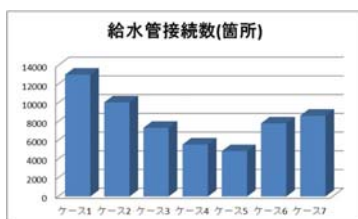
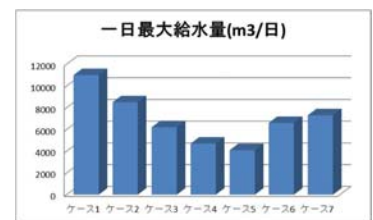
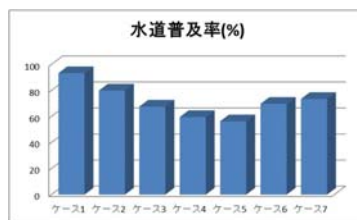
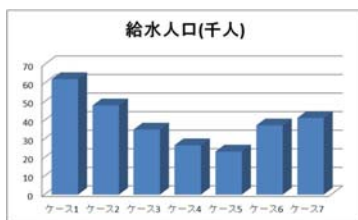
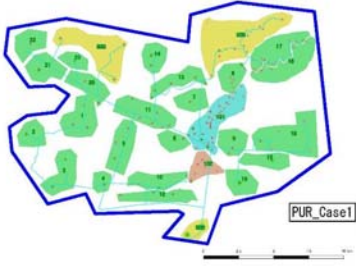
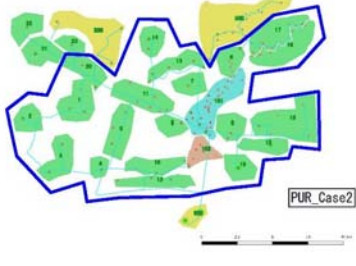
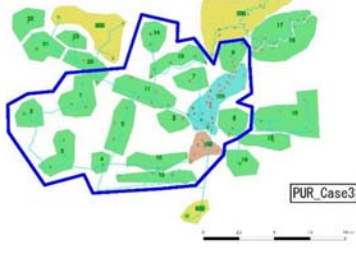





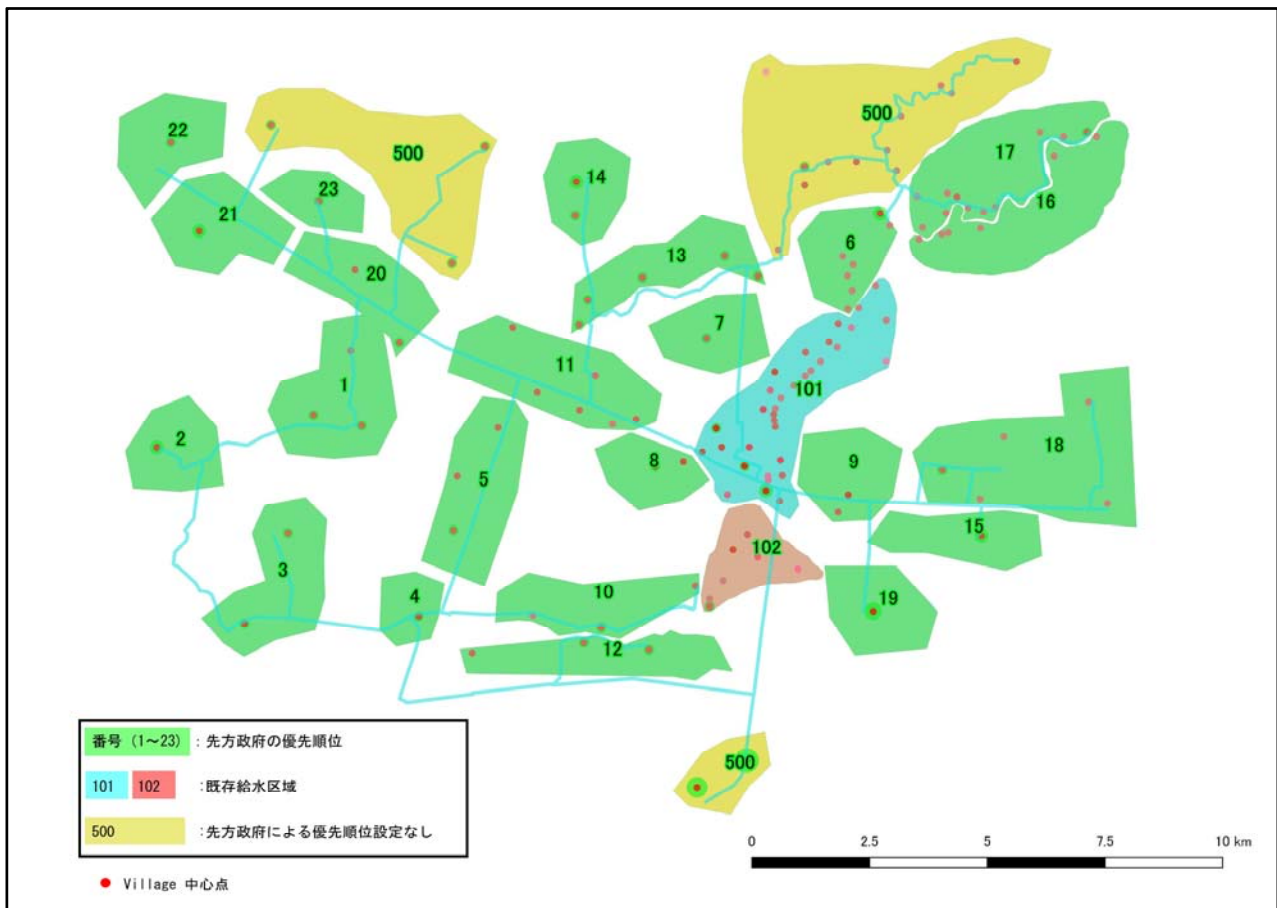
表-2 給水区域の検討ケース及び増加給水人口、増加一日最大給水量及び概略施設計画

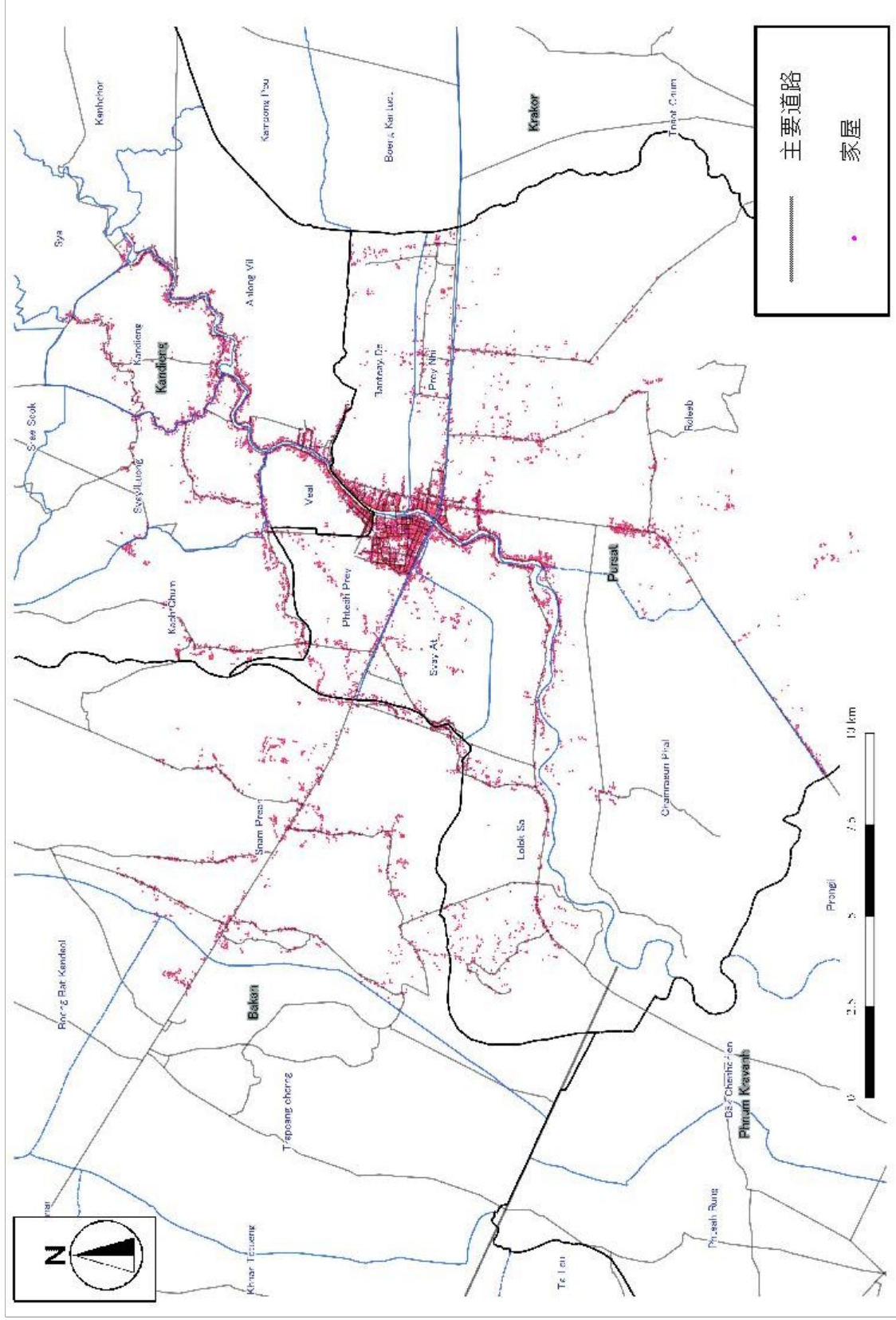
検討ケース №	給水区域	増加給水人口・一日最大給水量・概略施設計画																													
1	 <p>PUR_Case1</p> <p>給水区域(既存+拡張)</p> <p>先方政府から要請された給水区域全域とする案</p>	<p>増加給水人口 62,100 人 増加一日最大給水量 11,000m³/日 事業費 49.75 億円(設計監理費含む)</p> <table border="1"> <tr> <td rowspan="3">取水施設</td> <td>取水口</td> <td rowspan="2">12,100 m³/日</td> <td rowspan="3">1 式</td> </tr> <tr> <td>沈砂池</td> </tr> <tr> <td>導水ポンプ</td> <td>4.2m³/minx30m x 45kW x3(内 1 予備)台</td> </tr> <tr> <td>導水施設</td> <td>導水管</td> <td>φ450x7.8km</td> <td>1 式</td> </tr> <tr> <td>浄水施設</td> <td>浄水施設</td> <td>凝集沈澱・急速ろ過方式 11,000m³/日</td> <td>1 式</td> </tr> <tr> <td rowspan="3">配水施設</td> <td>配水池</td> <td>1,900m³ x 1 池</td> <td>1 式</td> </tr> <tr> <td>配水ポンプ</td> <td>2.5m³/min x 50m x 30kW x 5(内 1 予備)台</td> <td>1 式</td> </tr> <tr> <td>配水管</td> <td>φ75~φ500x 121km, φ50 x 103km 計 224km</td> <td>1 式</td> </tr> <tr> <td>給水管接続</td> <td></td> <td>13,020</td> <td>箇所</td> </tr> </table>	取水施設	取水口	12,100 m ³ /日	1 式	沈砂池	導水ポンプ	4.2m ³ /minx30m x 45kW x3(内 1 予備)台	導水施設	導水管	φ450x7.8km	1 式	浄水施設	浄水施設	凝集沈澱・急速ろ過方式 11,000m ³ /日	1 式	配水施設	配水池	1,900m ³ x 1 池	1 式	配水ポンプ	2.5m ³ /min x 50m x 30kW x 5(内 1 予備)台	1 式	配水管	φ75~φ500x 121km, φ50 x 103km 計 224km	1 式	給水管接続		13,020	箇所
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2	 <p>PUR_Case2</p> <p>給水区域(既存+拡張)</p> <p>先方政府の優先度に基づき設定した給水区域で、ケース 1 より範囲を狭めた案</p>	<p>増加給水人口 48,000 人 増加一日最大給水量 8,500m³/日 事業費 41.18 億円(設計監理費含む)</p> <table border="1"> <tr> <td rowspan="3">取水施設</td> <td>取水口</td> <td rowspan="2">9,350 m³/日</td> <td rowspan="3">1 式</td> </tr> <tr> <td>沈砂池</td> </tr> <tr> <td>導水ポンプ</td> <td>3.2m³/min x 32m x 30kW x 3(内 1 予備)台</td> </tr> <tr> <td>導水施設</td> <td>導水管</td> <td>φ400 x 7.8km</td> <td>1 式</td> </tr> <tr> <td>浄水施設</td> <td>浄水施設</td> <td>凝集沈澱・急速ろ過方式 8,500m³/日</td> <td>1 式</td> </tr> <tr> <td rowspan="3">配水施設</td> <td>配水池</td> <td>1,500m³ x 1 池</td> <td>1 式</td> </tr> <tr> <td>配水ポンプ</td> <td>2.6m³/min x 50m x 30kW x 4(内 1 予備)台</td> <td>1 式</td> </tr> <tr> <td>配水管</td> <td>φ75~φ450x83.3km, φ50 x 84km 計 167.3km</td> <td>1 式</td> </tr> <tr> <td>給水管接続</td> <td></td> <td>10,060</td> <td>箇所</td> </tr> </table>	取水施設	取水口	9,350 m ³ /日	1 式	沈砂池	導水ポンプ	3.2m ³ /min x 32m x 30kW x 3(内 1 予備)台	導水施設	導水管	φ400 x 7.8km	1 式	浄水施設	浄水施設	凝集沈澱・急速ろ過方式 8,500m ³ /日	1 式	配水施設	配水池	1,500m ³ x 1 池	1 式	配水ポンプ	2.6m ³ /min x 50m x 30kW x 4(内 1 予備)台	1 式	配水管	φ75~φ450x83.3km, φ50 x 84km 計 167.3km	1 式	給水管接続		10,060	箇所
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3	 <p>PUR_Case3</p> <p>給水区域(既存+拡張)</p> <p>先方政府の優先度に基づき設定した給水区域で、ケース 2 より範囲を狭めた案</p>	<p>増加給水人口 35,000 人 増加一日最大給水量 6,200m³/日 事業費 34.72 億円(設計監理費含む)</p> <table border="1"> <tr> <td rowspan="3">取水施設</td> <td>取水口</td> <td rowspan="2">6,820 m³/日</td> <td rowspan="3">1 式</td> </tr> <tr> <td>沈砂池</td> </tr> <tr> <td>導水ポンプ</td> <td>2.4m³/min x 33m x 30kW x3(内 1 予備)台</td> </tr> <tr> <td>導水施設</td> <td>導水管</td> <td>φ350x7.8km</td> <td>1 式</td> </tr> <tr> <td>浄水施設</td> <td>浄水施設</td> <td>凝集沈澱・急速ろ過方式 6,200m³/日</td> <td>1 式</td> </tr> <tr> <td rowspan="3">配水施設</td> <td>配水池</td> <td>1,100m³x1 池</td> <td>1 式</td> </tr> <tr> <td>配水ポンプ</td> <td>1.9m³/min x 50m x 30kW x4(内 1 予備)台</td> <td>1 式</td> </tr> <tr> <td>配水管</td> <td>φ75~φ400x66km, φ50x58km 計 124km</td> <td>1 式</td> </tr> <tr> <td>給水管接続</td> <td></td> <td>7,340</td> <td>箇所</td> </tr> </table>	取水施設	取水口	6,820 m ³ /日	1 式	沈砂池	導水ポンプ	2.4m ³ /min x 33m x 30kW x3(内 1 予備)台	導水施設	導水管	φ350x7.8km	1 式	浄水施設	浄水施設	凝集沈澱・急速ろ過方式 6,200m ³ /日	1 式	配水施設	配水池	1,100m ³ x1 池	1 式	配水ポンプ	1.9m ³ /min x 50m x 30kW x4(内 1 予備)台	1 式	配水管	φ75~φ400x66km, φ50x58km 計 124km	1 式	給水管接続		7,340	箇所
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<p>4</p>	 <p>PUR_Case4</p> <p>給水区域(既存+拡張)</p> <p>先方政府の優先度に基づき設定した給水区域で、ケース3より範囲を狭めた案</p>	<p>増加給水人口 26,600 人 増加一日最大給水量 4,700m³/日 事業費 30.38 億円(設計監理費含む)</p> <table border="1"> <tbody> <tr> <td rowspan="2">取水施設</td> <td>取水口</td> <td rowspan="2">5,170 m³/日</td> <td rowspan="2">1 式</td> </tr> <tr> <td>沈砂池</td> </tr> <tr> <td></td> <td>導水ポンプ</td> <td>1.8m³/minx 39mx18.5kWx 3(内 1 予備)台</td> <td></td> </tr> <tr> <td>導水施設</td> <td>導水管</td> <td>φ300 x 7.8km</td> <td>1 式</td> </tr> <tr> <td>浄水施設</td> <td>浄水施設</td> <td>凝集沈澱・急速ろ過方式 4,700m³/日</td> <td>1 式</td> </tr> <tr> <td rowspan="3">配水施設</td> <td>配水池</td> <td>800m³x1 池</td> <td>1 式</td> </tr> <tr> <td>配水ポンプ</td> <td>1.5m³/min x 50m x 22kW x4(内 1 予備)台</td> <td>1 式</td> </tr> <tr> <td>配水管</td> <td>φ75~φ400 x 48.7km, φ50 x 48km 計 96.7km</td> <td>1 式</td> </tr> <tr> <td>給水管接続</td> <td></td> <td>5,560</td> <td>箇所</td> </tr> </tbody> </table>	取水施設	取水口	5,170 m ³ /日	1 式	沈砂池		導水ポンプ	1.8m ³ /minx 39mx18.5kWx 3(内 1 予備)台		導水施設	導水管	φ300 x 7.8km	1 式	浄水施設	浄水施設	凝集沈澱・急速ろ過方式 4,700m ³ /日	1 式	配水施設	配水池	800m ³ x1 池	1 式	配水ポンプ	1.5m ³ /min x 50m x 22kW x4(内 1 予備)台	1 式	配水管	φ75~φ400 x 48.7km, φ50 x 48km 計 96.7km	1 式	給水管接続		5,560	箇所
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<p>5</p>	 <p>PUR_Case5</p> <p>給水区域(既存+拡張)</p> <p>先方政府の優先度に基づき設定した給水区域で、ケース4より範囲を狭めた案</p>	<p>増加給水人口 23,200 人 増加一日最大給水量 4,100m³/日 事業費 28.02 億円(設計監理費含む)</p> <table border="1"> <tbody> <tr> <td rowspan="2">取水施設</td> <td>取水口</td> <td rowspan="2">4,510 m³/日</td> <td rowspan="2">1 式</td> </tr> <tr> <td>沈砂池</td> </tr> <tr> <td></td> <td>導水ポンプ</td> <td>1.6m³/minx33mx18.5kWx3(内 1 予備)台</td> <td></td> </tr> <tr> <td>導水施設</td> <td>導水管</td> <td>φ300 x 7.8km</td> <td>1 式</td> </tr> <tr> <td>浄水施設</td> <td>浄水施設</td> <td>凝集沈澱・急速ろ過方式 4,100m³/日</td> <td>1 式</td> </tr> <tr> <td rowspan="3">配水施設</td> <td>配水池</td> <td>700m³x1 池</td> <td>1 式</td> </tr> <tr> <td>配水ポンプ</td> <td>1.3m³/min x 50m x 22kW x4(内 1 予備)台</td> <td>1 式</td> </tr> <tr> <td>配水管</td> <td>φ75~φ300 x 37.3km, φ50 x 44km 計 81.3km</td> <td>1 式</td> </tr> <tr> <td>給水管接続</td> <td></td> <td>4,850</td> <td>箇所</td> </tr> </tbody> </table>	取水施設	取水口	4,510 m ³ /日	1 式	沈砂池		導水ポンプ	1.6m ³ /minx33mx18.5kWx3(内 1 予備)台		導水施設	導水管	φ300 x 7.8km	1 式	浄水施設	浄水施設	凝集沈澱・急速ろ過方式 4,100m ³ /日	1 式	配水施設	配水池	700m ³ x1 池	1 式	配水ポンプ	1.3m ³ /min x 50m x 22kW x4(内 1 予備)台	1 式	配水管	φ75~φ300 x 37.3km, φ50 x 44km 計 81.3km	1 式	給水管接続		4,850	箇所
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<p>6</p>	 <p>PUR_Case6</p> <p>給水区域(既存+拡張)</p> <p>投資効率性を重視した拡張区域の案</p>	<p>増加給水人口 37,300 人 増加一日最大給水量 6,600m³/日 事業費 35.56 億円(設計監理費含む)</p> <table border="1"> <tbody> <tr> <td rowspan="2">取水施設</td> <td>取水口</td> <td rowspan="2">7,260 m³/日</td> <td rowspan="2">1 式</td> </tr> <tr> <td>沈砂池</td> </tr> <tr> <td></td> <td>導水ポンプ</td> <td>2.5m³/min x 36m x30kWx 3(内 1 予備)台</td> <td></td> </tr> <tr> <td>導水施設</td> <td>導水管</td> <td>φ350x7.8km</td> <td>1 式</td> </tr> <tr> <td>浄水施設</td> <td>浄水施設</td> <td>凝集沈澱・急速ろ過方式 6,600m³/日</td> <td>1 式</td> </tr> <tr> <td rowspan="3">配水施設</td> <td>配水池</td> <td>1,300m³x1 池</td> <td>1 式</td> </tr> <tr> <td>配水ポンプ</td> <td>2.0m³/minx50mx30kWx4(内 1 予備)台</td> <td>1 式</td> </tr> <tr> <td>配水管</td> <td>φ75~φ300 x 37.3km, φ50 x 44km 計 128.1km</td> <td>1 式</td> </tr> <tr> <td>給水管接続</td> <td></td> <td>7,810</td> <td>箇所</td> </tr> </tbody> </table>	取水施設	取水口	7,260 m ³ /日	1 式	沈砂池		導水ポンプ	2.5m ³ /min x 36m x30kWx 3(内 1 予備)台		導水施設	導水管	φ350x7.8km	1 式	浄水施設	浄水施設	凝集沈澱・急速ろ過方式 6,600m ³ /日	1 式	配水施設	配水池	1,300m ³ x1 池	1 式	配水ポンプ	2.0m ³ /minx50mx30kWx4(内 1 予備)台	1 式	配水管	φ75~φ300 x 37.3km, φ50 x 44km 計 128.1km	1 式	給水管接続		7,810	箇所
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7	 <p>PUR_Case7</p> <p>給水区域(既存+拡張)</p> <p>投資効率性を重視した拡張区域の案で、 ケース6より範囲を広げた案</p>	増加給水人口 41,200 人 増加一日最大給水量 7,300m ³ /日 事業費 37.98 億円(設計監理費含む)																													
		<table border="1"> <tr> <td rowspan="2">取水施設</td> <td>取水口</td> <td rowspan="2">8,030 m³/日</td> <td rowspan="2">1 式</td> </tr> <tr> <td>沈砂池</td> </tr> <tr> <td></td> <td>導水ポンプ</td> <td>2.8m³/min x 33m x 30kW x3 (内1 予備)台</td> <td>1 式</td> </tr> <tr> <td>導水施設</td> <td>導水管</td> <td>φ450 x 7.8km</td> <td>1 式</td> </tr> <tr> <td>浄水施設</td> <td>浄水施設</td> <td>凝集沈澱・急速ろ過方式 7,300m³/日</td> <td>1 式</td> </tr> <tr> <td rowspan="3">配水施設</td> <td>配水池</td> <td>1,400m³x1 池</td> <td>1 式</td> </tr> <tr> <td>配水ポンプ</td> <td>2.2m³/min x 50m x 30kW x 4(内1 予備)台</td> <td>1 式</td> </tr> <tr> <td>配水管</td> <td>φ75~φ300 x 37.3km, φ50 x 44km 計 144.1km</td> <td>1 式</td> </tr> <tr> <td>給水管接続</td> <td></td> <td>8,640</td> <td>箇所</td> </tr> </table>	取水施設	取水口	8,030 m ³ /日	1 式	沈砂池		導水ポンプ	2.8m ³ /min x 33m x 30kW x3 (内1 予備)台	1 式	導水施設	導水管	φ450 x 7.8km	1 式	浄水施設	浄水施設	凝集沈澱・急速ろ過方式 7,300m ³ /日	1 式	配水施設	配水池	1,400m ³ x1 池	1 式	配水ポンプ	2.2m ³ /min x 50m x 30kW x 4(内1 予備)台	1 式	配水管	φ75~φ300 x 37.3km, φ50 x 44km 計 144.1km	1 式	給水管接続	
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<各ケース対象区域図の説明(参考)>





参考図 プルサットの家屋分布状況

出典：JICA 調査団。Google Earth をもとに家屋をプロットし作成

参考表) プルサットのピレッジと給水区域対象、対象外の関係

凡例 1:給水区域対象 0:給水区域対象外

No.	District	Commune	Village Number	Village Name	ピレッジレベル 優先順位1	ピレッジレベル 優先順位2	区域別	ケース1	ケース2	ケース3	ケース4	ケース5	ケース6	ケース7
1	I501Bakan	07_Snuam Preah	15010715	Svay Att	99	11	既存	1	1	1	1	1	1	1
2	I501Bakan	07_Snuam Preah	15010712	Kam Peanh Svay	8	5	既存	1	1	1	1	1	1	1
3	I501Bakan	07_Snuam Preah	15010707	Stock Svay	40	23	拡張	1	0	0	0	0	0	0
4	I501Bakan	07_Snuam Preah	15010703	Ang Doung Sambour	99	500	既存	1	0	0	0	0	0	0
5	I501Bakan	07_Snuam Preah	15010711	Ang long Mean	99	500	拡張	1	0	0	0	0	0	0
6	I501Bakan	07_Snuam Preah	15010717	Ang Doung Krasang	36	21	拡張	1	0	0	0	0	0	0
7	I501Bakan	07_Snuam Preah	15010701	Snuam Preah	35	20	既存	1	1	0	0	0	0	0
8	I501Bakan	07_Snuam Preah	15010716	A Rean	1	1	拡張	1	1	1	1	0	0	0
9	I501Bakan	07_Snuam Preah	15010719	Chheung Phleung	2	1	拡張	1	1	1	1	0	0	0
10	I501Bakan	07_Snuam Preah	15010702	Kra Peur Rol	99	20	拡張	1	1	0	0	0	0	0
11	I501Bakan	07_Snuam Preah	15010708	Koath Krasang	3	1	拡張	1	1	1	1	0	0	0
12	I501Bakan	07_Snuam Preah	15010710	Dang Keab Kdam	17	5	拡張	1	1	1	1	1	1	1
13	I501Bakan	07_Snuam Preah	15010714	Chhout Ta Cab	4	2	拡張	1	1	1	1	0	0	0
14	I501Bakan	07_Snuam Preah	15010718	Bak Preah	99	500	拡張	1	0	0	0	0	0	0
15	I501Bakan	10_Traprang Chomng	15011018	Kaley Chhmoul	38	22	拡張	1	0	0	0	0	0	0
16	I502Kandiang	01_Ahlong Vil	15020101	Toul Cha	99	101-102	既存	1	1	1	1	1	1	1
17	I502Kandiang	01_Ahlong Vil	15020102	On Bakon	99	101-102	既存	1	1	1	1	1	1	1
18	I502Kandiang	01_Ahlong Vil	15020103	Wat Por 1	99	101-102	既存	1	1	1	1	1	1	1
19	I502Kandiang	01_Ahlong Vil	15020104	Wat Por 2	99	101-102	既存	1	1	1	1	1	1	1
20	I502Kandiang	01_Ahlong Vil	15020107	Kancheut Baydak	99	101-102	既存	1	1	1	1	1	1	1
21	I502Kandiang	01_Ahlong Vil	15020108	Ang long Vil	99	16	既存	1	1	0	0	0	0	0
22	I502Kandiang	01_Ahlong Vil	15020109	Preak Ta Young	99	101-102	既存	1	1	1	1	1	1	1
23	I502Kandiang	01_Ahlong Vil	15020105	Kampong Kra bey	99	6	拡張	1	1	1	1	1	1	1
24	I502Kandiang	01_Ahlong Vil	15020106	Phlou Kra bey	99	6	拡張	1	1	1	1	1	1	1
25	I502Kandiang	01_Ahlong Vil	15020110	Preak Ta Kong	28	16	拡張	1	1	0	0	0	0	0
26	I502Kandiang	01_Ahlong Vil	15020111	Koath Kra sang	28	16	拡張	1	1	0	0	0	0	0
27	I502Kandiang	01_Ahlong Vil	15020112	Preak Chheut Trav	28	16	拡張	1	1	0	0	0	0	0
28	I502Kandiang	01_Ahlong Vil	15020113	Chey Chom mas	28	16	拡張	1	1	0	0	0	0	0
29	I502Kandiang	01_Ahlong Vil	15020114	Boeing Chhokk	28	16	拡張	1	1	0	0	0	0	0
30	I502Kandiang	01_Ahlong Vil	15020116	Khal Ro mas	28	16	拡張	1	1	0	0	0	0	0
31	I502Kandiang	03_Kandiang	15020304	Kandiang Knoung	99	17	既存	1	1	0	0	0	0	0
32	I502Kandiang	03_Kandiang	15020305	Kandiang	99	17	既存	1	1	0	0	0	0	0
33	I502Kandiang	03_Kandiang	15020306	Station	99	17	既存	1	1	0	0	0	0	0
34	I502Kandiang	03_Kandiang	15020307	Yous	99	17	既存	1	1	0	0	0	0	0
35	I502Kandiang	03_Kandiang	15020302	Keo Vi chey	99	24	既存	1	0	0	0	0	0	0
36	I502Kandiang	03_Kandiang	15020308	Prey Kaley Ieu	29	17	既存	1	1	0	0	0	0	0

参考表) プルサットのピレッジと給水区域対象、対象外の関係

凡例 1:給水区域対象 0:給水区域対象外

No.	District	Commune	Village Number	Village Name	ピレッジレベル 優先順位1	ピレッジレベル 優先順位2	区域別	ケース1	ケース2	ケース3	ケース4	ケース5	ケース6	ケース7
37	1502Kandiang	03_Kandiang	15020309	Prey Kley Kandal	29	17	既存	1	1	0	0	0	0	1
38	1502Kandiang	03_Kandiang	15020301	Kampong Roka	99	500	拡張	1	0	0	0	0	0	0
39	1502Kandiang	03_Kandiang	15020303	Svay Yeang	99	500	拡張	1	0	0	0	0	0	0
40	1502Kandiang	03_Kandiang	15020312	Bong Kol	99	500	拡張	1	0	0	0	0	0	0
41	1502Kandiang	03_Kandiang	15020313	Steung Leu	99	500	拡張	1	0	0	0	0	0	0
42	1502Kandiang	03_Kandiang	15020314	Steung Krom	99	500	拡張	1	0	0	0	0	0	0
43	1502Kandiang	03_Kandiang	15020315	Kampong Krasang leu	29	17	拡張	1	1	0	0	0	0	1
44	1502Kandiang	03_Kandiang	15020316	Kampong Krasang Krom	29	17	拡張	1	1	0	0	0	0	1
45	1502Kandiang	03_Kandiang	15020317	Boeung Chhook	29	17	拡張	1	1	0	0	0	0	1
46	1502Kandiang	07_Svay Luong	15020701	Boeung Krath	99	17	既存	1	1	0	0	0	0	1
47	1502Kandiang	07_Svay Luong	15020702	Rong Machine	99	17	既存	1	1	0	0	0	0	1
48	1502Kandiang	07_Svay Luong	15020703	Svay Luon	99	6	既存	1	1	1	1	1	1	1
49	1502Kandiang	07_Svay Luong	15020704	Svay Chan	99	6	既存	1	1	1	1	1	1	1
50	1502Kandiang	07_Svay Luong	15020705	Plouy portivong	9	6	既存	1	1	1	1	1	1	1
51	1502Kandiang	07_Svay Luong	15020706	Svay Cham bok	99	500	拡張	1	0	0	0	0	0	0
52	1502Kandiang	07_Svay Luong	15020707	Por Leung	99	500	拡張	1	0	0	0	0	0	0
53	1502Kandiang	07_Svay Luong	15020708	Ko Kor	99	500	拡張	1	0	0	0	0	0	0
54	1502Kandiang	07_Svay Luong	15020709	Sun lot	99	500	拡張	1	0	0	0	0	0	0
55	1502Kandiang	07_Svay Luong	15020710	Svay Yeang	99	500	拡張	1	0	0	0	0	0	0
56	1502Kandiang	09_Veal	15020901	Khal Hong	99	101-102	既存	1	1	1	1	1	1	1
57	1502Kandiang	09_Veal	15020902	Braly Thon	99	101-102	既存	1	1	1	1	1	1	1
58	1502Kandiang	09_Veal	15020903	Veal	99	101-102	既存	1	1	1	1	1	1	1
59	1502Kandiang	09_Veal	15020904	Por Kambor	99	101-102	既存	1	1	1	1	1	1	1
60	1502Kandiang	09_Veal	15020905	Kancheut Baydak	99	6	既存	1	1	1	1	1	1	1
61	1502Kandiang	09_Veal	15020906	Por Damnak	99	101-102	既存	1	1	1	1	1	1	1
62	1502Kandiang	09_Veal	15020907	Boeung Ya	99	6	既存	1	1	1	1	1	1	1
63	1502Kandiang	09_Veal	15020908	Ta Suley	99	6	既存	1	1	1	1	1	1	1
64	1502Kandiang	09_Veal	15020909	Toil Pon Ro	99	13	拡張	1	1	1	0	0	0	1
65	1502Kandiang	10_Kaoh Chum	15021002	Bridge	25	13	拡張	1	1	1	0	0	0	1
66	1502Kandiang	10_Kaoh Chum	15021003	Dong Ron	99	13	拡張	1	1	1	0	0	0	1
67	1502Kandiang	10_Kaoh Chum	15021004	Dong Lon	26	14	拡張	1	1	1	0	0	0	1
68	1502Kandiang	10_Kaoh Chum	15021001	Ang long hab	25	13	拡張	1	1	1	0	0	0	1
69	1502Kandiang	10_Kaoh Chum	15021005	Stock Chhom	26	14	拡張	1	1	1	0	0	0	1
70	1505Sampov Meas	01_Chamraeun Phal	15050101	Leav	24	12	拡張	1	1	1	0	0	0	1
71	1505Sampov Meas	01_Chamraeun Phal	15050103	Au Toung	24	12	拡張	1	1	1	0	0	0	1
72	1505Sampov Meas	01_Chamraeun Phal	15050107	Svay Meas	99	12	拡張	1	1	1	0	0	0	1

参考表) プルサットのピレッジと給水区域対象、対象外の関係

凡例 1:給水区域対象 0:給水区域対象外

No.	District	Commune	Village Number	Village Name	ピレッジレベル 優先順位1	ピレッジレベル 優先順位2	区域別	ケース1	ケース2	ケース3	ケース4	ケース5	ケース6	ケース7
73	I505Sampov Meas	03_Loelok Sa	15050301	Por ta koy	99	101-102	既存	1	1	1	1	1	1	1
74	I505Sampov Meas	03_Loelok Sa	15050302	Preak Sdey	99	101-102	既存	1	1	1	1	1	1	1
75	I505Sampov Meas	03_Loelok Sa	15050303	Loelok sa	99	10	既存	1	1	1	1	1	1	1
76	I505Sampov Meas	03_Loelok Sa	15050305	Phsar Leu	15	10	拡張	1	1	1	1	1	1	1
77	I505Sampov Meas	03_Loelok Sa	15050304	Phum Kok	14	10	拡張	1	1	1	1	1	1	1
78	I505Sampov Meas	03_Loelok Sa	15050306	Wat Loung	7	4	拡張	1	1	1	1	1	1	1
79	I505Sampov Meas	03_Loelok Sa	15050307	Chhoon rom siem	99	5	拡張	1	1	1	1	1	1	1
80	I505Sampov Meas	03_Loelok Sa	15050308	Dob Bat	6	3	拡張	1	1	1	1	1	0	0
81	I505Sampov Meas	03_Loelok Sa	15050310	Khmoar	5	3	拡張	1	1	1	1	1	0	0
82	I505Sampov Meas	04_Phteah Prey	15050401	Peal hbeak 1	99	101-102	既存	1	1	1	1	1	1	1
83	I505Sampov Meas	04_Phteah Prey	15050402	Peal hbeak 2	99	101-102	既存	1	1	1	1	1	1	1
84	I505Sampov Meas	04_Phteah Prey	15050403	Khal Hong	99	101-102	既存	1	1	1	1	1	1	1
85	I505Sampov Meas	04_Phteah Prey	15050405	North banana plantation	99	101-102	既存	1	1	1	1	1	1	1
86	I505Sampov Meas	04_Phteah Prey	15050406	South banana plantation	99	101-102	既存	1	1	1	1	1	1	1
87	I505Sampov Meas	04_Phteah Prey	15050407	Ou Sdav	23	11	既存	1	1	1	1	1	1	1
88	I505Sampov Meas	04_Phteah Prey	15050410	Ra	99	101-102	既存	1	1	1	1	1	1	1
89	I505Sampov Meas	04_Phteah Prey	15050408	Thmoat Threat	24	11	既存	1	1	1	1	1	1	1
90	I505Sampov Meas	04_Phteah Prey	15050409	Kork	99	13	既存	1	1	1	0	0	1	1
91	I505Sampov Meas	04_Phteah Prey	15050404	Doug ka	10	7	既存	1	1	1	1	1	1	1
92	I505Sampov Meas	05_Prey Nhi	15050501	Bak rotets	99	101-102	既存	1	1	1	1	1	1	1
93	I505Sampov Meas	05_Prey Nhi	15050502	Doung Chhroum	99	101-102	既存	1	1	1	1	1	1	1
94	I505Sampov Meas	05_Prey Nhi	15050503	Bralay Thoon	99	101-102	既存	1	1	1	1	1	1	1
95	I505Sampov Meas	05_Prey Nhi	15050504	Khal seen thmor	99	101-102	既存	1	1	1	1	1	1	1
96	I505Sampov Meas	05_Prey Nhi	15050505	Man clear	13	9	既存	1	1	1	1	1	1	1
97	I505Sampov Meas	05_Prey Nhi	15050507	Kuang Ta Sen	30	18	拡張	1	1	0	0	0	1	1
98	I505Sampov Meas	05_Prey Nhi	15050506	Sala Kom rou	99	18	拡張	1	1	0	0	0	1	1
99	I505Sampov Meas	05_Prey Nhi	15050508	Sras Strong	31	18	拡張	1	1	0	0	0	1	1
100	I505Sampov Meas	06_Roleab	15050601	Por Andat	99	101-102	既存	1	1	1	1	1	1	1
101	I505Sampov Meas	06_Roleab	15050604	Thmor Bombbeak	27	9	既存	1	1	1	1	1	1	1
102	I505Sampov Meas	06_Roleab	15050605	Concrete bridge	99	101-102	既存	1	1	1	1	1	1	1
103	I505Sampov Meas	06_Roleab	15050606	Chhoun kat	99	101-102	既存	1	1	1	1	1	1	1
104	I505Sampov Meas	06_Roleab	15050607	Steung Toch	99	101-102	既存	1	1	1	1	1	1	1
105	I505Sampov Meas	06_Roleab	15050611	Japan road	99	101-102	既存	1	1	1	1	1	1	1
106	I505Sampov Meas	06_Roleab	15050602	Preak Ori mal	34	19	既存	1	1	0	0	0	1	1
107	I505Sampov Meas	06_Roleab	15050609	Soriya leu	24	101-102	既存	1	1	1	1	1	1	1
108	I505Sampov Meas	06_Roleab	15050610	Soriya krom	24	101-102	既存	1	1	1	1	1	1	1

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凡例 1:給水区域対象 0:給水区域対象外

No.	District	Commune	Village Number	Village Name	ピレッジレベル優先順位1	ピレッジレベル優先順位2	区域別	ケース1	ケース2	ケース3	ケース4	ケース5	ケース6	ケース7
109	I505Sampov Meas	06_Roleab	15050613	Aur Phkeuv	99	500	拡張	1	0	0	0	0	0	0
110	I505Sampov Meas	06_Roleab	15050608	Roleab	99	500	拡張	1	0	0	0	0	0	0
111	I505Sampov Meas	06_Roleab	15050612	Preak Thout	24	101-102	拡張	1	1	1	1	1	1	1
112	I505Sampov Meas	06_Roleab	15050603	Toul Makak	27	15	拡張	1	1	0	0	0	0	1
113	I505Sampov Meas	07_Svay At	15050702	Kean Porniak	12	8	既存	1	1	1	1	1	1	1
114	I505Sampov Meas	07_Svay At	15050703	Trang	99	11	既存	1	1	1	1	1	1	1
115	I505Sampov Meas	07_Svay At	15050701	Station	99	8	既存	1	1	1	1	1	1	1
116	I505Sampov Meas	07_Svay At	15050705	On Svay	20	11	既存	1	1	1	1	1	1	1
117	I505Sampov Meas	07_Svay At	15050704	Svat At	19	11	既存	1	1	1	1	1	1	1
118	I505Sampov Meas	08_Bateay Dei	15050801	On Bakon leu	99	101-102	既存	1	1	1	1	1	1	1
119	I505Sampov Meas	08_Bateay Dei	15050802	On Bakon Krom	99	101-102	既存	1	1	1	1	1	1	1
120	I505Sampov Meas	08_Bateay Dei	15050803	On Bakon Kandul	99	101-102	既存	1	1	1	1	1	1	1
121	I505Sampov Meas	08_Bateay Dei	15050804	Keo Sovann leu	99	101-102	既存	1	1	1	1	1	1	1
122	I505Sampov Meas	08_Bateay Dei	15050805	Keo Sovann krom	99	101-102	既存	1	1	1	1	1	1	1
123	I505Sampov Meas	08_Bateay Dei	15050807	Khal Hong	99	101-102	既存	1	1	1	1	1	1	1
124	I505Sampov Meas	08_Bateay Dei	15050808	Bondeus Santadek	99	101-102	既存	1	1	1	1	1	1	1
125	I505Sampov Meas	08_Bateay Dei	15050809	Ouek Sliam	99	101-102	既存	1	1	1	1	1	1	1
126	I505Sampov Meas	08_Bateay Dei	15050810	Banteay dey leu	99	101-102	既存	1	1	1	1	1	1	1
127	I505Sampov Meas	08_Bateay Dei	15050811	Banteay dey krom	99	101-102	既存	1	1	1	1	1	1	1
128	I505Sampov Meas	08_Bateay Dei	15050812	Keo Mony	32	18	拡張	1	1	0	0	0	0	1
129	I505Sampov Meas	08_Bateay Dei	15050806	Ta Koy	99	18	拡張	1	1	0	0	0	0	1

注) ピレッジレベル優先順位 1:先方政府が設定した優先順位(1~40、数字の小さい方が優先度が高い)、99:優先順位設定なし。
ピレッジレベル優先順位 2:ピレッジレベル優先順位 1 をもとにピレッジをグループ化し設定した優先順位(1~23、数字の小さい方が優先度が高い)、101-102 は既存区域、500:優先順位設定なし

資料 7.13

プロジェクトモニタリングレポート

<p><u>Project Monitoring Report</u></p> <p>on</p> <p><u>Project Name</u></p> <p>Chapter 1. Grant Agreement No. <u>XXXXXXXX</u></p> <p>20XX, Month</p>

Organizational Information

Signer of the G/A (Recipient)	_____ Person in Charge (Designation) _____ _____ Contacts Address: _____ Phone/FAX: _____ Email: _____
Executing Agency	<u>Ministry of Industry and Handicraft (MIH)</u> Person in Charge <u>H.E. OUM SOTHA, Secretary of State</u> <u>Ministry of Public Works and Transport</u> Contacts Address: <u>45, Preah Norodom Boulevard</u> Phone/FAX: <u>+855-97-77-11111</u> Email: <u>eksonnchan@hotmail.com</u>
Line Ministry	_____ Person in Charge (Designation) _____ _____ Contacts Address: _____ Phone/FAX: _____ Email: _____

General Information:

Project Title	The Project for Expansion of Water Supply Systems in Pursat
E/N	Signed date: Duration:
G/A	Signed date: Duration:
Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____

1: Project Description

1-1 Project Objective

The overall goal of the project is to contribute to the social development through the expansion of water supply system in Pursat, Cambodia. The purpose of the project is as follows;

- 1) Improving living environment of the residents
- 2) Increasing house connections for the poor household

1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

Ability of water supply to the residents in Pursat City is expanded by this project. The water supply coverage ratio of approximately 38% in 2018 in the controlled area of the Water Works will be risen to 67.9% in the target year:2025. The ratio in the urban area advocated by MIH becomes 86.1%. Increased benefit population is approximately 39,900 people. The additional daily average water supply volume and daily maximum water supply volume are approximately 5,800m³/day and 7,100m³/day respectively.

Although the Pursat City has an existing water supply system, the expansion of the system becomes the urgent matter for the further improvement of the water supply coverage ratio because the ratio remains in approximately 38% in 2018.

MIH aims to work out 100% of the water supply coverage ratio in the urban area by 2025 by covering 90% with pipe water supply system and remaining 10% with other water supply system. This aim can be almost accomplished in the urban area within the administrative area of the Waterworks. This project also includes supplying equipment and materials to the poor households for house connection works conducted by the Cambodian side. Therefore, the consistency with the poverty reduction which is the greatest purpose in NPDS is ensured.

According to “Rolling Plan for the Royal Government of Cambodia, July 2017”, one of the important priority areas is “Promotion of Social Development” including “Program for Water Supply and Sewage System”. The implementation of this project has consistency with this Japan’s ODA policy.

1-3 Indicators for measurement of “Effectiveness”

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr: 2018)	Target (Yr: 2025)
Dairy average water supply volume (m ³ /day)	5,607	11,386
Population served (Person)	37,661	75,033
Qualitative indicators to measure the attainment of project objectives		
➤ Improving living environment of the residents		
➤ Increasing house connections for the poor household		

2: Details of the Project

2-1 Location

Components	Original <i>(proposed in the outline design)</i>	Actual
1. Intake Pump Station	(1) 220m upstream of Damnak Ampil HW	
2. Water Treatment Plant	(2) 8.3km downstream of intake point	

2-2 Scope of the work

Components	Original* <i>(proposed in the outline design)</i>	Actual*
1. Intake Facility, 7,260m ³ /day	(1) Sedimentation pond: (Circular Elevated Tank) 7,260m ³ /day x 1 pond (2) Intake Pump Facility Pump Room with intake pump: (5.04m ³ /min x 2 sets) Personnel Office	
2. Conveyance Facility	(1) DCIP ϕ 350 x 8.3km (2) Bridge piggy-backed pipe: SP ϕ 350 x 4 sites	
3. Water Treatment Plant	(1) Receiving well (1Basin) Volume: 27.5m ³ , Retention Time: 5.5min (2) Mixing Well (1Basin) Volume: 9.27m ³ , Retention Time: 1.83min (3) Flocculation Basin (2Basin) Up-and-Down Roundabout Type (zigzag flow) (4) Sedimentation Basin (2Basin) Surface Loading: Q/A=18.0mm/min Mean Velocity (V): 0.08m/min (5) Rapid Sand Filter (4Basin) (Reference) Filtration Rate (V): 121m/day Backwash Method: Air Wash + Water Wash (6) Service Reservoir (2Basin) Effective Volume: 1,152m ³ (576m ³ ×2Basins) Retention Time: 8.4hours (7) Drainage Basin (2Basin) Volume: 228.8m ³ (114.4m ³ ×2Basins) (8) Drying Bed (4Bed) Effective Area: 536.8m ² (9) Chemical Feeding Facilities (1Unit) (10) Power Generator Equipment (in Chemical Building) (1Unit) Capacity: 350KVA	

	<p>(11) Chemical Building (1Unit) 3Storey Building, Total Floor Area (A):425.8m²</p> <p>(12) Administration Building (1Unit) 1 Story Building, Total Floor Area (A): 266.7m²</p>	
4. Distribution Facility	<p>(1) Service Reservoir (inside new WTP) Capacity: V=1,100 m³×2</p> <p>(2) Distribution Pump Facilities (inside new WTP) Horizontal Volute Pump 3.5m³/min (3 Pumps)</p> <p>(3) Distribution Mains (DCIP: T type) φ400mm L= 0.1km / φ350mm L= 5.8km / φ300mm L= 1.4km / (HDPE) φ250mm L= 6.6km φ200mm L= 11.2km / φ150mm L= 10.3km / φ100mm L= 16.5km / φ 80mm L= 7.7km / φ 50mm L= 23.1km</p> <p>(4) Water Main Bridge (Steel Pipe)φ 80mm 1 Place</p> <p>(5) Bridge-piggybacked Water Main (Steel Pipe) φ300mm 3 Place / φ250mm 4 Places / φ200mm 8 Places / φ150mm 10 Places / φ100mm 6 Places / φ 80mm 8 Places / φ 50mm 1 Place</p> <p>(6) Monitoring equipment of water distribution (ILS)</p>	
5. Procurement of equipment	<p>(1) Jar tester, distilled water maker, pH meter, residual chlorine meter, conductance meter, water bath, microscope, continuous water quality analyzer for conductivity and residual chlorine, absorptiometer, UPS, microorganism analyzer, reagents, glassware, laboratory table etc.</p> <p>(2) Tools for Mechanical Equipment Clamp Power Meter, Vibration Checker, Mechanical Torque Wrench, Portable Ultrasonic Flow meter, Sieve Shaking Machine</p> <p>(3) Equipment for management of distribution pipes Butt Fusion Machine for PE Pipes</p> <p>(4) Equipment and materials for house connection to poor households Water supply pipes, water meters and</p>	

	accessories (5) Accounting system SUMS system (PC and extra software license) quality management	
6. Soft Component	(1) Formulating and learning work procedures for new facilities (2) Distribution flow monitoring (3) Ensuring quality of service connection installations (4) Promotion of applications for service connections (5) Improvement of production management Creation and revision of SOP	
7. Consulting Services	Detailed design, bidding assistance and construction supervision	

Reasons for modification of scope (if any).

(PMR)

2-3 Implementation Schedule

Items	Original		Actual
	<i>(proposed in the outline design)</i>	<i>(at the time of signing the Grant Agreement)</i>	
Cabinet approval	11/2019		
E/N	12/2019		
G/A	12/2019		
Detail Design	01/2020-06/2020		
Tender Notice	07/2020		
Tender	10/2020		
Award to Contract	10/2020		
Completion of Contract	11/2022		
Defect Liability Period	11/2023		
Project Completion	11/2023		

Reasons for any changes of the schedule, and their effects on the project (if any)

2-4 Obligations by the Recipient

2-4-1 Progress of Specific Obligations

See Attachment 2.

2-4-2 Activities

See Attachment 3.

2-4-3 Report on RD

See Attachment 11.

2-5 Project Cost

2-5-1 Cost borne by the Grant (Confidential until the Bidding)

Components			Cost(Million Yen)	
	Original (proposed in the outline design)	Actual (in case of any modification)	Original ^{1),2)} (proposed in the outline design)	Actual
Construction Facilities	1. Intake Facilities 2. Water Treatment Plant 3. Water Conveyance and Distribution Pipes			
Equipment	1. Water Quality Analysis Equipment 2. Tools for Mechanical Equipment 3. Accounting System Equipment 4. Service Connection Installations			
Consulting Services	1. Detailed Design 2. Construction Supervision 3. Soft Component			
Total				

Note: 1) Date of estimation: April, 2019

2) Exchange rate: 1 US Dollar = 111.21 Yen

2-5-2 Cost borne by the Recipient

Components			Cost (USD)	
	Original (proposed in the outline design)	Actual (in case of any modification)	Original ¹⁾ (proposed in the outline design)	Actual
1	Land leveling for the Intake and WTP		437,305	
2	Rental Cost for Temporary Yard		49,978	
3	UXO Survey for Temporary Yard		20,527	
4	Environmental Monitoring for Noise, Vibration and Treatment of Dry Sludge		8,925	
5	Contracting process of broadband LAN connection for the distribution information system		4,463	
6	Transmission of electricity to the Intake facilities and WTP		51,763	
7	Bank arrangement Charge and Commission of Authorization to Pay		22,313	
8	Connection equipment for poor households (poor level 2: 885 houses)		5,710	
9	Installation of connection equipment for poor households (poor level 1: 257 houses + poor level 2: 885 houses)		60,180	
			661,164	

Note: 1) Date of estimation: April, 2019

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

2-6 Executing Agency

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original (at the time of outline design)

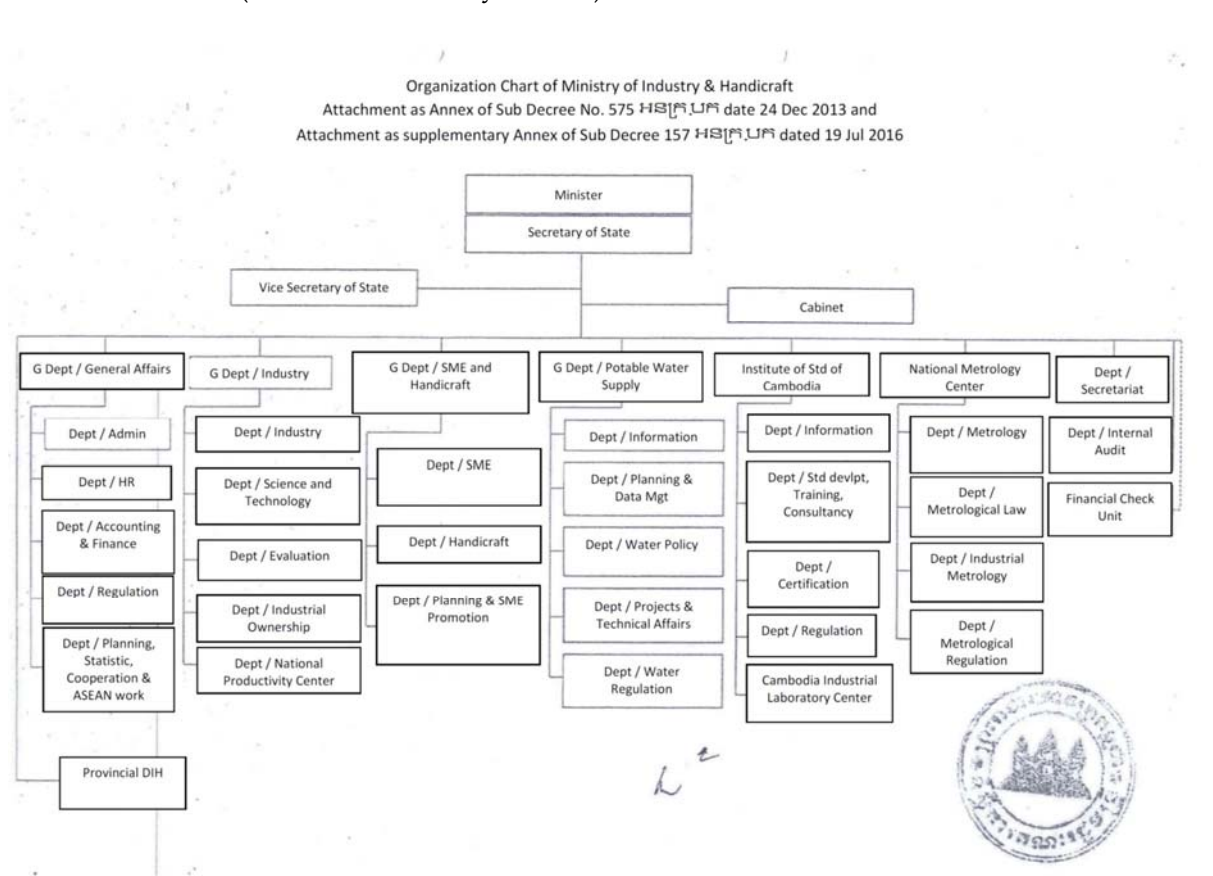
name: Ministry of Industry and Handicraft (MIH)

role:

financial situation:

institutional and organizational arrangement (organogram):

human resources (number and ability of staff):



Actual (PMR)

2-7 Environmental and Social Impacts

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

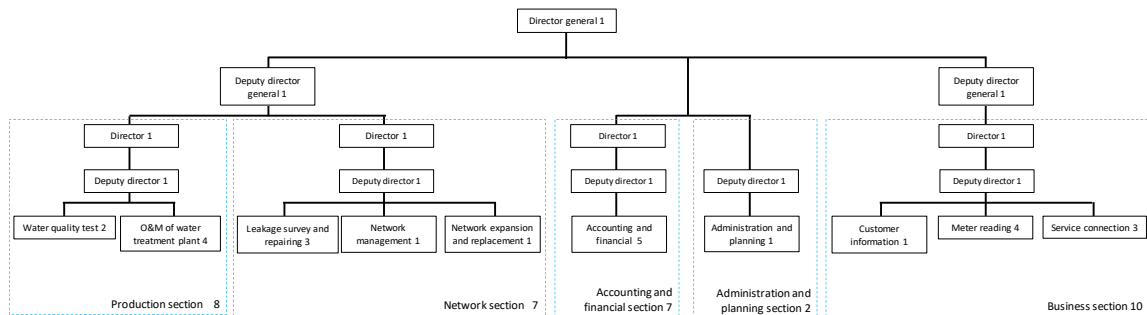
3: Operation and Maintenance (O&M)

3-1 Physical Arrangement

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

Original (at the time of outline design)

Current organization of Pursat Waterworks is shown below;



Actual (PMR)

3-2 Budgetary Arrangement

- Required O&M cost and actual budget allocation for O&M

Original (at the time of outline design)

Outline of Profit and Loss (PL) Statement in Pursat Waterworks in 2018 is shown below

(Unit: Riel)

Revenue		Expense	
Water Sales	3,052,797,400	Personnel	585,366,066
Other Revenue	137,110,800	Material/Chemical	239,260,503
Revenue Total	3,189,908,200	Electricity/Fuel	642,862,906
		Depreciation	579,718,538
		Interest Payment	81,077,903
		Taxes	54,878,165
		Other	600,367,784
		Expense Total	2,783,531,865
Net Profit			406,376,335

Actual (PMR)

4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

Assessment of Potential Risks (at the time of outline design)

Potential Risks	Assessment
-----------------	------------

1. To complete the investigation and removal of UXO and Mines in all construction and temporary areas	Probability: High/ <u>Moderate</u> /Low
	Impact: High/ <u>Moderate</u> /Low
	Analysis of Probability and Impact:
	The clearance of UXO/Mines for the construction area is essential for the project commencement. Without the clearance of UXO/Mines, the construction work will not be started.
	Mitigation Measures:
	Discussing the clearance of UXO/Mines in well advance, and to ask the clearance completed prior to the bidding announcement as "Major Undertakings to be taken by the Government of Cambodia".
	Action required during the implementation stage:
	The clearance of UXO/Mines required prior to the bidding announcement.
	Contingency Plan (if applicable):
The delay of UXO clearance causes the contractor's claims. Therefore, in case UXO clearance may be delayed, the timing of bidding shall be postponed.	
2. To secure and clear the temporary construction yard near the Project area	Probability: High/ <u>Moderate</u> /Low
	Impact: High/ <u>Moderate</u> /Low
	Analysis of Probability and Impact:
	The temporary yard will be required prior to the bidding announcement to commence the construction work smoothly.
	Mitigation Measures:
	Discussion of the temporary construction yard in well advance so that the securing of the yard could complete prior to the bidding announcement.
	Action required during the implementation stage:
	The securing of the temporary construction yard is required prior to the bidding announcement.
	Contingency Plan (if applicable):
The delay of UXO clearance causes the contractor's claims. Therefore, in case UXO clearance may be delayed, the timing of bidding shall be postponed.	
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
Contingency Plan (if applicable):	
Actual Situation and Countermeasures	
(PMR)	

5: Evaluation and Monitoring Plan (after the work completion)

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/ department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

Attachment

1. Project Location Map
2. Specific obligations of the Recipient which will not be funded with the Grant
3. Monthly Report submitted by the Consultant
- Appendix - Photocopy of Contractor's Progress Report (if any)
 - Consultant Member List
 - Contractor's Main Staff List
4. Check list for the Contract (including Record of Amendment of the Contract/Agreement and Schedule of Payment)
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final)only)
8. Pictures (by JPEG style by CD-R) (PMR (final)only)
9. Equipment List (PMR (final)only)
10. Drawing (PMR (final)only)
11. Report on RD (After project)

Attachment 1 Project Location Map



Attachment 2 Specific obligations of the Government of Cambodia which will not be funded with the Grant

(1) Before the Tender

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To open bank account (B/A)	within 1 month after the signing of the G/A	MEF	\$4,463	
2	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the consultant	within 1 month after the signing of the contract(s)	MIH		
3	To approve IEIA (Conditions of approval should be fulfilled, if any) and secure the necessary budget for implementation	within 1 month after the signing of the G/A	MIH		
4	To contract land lease in order to secure the temporary yard	before notice of the bidding document(s)	MIH	\$49,978	
5	To obtain the planning, zoning, building permit	before notice of the bidding document(s)	MIH		
6	To clear, level and reclaim the following sites 1) Embankment at proposed water treatment plant site and intake pump station site 2) To explore landmines and UXO at construction site and temporary yard	before notice of the bidding document(s)	MIH	\$437,305	
			MIH	\$20,527	
7	To submit Project Monitoring Report (with the result of Detail Design)	before preparation of bidding document(s)	MIH		

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the Supplier(s)	within 1 month after the signing of the contract(s)	MIH	\$4,463	
2	To bear the following commissions to a bank in Japan for the banking services based upon the B/A				

NO	Items	Deadline	In charge	Estimated Cost	Ref.
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)	MIH		
	2) Payment commission for A/P	every payment	MEF	\$13,387	
3	To ensure prompt unloading and customs clearance at ports of disembarkation in Cambodia and to assist the Supplier(s) with internal transportation therein	during the Project	MIH		
4	To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the Cambodia and stay therein for the performance of their work	during the Project	MEF		
5	To ensure that customs duties, VAT, internal taxes and other fiscal levies which may be imposed in Cambodia with respect to the purchase of the products and/or the services be exempted by its designated authority without using the Grant;	during the Project	MEF		
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project			
7	1) To submit Project Monitoring Report	every month	MIH		
	2) To submit Project Monitoring Report (final)	within one month after signing of Certificate of Completion for the works under the contract(s)	MIH		
8	To submit a report concerning completion of the Project	within six months after completion of the Project	MIH		
9	To get permit for construction of temporary access bridges for laying water pipes and lease necessary land for approach road to the temporary access bridges (if necessary)	1 month before the start of the construction	Local Communities, MIH		

NO	Items	Deadline	In charge	Estimated Cost	Ref.
10	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the site(s)				
	1) Electricity The distributing line to the site	before start of the construction	MIH	\$51,763	
	2) Information System Contracting process of broadband LAN connection for the distribution information system	2 months before completion of the construction	MIH	\$4,463	
11	To take necessary measure for safety construction - traffic control - rope off	during the construction	MIH		
12	To implement EMP and EMoP	during the construction	MIH		
13	To submit results of environmental monitoring to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	during the construction	MIH		
14	To obtain permission for occupancy of roads for the pipe laying work	before start of the construction for conveyance, transmission and distribution pipes	MIH (PWW ¹)		
15	To obtain all permissions required for the project implementation such as construction permission for intake facility and water treatment facility	before start of the construction	MIH (PWW)		
16	To recruit new staff members who are necessary for the operation of new system	up to the end of 2025	MIH (PWW)		
17	To establish the construction scheme for the new service pipe connections, including hiring temporary work force. To carry out the technical guidance, budgeting, planning and publicity for enhancing new connections.	up to the end of 2025	MIH (PWW)		

¹ PWW: Provincial Waterworks

NO	Items	Deadline	In charge	Estimated Cost	Ref.
18	To identify poor household (planning households is 2,469) ²	up to the end of 2025	MIH (PWW)		

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To implement EMP and EMoP	for a period based on EMP and EMoP	MIH	\$8,925	
2	To submit results of environmental monitoring to JICA, by using the monitoring form, semiannually - The period of environmental monitoring may be extended if any significant negative impacts on the environment are found. The extension of environmental monitoring will be decided based on the agreement between MIH and JICA.	for 3 years after the Project	MIH		
3	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection	after completion of the construction	MIH		
4	To work for service pipe connection (planned number of households (HHs) is 7,625) The implementation plan is about 1,906 connections per year after completion. (Maximum is 2,112 connections per year). (in 2019: 78HHs, in 2020: 78HHs, in 2021: 79HHs, in 2022: 1,054HHs, in 2023: 2,112HHs, in 2024: 2,112HHs, in 2025: 2,112HHs) 1) Establishment of construction scheme including hiring temporary staff for service connection work, providing guidance, budgeting, planning and publicity for enhancing new connections.	up to the end of 2025	MIH (PWW)		
	2) Connection for the poor level 1 household (257 HHs) - Material is procured by Japanese side, connection work is conducted by Cambodian side. 3) Connection for household without poverty group (7,368			\$65,890	

² Planning household number of 2,469 is an estimation referable in the section of 2-2-2-7 (5) in the draft final report. At the construction, PWW shall identify the target household.

	households) - Material and connection work is under responsibility of Cambodian side.				
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Attachment 5 Environmental Monitoring Form / Social Monitoring Form

1) Environmental Check List

Category	Environmental Item	Main Check Items	Yes: Y No : N	Specific Environmental and Social Considerations (Reason for Yes or No, rationale, mitigation measures, etc.)
1 Approvals, explanations	(1) EIA and Environmental Permits	<p>(a) Have EIA reports been already prepared in official process?</p> <p>(b) Have EIA reports been approved by authorities of the host country's government?</p> <p>(c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?</p> <p>(d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?</p>	<p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p> <p>(d) Y</p>	<p>(a) IEIA is required. Preparation is in the process. It will be submitted in May 2018.</p> <p>(b) It will be approved after submission.</p> <p>(c) MOE will give all consents at approval of IEIA.</p> <p>(d) MIH obtained the permission of water extraction from Pursat River by MOWRAM.</p>
	(2) Explanation to the Local Stakeholders	<p>(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders?</p> <p>(b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?</p>	<p>(a) Y</p> <p>(b) N</p>	<p>(a) All related departments of city hall understood the project purpose and contents, and they agreed on the implementation. At the public hearing, the villagers welcomed the project. They wished for the affordable price setting of connection and assistance to poor. There is no particular objection.</p> <p>(b) Disturbance on traffic was suspected, it will be solved by the setting of detour and information sharing of construction program.</p>
	(3) Examination of Alternatives	<p>(a) Have multiple alternative plans for the Project been analyzed? (Including analysis of items related to the environment/society.)</p>	<p>(a) Y</p>	<p>(a) Alternatives have been examined for the site selection of intake and WTP, and extent of the supply area.</p>
2 Pollution Measures	(1) Air Quality	<p>(a) Is there a possibility that chlorine from chlorine storage facilities and chlorine injection facilities will cause air pollution? Are any mitigating measures taken?</p> <p>(b) Do chlorine concentrations within the working environments comply with the country's occupational health and safety standards?</p>	<p>(a) N</p> <p>(b) Y</p>	<p>(a) The Project plans to use breaching power for disinfection. This reagent is stable, and occurrence of air pollution is considered less. The exhaust fan will be situated at the facilities of disinfection.</p> <p>(b) The above measures serve to keep appropriate working condition.</p>

Category	Environmental Item	Main Check Items	Yes: Y No : N	Specific Environmental and Social Considerations (Reason for Yes or No, rationale, mitigation measures, etc.)
	(2) Water Quality	(a) Do pollutants, such as SS, BOD, COD contained in effluents discharged by the facility operations comply with the country's effluent standards?	(a) N/A	Discharge generated at the treatment process will be recycled, and sludge will be dried. Therefore, any effluent from treatment process will not be generated. Sewage will be treated by septic tanks and clear upper portion will be infiltrated into ground. Therefore, the discharge water is not generated.
	(3) Wastes	(a) Are wastes, such as sludge generated by the facility operations properly treated and disposed in accordance with the country's regulations?	(a) Y	(a) Sludge will be treated and dried at dry-bed, then dumped to the dumping yard prepared by the PWW.
	(4) Noise and vibration	(a) Do noise and vibrations generated from the facilities, such as pumping stations comply with the country's standards?	(a) Y	(a) The pump will be installed at basement made by the RC with the noise reducing walls. The noise will be controlled within the limit of RGC requirement. There is no standards of vibration, but it is controlled in permissible limit by the above measures.
	(5) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) N	(a) The Project does not use groundwater.
3 Natural Environment	(1) Protected areas	(a) Is the project site or discharge area located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) There are no protected areas within the vicinity of the Project Site.
	(2) Ecosystems	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site or discharge area encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that the amount of water used (e.g., surface water,	(a) N (b) N (c) N (d) N	(a) The site does not contain any virgin forests, tropical old-growth forests, or important ecological habitats. (b) No habitats for any rare species are present in the site. (c) No major concerns. (d) No major concerns

Category	Environmental Item	Main Check Items	Yes: Y No : N	Specific Environmental and Social Considerations (Reason for Yes or No, rationale, mitigation measures, etc.)
		groundwater) by project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?		
	(3) Hydrology	(a) Is there a possibility that the amount of water used (e.g., surface water, groundwater) by the project will adversely affect surface water and groundwater flows?	(a) N	(a) At the time of serious draught, the Pursat River had enough discharge to cover the intake amount for the project. Therefore, the hydrological impact is not significant.
4. Social Environment	(1) Resettlement	<p>(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?</p> <p>(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?</p> <p>(c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?</p> <p>(d) Is the compensation going to be paid prior to the resettlement?</p> <p>(e) Are the compensation policies prepared in document?</p> <p>(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?</p> <p>(g) Are agreements with the affected people obtained prior to resettlement?</p> <p>(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?</p> <p>(i) Are any plans developed to monitor the impacts of resettlement?</p> <p>(j) Is the grievance redress mechanism established?</p>	<p>(a)N</p> <p>(b) N/A</p> <p>(c) N/A</p> <p>(d) N/A</p> <p>(e) N/A</p> <p>(f) N/A</p> <p>(g) N/A</p> <p>(h) N/A</p> <p>(i) N/A</p> <p>(j) N/A</p>	(a) There will be no involuntary settlement, meaning that questions (b)-(j) are not applicable.
	(2) Living and Livelihood	<p>(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?</p> <p>(b) Is there a possibility that the amount of</p>	<p>(a) N</p> <p>(b) N</p>	<p>(a) The project has positive impact to improve basic human needs. There is no particular negative impact.</p> <p>(b) The Pursat River has enough discharge capacity and the</p>

Category	Environmental Item	Main Check Items	Yes: Y No : N	Specific Environmental and Social Considerations (Reason for Yes or No, rationale, mitigation measures, etc.)
		water used (e.g., surface water, groundwater) by the project will adversely affect the existing water uses and water area uses?		intake of water supply does not affect significantly.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) No anthropological, historical, cultural, religiously important heritages or historical remains have been identified in the project site.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) The building location is in paddy field and residents are rare in the vicinity, therefore the impact on landscape is not significant.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a)(b) There are no ethnic minorities or indigenous peoples living near the project site.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) Y (b) Y (c) Y (d) Y	(a) Adherence to laws concerning working conditions will be made explicit in contracts with contractors and managed. (b) Countermeasures such as installation of safety handrail are taken. (c) It will be achieved to set as an obligation of contractor in contract document. (d) Security guards will be included in target members of worker training.
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce	(a) Y (b) N (c) Y (d) N	(a) Mitigation measures will be taken under EPM for managing all noise, vibration, turbid water, dust, gas emissions, and waste discharged from the work site.

Category	Environmental Item	Main Check Items	Yes: Y No : N	Specific Environmental and Social Considerations (Reason for Yes or No, rationale, mitigation measures, etc.)
		<p>impacts?</p> <p>(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?</p> <p>(d) If the construction activities might cause traffic congestion, are adequate measures considered to reduce such impacts?</p>		<p>(b) Particular negative impact is not expected.</p> <p>(c) Temporary traffic disturbance will occur. The negative effect will be minimized by the measures such as setting of detour, assignment of traffic guide, installation of signboard, appropriate information sharing.</p> <p>(d) This is an expansion of the water supply and construction site is out of the city center. Therefore, serious traffic congestion is not expected.</p>
	(2) Monitoring	<p>(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?</p> <p>(b) What are the items, methods and frequencies of the monitoring program?</p> <p>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?</p> <p>(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?</p>	<p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p> <p>(d) Y</p>	<p>(a) MIH is responsible for the monitoring as in previous similar project which they are experienced.</p> <p>(b) It will be determined in EMO.P.</p> <p>(c) Monitoring by proponent is a part of usual operation activities. The training will be given as a part of soft component.</p> <p>(d) It is stipulated in the EMP.</p>
6 Focal points	Reference to Checklist of Other Sectors	<p>(a) Where necessary, pertinent items described in the Dam and River Projects checklist should also be checked.</p>	<p>(a) N</p>	<p>(a) The intake amount is not much, and the intake structure is small scale at the upper flow of existing headwork. Therefore, it is not necessary to refer the checklist of Dam and River Projects</p>
	Precautions when using the environmental checklist	<p>(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).</p>	<p>(a) N</p>	<p>(a) None</p>

2) Environmental Management Plan / Environmental Monitoring Plan

Impact	Parameter	Monitoring Method	Monitoring Point	Frequency	Responsibility
Construction					
Air Pollution	Dust	Visual observation	Vicinity of construction site	Daily	Contractor
	Exhaust gas	Inspection of registered vehicle	Construction Office	Monthly	Contractor
Noise and vibration	Working time	Working record	Construction site	Daily during construction	Contractor
	Management of vehicles	Inspection of registered vehicles	Construction Office	Monthly	Contractor
	Guidance to operator	Training record	Construction Office	Once during construction	Contractor
Water Pollution and sediment	Turbidity, oil	Visual inspection	Inlet of discharge	Weekly but daily during construction of foundation	Contractor
	Water quality	pH, EC, BOD, turbidity, oil	Inlet of discharge	When abnormal incident is observed	Contractor
Solid Waste (domestic)	Proper management	Visual inspection	Domestic waste	Weekly	Contractor
Solid Waste (Construction)	Proper dumping	Visual inspection	Temporary dumping yard	At the time of dumping	Contractor
	Preparation of dumping site	Contract document	Dumping site for soil waste	At the time of contract	PWW, MIH
Ecosystem	Ban of hunting and fishing	Training record	Construction Office	Monthly	Contractor
Hydrology	Construction schedule in rainy season	Monthly construction report	Construction Office	Monthly during rainy season	Contractor
Land and local resource usage	Lease of land	Contract document	Construction Office	At the time of contract of lease	PWW、MIH
Existing social infrastructure and services	Mitigation measures to prevent traffic disturbance	Monthly construction report	Construction Office	Monthly	Contractor
HIV/AIDS and other infectious disease	Management of occupational safety and hygiene	Monthly construction report	Construction Office	Monthly	Contractor
Working condition	Management of occupational safety and hygiene	Monthly construction report	Construction Office	Monthly	Contractor
Accident	Traffic plan of construction vehicle	Plan	Construction Office	At planning	Contractor
	Safety training	Monthly construction report	Construction Office	Monthly	Contractor
Miscellaneous	Complaint management	Analysis of complaint	Construction Office	Monthly	Contractor

Impact	Parameter	Monitoring Method	Monitoring Point	Frequency	Responsibility
Operation					
Waste	Appropriate treatment of sludge	Monitoring record	WTP	Every three months	PWW
	Preparation of dumping site for sludge	Contract document	PWW	At the time of contract	PWW
Noise and vibration	Monitoring with standard operating procedure (SOP)	SOP and monitoring record	Pumping station	Every three months	PWW
	Guidance for operators	Training record	Pumping station	Every three months	PWW

3) Environmental and Social Monitoring Form

Monitoring Form (Construction)

Construction site (Daily monitoring)

Monitoring Item		Procedure	Result	Measures to be taken	Reference standard	Frequency
Dust		Visual inspection			Acceptable or not	Daily
Noise		Sensory inspection			Acceptable or not	Daily
		Operation time check			Stated operation time in EMP	Daily
Water Quality (turbidity, oil)		Visual inspection			Acceptable or not	Daily (during foundation work)
Water Quality	pH	Laboratory test			5 - 7	Determined by the monitoring result
	EC				80	
	BOD				10	
	Turbidity				250	
						In case of abnormal observation of turbidity or oil

Construction site (Weekly monitoring)

Monitoring Item		Procedure	Result	Measures to be taken	Reference standard	Frequency
Waste (Domestic)		Patrol			Acceptable or not	Weekly

Construction site (Monthly monitoring)

Monitoring Item		Procedure	Result	Measures to be taken	Reference standard	Frequency
Condition of construction machinery and vehicles		Maintenance record check			Acceptable or not (Exhaust gas, noise, vibration, and usual safety check)	
Traffic management		Patrol			Stated procedure in EMP	Monthly
Accident		Patrol			Acceptable or not	Monthly
Training and educational meeting to worker		Report check			Stated procedure in EMP (frequency, contents, target, etc.)	
Claim and comment		Report check			Acceptable or not	Monthly

Others

Monitoring Item		Procedure	Result	Measures to be taken	Reference standard	Frequency
Land for waste dumping Land for temporary use		Lease condition			Appropriate or not	Contract of lease
Plan of safety transportation		Plan check			Acceptable or not	At planning

Source: JICA Survey Team

Monitoring Form (Operation)

Monitoring Item		Procedure	Result	Measures to be taken	Reference standard	Frequency
Waste (treatment sludge)		Patrol			Appropriate or not	Monthly
Land for waste dumping		Procedure check			Appropriate or not	At contract agreement
Noise and vibration*		Patrol and maintenance			Normal condition or not	Daily

*Noise and vibration of pump shall be checked in an operation record every day.

Attachment 6 Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment	
					Price (Decreased) E=C-D	Price (Increased) F=C+D
1 Item 1	●●t	●	●	●	●	●
2 Item 2	●●t	●	●	●		
3 Item 3						
4 Item 4						
5 Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

Items of Specified Materials	1st month, 2015	2nd month, 2015	3rd month, 2015	4th	5th	6th
1 Item 1	●	●	●			
2 Item 2						
3 Item 3						
4 Item 4						
5 Item 5						

(3) Summary of Discussion with Contractor (if necessary)

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Attachment 7 Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)

(Actual Expenditure by Construction and Equipment each)

	Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost	(A/D%)	(B/D%)	(C/D%)	
Direct Construction	(A/D%)	(B/D%)	(C/D%)	
Cost				
others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost	(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost	(A/D%)	(B/D%)	(C/D%)	
Total	(A/D%)	(B/D%)	(C/D%)	

