

APPENDIX-II

METEOROLOGY AND HYDROLOGY

APPENDIX II: METEOROLOGY AND HYDROLOGY

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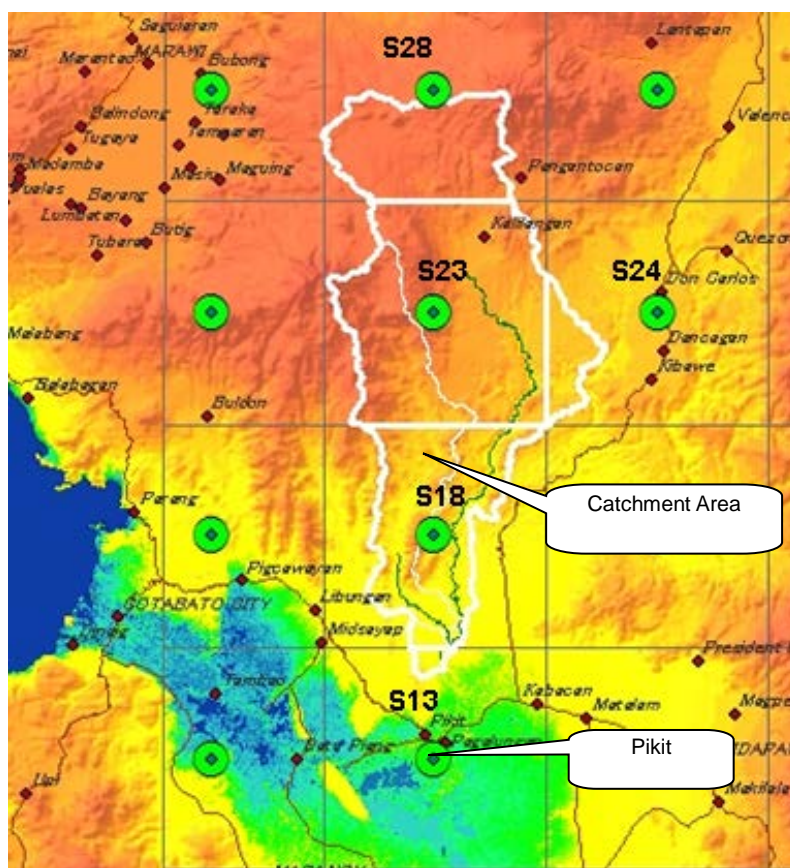
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APPENDIX II. METEOROLOGY AND HYDROLOGY

II.1 Climate Station by Satellite Image Analysis

The climate and rainfall data at project area and catchment area are obtained by simulated climate data based on satellite image analysis at a point of each 35 km x 35 km, which are provided by Climate Forecast System Reanalysis (CFSR) operated by the National Centers for Environmental Prediction (NCEP, US).

Below figure and table show the climate stations by CFSR; namely Station No.13 located at Pikit Area and Station No.18, No.23, No.24 and No.28 located within the catchment area.



Station No.	Elevation, m	Longitude	Latitude
S13	10	124.688	7.025
S18	399	124.688	7.337
S23	794	124.688	7.649
S24	321	125.000	7.649
S28	1,277	124.688	7.962

Climate Station Location
Source: NCEP, US

II.2 Temperature at Project Area (Pikit)**(1) Maximum Temperature**

Maximum Temperature at Project Area (Station No. 13: Pikit Area)

Unit: °C

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1979	34.2	35.4	34.5	37.0	35.5	34.0	34.7	35.7	35.1	33.3	34.0	33.1
1980	33.2	33.4	35.2	36.0	36.2	33.6	32.7	33.6	34.2	34.8	35.7	34.3
1981	33.3	33.0	35.3	36.4	36.9	35.4	36.2	35.9	36.0	34.0	34.3	33.4
1982	34.1	32.3	35.7	38.0	36.1	32.7	33.2	33.1	35.0	33.8	35.0	36.0
1983	34.4	35.8	37.1	37.0	37.8	35.7	33.7	34.7	28.4	34.1	34.3	33.9
1984	32.5	31.9	34.8	35.2	36.3	35.2	35.7	35.1	35.5	33.9	35.8	33.5
1985	34.2	34.3	36.4	35.6	36.0	34.8	33.9	35.5	33.2	33.7	33.0	32.9
1986	32.6	33.9	33.8	37.2	35.8	35.7	33.7	34.8	34.2	34.3	32.3	33.3
1987	32.8	33.6	35.2	37.2	36.7	36.3	35.0	34.6	36.1	34.6	33.3	35.6
1988	35.6	34.0	35.9	36.2	36.1	35.9	36.6	35.9	35.5	33.3	33.0	33.1
1989	33.7	33.1	32.9	33.7	34.1	33.2	33.5	33.5	35.4	33.5	33.7	-
1990	33.5	35.2	36.2	36.4	36.2	34.5	35.3	34.9	35.4	34.4	32.6	34.4
1991	32.8	33.0	36.2	37.2	35.1	34.8	34.6	35.4	35.7	35.1	35.5	34.0
1992	34.7	34.6	35.8	37.7	37.7	35.1	35.2	35.4	35.6	33.2	33.3	31.5
1993	33.4	35.3	35.1	35.8	36.8	35.1	34.9	34.3	35.3	34.6	35.8	33.2
1994	32.9	33.9	34.9	36.7	35.2	34.3	34.2	35.3	33.0	36.0	35.7	34.3
1995	33.4	34.8	35.2	35.4	36.3	35.7	35.4	36.0	34.0	34.2	34.0	34.3
1996	32.3	32.2	35.3	36.5	35.9	25.9	35.8	36.3	35.8	35.9	32.9	33.6
1997	34.2	31.5	35.5	36.0	35.6	35.8	35.9	36.2	36.6	36.7	35.3	34.4
1998	34.2	35.6	36.8	37.9	36.5	35.6	36.0	37.2	36.4	33.9	33.1	32.7
1999	-	33.4	33.2	32.7	33.1	33.0	33.1	32.6	33.0	34.6	33.0	32.7
2000	31.3	31.3	33.6	33.4	35.0	34.0	33.5	33.6	34.7	33.0	32.1	32.3
2001	32.3	33.9	33.6	35.0	34.9	34.2	33.9	32.7	35.7	33.9	33.1	32.3
2002	31.9	33.7	35.6	37.3	35.0	33.8	33.8	32.9	32.1	33.9	33.8	34.2
2003	33.8	32.8	34.0	37.7	34.3	33.7	33.1	33.3	32.8	32.8	34.2	31.6
2004	32.5	33.6	34.9	36.0	34.7	32.8	33.5	33.2	34.0	32.6	34.2	33.7
2005	33.4	35.7	35.6	36.7	35.1	35.1	33.4	33.4	33.3	34.8	34.4	33.0
2006	32.2	32.4	33.8	35.0	36.0	35.9	34.1	34.7	35.1	33.0	35.0	35.5
2007	33.8	34.3	35.5	36.5	36.4	35.7	34.1	34.6	35.1	35.4	34.2	33.9
2008	33.4	33.2	34.0	35.0	34.3	33.8	34.5	34.3	34.0	34.3	33.0	32.7
2009	33.4	32.9	34.5	33.8	33.0	33.0	31.2	32.8	31.9	32.9	32.8	33.3
2010	32.2	35.3	37.1	35.5	34.8	34.2	32.8	32.8	33.8	32.8	33.4	32.7
2011	32.9	31.9	32.9	33.2	31.9	31.7	32.1	32.4	32.9	33.4	32.6	31.9
2012	32.2	32.8	33.9	33.9	32.8	32.8	31.8	33.4	31.2	32.8	33.2	32.2
2013	31.0	32.7	35.1	34.4	34.2	32.9	31.9	32.7	33.0	31.2	32.2	33.0
2014	31.4	33.1	34.1	34.1	34.0	32.8	31.6	-	-	-	-	-
Max.	35.6	35.8	37.1	38.0	37.8	36.3	36.6	37.2	36.6	36.7	35.8	36.0
Min.	31.0	31.3	32.9	32.7	31.9	25.9	31.2	32.4	28.4	31.2	32.1	31.5
Ave.	33.1	33.6	35.0	35.8	35.3	34.1	34.0	34.4	34.3	34.0	33.8	33.4

Source: Climate Forecast System Reanalysis (CFSR), NCEP, US

(2) Minimum Temperature

Minimum Temperature at Project Area (Station 13: Pikit Area)

Unit: °C

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1979	17.6	18.5	19.4	19.2	20.7	20.5	19.6	19.3	19.9	20.5	19.9	18.9
1980	20.0	19.2	18.7	20.0	20.0	20.7	19.8	20.0	19.7	19.4	20.0	19.8
1981	20.2	19.3	17.9	20.2	20.4	19.7	19.2	18.7	20.5	20.4	20.2	19.2
1982	19.9	19.6	18.4	20.3	19.9	20.1	18.9	19.5	18.7	18.8	18.5	18.5
1983	18.0	17.1	18.2	19.4	19.6	19.8	20.1	20.1	19.2	19.8	19.5	19.9
1984	19.6	19.5	19.0	20.3	20.0	19.9	18.7	19.3	19.2	19.5	18.5	18.8
1985	18.0	19.2	19.1	20.3	20.1	19.0	19.1	19.2	20.2	19.5	19.7	19.5
1986	20.1	19.4	19.7	19.5	19.5	19.3	19.2	18.9	19.5	19.5	19.7	17.4
1987	18.8	19.2	17.7	19.7	20.0	19.7	18.9	19.7	18.9	19.4	20.2	18.8
1988	18.8	19.7	19.5	20.3	21.0	19.8	18.9	19.1	19.3	20.3	20.4	19.4
1989	19.6	20.2	20.2	19.9	20.5	19.6	18.6	19.4	18.8	20.1	19.0	-
1990	19.0	18.0	19.5	20.1	21.0	20.1	18.8	19.5	20.0	20.0	19.6	18.1
1991	19.1	19.5	18.4	20.3	20.6	19.6	19.0	19.8	19.3	19.0	18.7	18.1
1992	18.0	17.3	18.8	19.4	19.9	19.8	18.8	19.1	18.8	19.4	18.8	18.4
1993	17.5	19.1	18.5	19.6	19.7	19.8	19.2	19.3	19.2	19.3	19.2	19.6
1994	18.4	18.6	19.3	20.1	20.5	19.6	19.1	19.1	19.8	18.4	18.5	19.1
1995	18.5	19.6	20.4	19.4	20.5	20.1	19.2	20.1	20.3	20.6	20.3	20.0
1996	20.5	20.4	19.3	20.3	20.5	20.3	19.2	18.9	20.1	20.0	19.8	18.9
1997	19.8	20.4	19.8	20.5	20.0	17.9	19.1	19.0	19.0	19.3	19.0	18.3
1998	17.8	17.9	17.7	19.7	21.5	20.6	18.4	18.7	19.6	20.8	21.3	20.1
1999	-	19.9	21.2	21.6	20.7	20.1	19.1	20.2	19.7	19.7	20.2	20.5
2000	19.4	20.9	20.4	21.1	20.4	19.8	19.6	19.9	19.6	20.5	20.2	20.4
2001	20.5	19.9	20.9	21.2	21.0	20.1	19.9	21.0	20.2	20.5	20.7	19.8
2002	19.6	20.2	20.1	20.3	21.3	20.4	19.8	20.4	20.5	20.4	20.3	19.5
2003	19.7	20.2	20.6	20.7	21.3	19.9	20.3	20.8	21.0	21.1	19.8	21.0
2004	20.4	20.9	20.6	21.5	21.6	20.7	20.3	20.5	20.4	20.1	19.9	20.6
2005	19.5	20.0	20.5	20.3	21.7	20.6	20.8	20.8	20.4	20.4	20.4	21.3
2006	20.1	20.6	20.8	20.1	20.8	20.4	20.5	20.8	20.8	20.6	20.2	20.2
2007	20.9	20.3	19.4	20.7	21.1	21.3	20.6	20.6	21.0	20.7	20.8	20.4
2008	20.2	20.7	20.7	20.4	20.4	20.3	20.2	19.9	20.9	21.0	21.0	19.9
2009	20.8	20.3	20.1	21.7	21.2	19.9	21.0	20.9	21.3	20.5	20.6	18.9
2010	20.3	19.8	20.5	21.3	21.9	20.7	20.5	21.1	20.6	20.9	20.6	20.4
2011	20.3	20.5	20.6	21.1	21.0	20.8	20.1	20.6	20.6	20.2	20.4	20.1
2012	19.7	20.3	19.9	21.0	21.1	20.0	20.3	20.2	20.5	20.5	20.2	19.9
2013	20.8	19.5	21.1	21.3	21.2	21.2	20.3	20.5	20.4	20.4	20.0	20.1
2014	19.8	20.0	20.6	20.7	21.3	20.9	20.5	-	-	-	-	-
Max.	20.9	20.9	21.2	21.7	21.9	21.3	21.0	21.1	21.3	21.1	21.3	21.3
Min.	17.5	17.1	17.7	19.2	19.5	17.9	18.4	18.7	18.7	18.4	18.5	17.4
Ave.	19.5	19.6	19.7	20.4	20.7	20.1	19.6	19.9	19.9	20.0	19.9	19.5

Source: Climate Forecast System Reanalysis (CFSR), NCEP, US

(3) Mean Temperature

Mean Temperature at Pikit (S13: CFSR)

Unit: °C

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1979	25.9	27.0	27.0	28.1	28.1	27.3	27.2	27.5	27.5	26.9	27.0	26.0
1980	26.6	26.3	27.0	28.0	28.1	27.2	26.3	26.8	27.0	27.1	27.9	27.1
1981	26.8	26.2	26.6	28.3	28.7	27.6	27.7	27.3	28.3	27.2	27.3	26.3
1982	27.0	26.0	27.1	29.2	28.0	26.4	26.1	26.3	26.9	26.3	26.8	27.3
1983	26.2	26.5	27.7	28.2	28.7	27.8	26.9	27.4	23.8	27.0	26.9	26.9
1984	26.1	25.7	26.9	27.8	28.2	27.6	27.2	27.2	27.4	26.7	27.2	26.2
1985	26.1	26.8	27.8	28.0	28.1	26.9	26.5	27.4	26.7	26.6	26.4	26.2
1986	26.4	26.7	26.8	28.4	27.7	27.5	26.5	26.9	26.9	26.9	26.0	25.4
1987	25.8	26.4	26.5	28.5	28.4	28.0	27.0	27.2	27.5	27.0	26.8	27.2
1988	27.2	26.9	27.7	28.3	28.6	27.9	27.8	27.5	27.4	26.8	26.7	26.3
1989	26.7	26.7	26.6	26.8	27.3	26.4	26.1	26.5	27.1	26.8	26.4	-
1990	26.3	26.6	27.9	28.3	28.6	27.3	27.1	27.2	27.7	27.2	26.1	26.3
1991	26.0	26.3	27.3	28.8	27.9	27.2	26.8	27.6	27.5	27.1	27.1	26.1
1992	26.4	26.0	27.3	28.6	28.8	27.5	27.0	27.3	27.2	26.3	26.1	25.0
1993	25.5	27.2	26.8	27.7	28.3	27.5	27.1	26.8	27.3	27.0	27.5	26.4
1994	25.7	26.3	27.1	28.4	27.9	27.0	26.7	27.2	26.4	27.2	27.1	26.7
1995	26.0	27.2	27.8	27.4	28.4	27.9	27.3	28.1	27.2	27.4	27.2	27.2
1996	26.4	26.3	27.3	28.4	28.2	23.1	27.5	27.6	28.0	28.0	26.4	26.3
1997	27.0	26.0	27.7	28.3	27.8	26.9	27.5	27.6	27.8	28.0	27.2	26.4
1998	26.0	26.8	27.3	28.8	29.0	28.1	27.2	28.0	28.0	27.4	27.2	26.4
1999	-	26.7	27.2	27.2	26.9	26.6	26.1	26.4	26.4	27.2	26.6	26.6
2000	25.4	26.1	27.0	27.3	27.7	26.9	26.6	26.8	27.2	26.8	26.2	26.4
2001	26.4	26.9	27.3	28.1	28.0	27.2	26.9	26.9	28.0	27.2	26.9	26.1
2002	25.8	27.0	27.9	28.8	28.2	27.1	26.8	26.7	26.3	27.2	27.1	26.9
2003	26.8	26.5	27.3	29.2	27.8	26.8	26.7	27.1	26.9	27.0	27.0	26.3
2004	26.5	27.3	27.8	28.8	28.2	26.8	26.9	26.9	27.2	26.4	27.1	27.2
2005	26.5	27.9	28.1	28.5	28.4	27.9	27.1	27.1	26.9	27.6	27.4	27.2
2006	26.2	26.5	27.3	27.6	28.4	28.2	27.3	27.8	28.0	26.8	27.6	27.9
2007	27.4	27.3	27.5	28.6	28.8	28.5	27.4	27.6	28.1	28.1	27.5	27.2
2008	26.8	27.0	27.4	27.7	27.4	27.1	27.4	27.1	27.5	27.7	27.0	26.3
2009	27.1	26.6	27.3	27.8	27.1	26.5	26.1	26.9	26.6	26.7	26.7	26.1
2010	26.3	27.6	28.8	28.4	28.4	27.5	26.7	27.0	27.2	26.9	27.0	26.6
2011	26.6	26.2	26.8	27.2	26.5	26.3	26.1	26.5	26.8	26.8	26.5	26.0
2012	26.0	26.6	26.9	27.5	27.0	26.4	26.1	26.8	25.9	26.7	26.7	26.1
2013	25.9	26.1	28.1	27.9	27.7	27.1	26.1	26.6	26.7	25.8	26.1	26.6
2014	25.6	26.6	27.4	27.4	27.7	26.9	26.1	-	-	-	-	-
Max.	27.4	27.9	28.8	29.2	29.0	28.5	27.8	28.1	28.3	28.1	27.9	27.9
Min.	25.4	25.7	26.5	26.8	26.5	23.1	26.1	26.3	23.8	25.8	26.0	25.0
Ave.	26.3	26.6	27.3	28.1	28.0	27.1	26.8	27.1	27.1	27.0	26.9	26.5

Source: Climate Forecast System Reanalysis (CFSR), NCEP, US

II.2 Rainfall at Project Area and Catchment Area**(1) Monthly Rainfall at Project Area (Pikit)**

Monthly Rainfall at Project Area (Station No. 13: Pikit Area)

Unit: mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1979	7	10	41	2	144	195	111	51	92	99	68	69	889
1980	40	29	35	36	24	145	79	98	28	75	76	94	759
1981	81	12	15	27	119	98	77	8	56	141	140	57	831
1982	83	46	31	27	52	81	68	112	26	96	38	38	698
1983	0	0	0	8	18	108	136	121	0	107	65	110	673
1984	55	93	91	52	55	124	107	55	110	53	15	54	864
1985	20	56	12	170	75	26	99	68	100	121	80	40	867
1986	74	63	69	13	43	69	83	35	86	61	71	6	673
1987	5	36	6	7	74	52	58	161	26	53	92	4	574
1988	1	43	128	57	106	149	62	45	74	101	89	63	918
1989	92	92	104	95	227	117	72	110	90	137	39	-	1,175
1990	38	0	7	15	89	105	37	65	394	77	80	0	907
1991	84	22	1	33	103	82	46	15	5	46	35	5	477
1992	9	3	4	5	42	38	132	43	18	100	51	97	542
1993	4	6	81	26	66	66	74	48	47	50	62	53	583
1994	5	14	17	29	94	98	39	67	26	14	3	37	443
1995	40	5	21	19	41	71	115	114	125	140	38	34	763
1996	104	66	17	67	75	0	43	51	50	97	52	21	643
1997	16	124	43	59	47	32	51	3	35	50	25	1	486
1998	0	0	0	0	46	54	21	21	64	81	123	33	443
1999	0	15	120	200	130	153	62	99	66	95	118	44	1,102
2000	74	38	90	121	121	140	84	101	81	137	47	58	1,092
2001	37	22	100	90	146	65	134	55	141	139	78	24	1,031
2002	19	50	26	11	204	84	49	84	75	119	72	19	812
2003	55	13	92	71	94	54	101	108	79	110	59	103	939
2004	34	34	24	44	83	55	111	25	145	79	61	78	773
2005	20	3	40	15	141	101	117	67	72	89	42	53	760
2006	35	15	64	28	79	98	27	50	80	63	52	15	606
2007	71	16	18	20	101	72	83	150	69	84	81	34	799
2008	33	38	39	46	185	70	115	126	99	147	77	42	1,017
2009	73	65	70	150	87	110	132	112	68	82	87	18	1,054
2010	45	10	73	80	83	119	126	160	186	100	105	50	1,137
2011	124	255	229	257	175	157	85	145	95	178	208	136	2,044
2012	112	166	49	319	141	68	182	111	91	151	127	210	1,727
2013	178	85	161	189	276	83	253	148	81	121	149	115	1,839
2014	192	96	169	94	251	206	69	-	-	-	-	-	1,077
Ave.	51.7	45.6	58.0	68.9	106.6	92.9	90.0	80.9	82.3	96.9	74.4	53.4	902

Source: Climate Forecast System Reanalysis (CFSR), NCEP, US

(2) Monthly Rainfall at Catchment Area

Monthly Rainfall at Catchment Area (Station No. 18)

Unit: mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1979	11	22	57	5	222	311	215	86	160	201	162	123	1,575
1980	82	44	52	42	34	376	153	175	66	172	138	149	1,483
1981	119	24	26	60	152	165	165	13	150	364	186	91	1,515
1982	132	92	53	43	95	199	132	175	54	194	112	57	1,338
1983	4	0	1	12	28	219	259	207	0	189	103	144	1,166
1984	95	95	119	91	118	231	212	120	232	76	39	114	1,542
1985	60	115	34	266	130	65	197	127	211	255	145	101	1,706
1986	142	95	87	30	83	152	133	61	161	123	145	20	1,232
1987	17	59	2	24	134	84	155	362	47	106	206	9	1,205
1988	5	41	112	94	180	245	112	85	145	187	173	89	1,468
1989	148	186	134	125	378	276	138	139	169	307	106	-	2,106
1990	60	1	8	39	173	264	53	167	462	153	154	1	1,535
1991	92	32	8	59	181	169	115	41	14	107	84	11	913
1992	31	8	7	25	90	81	208	59	43	145	124	139	960
1993	9	29	134	52	63	112	176	133	86	133	157	121	1,205
1994	25	37	35	82	151	217	60	172	43	46	6	54	928
1995	88	11	57	38	110	131	183	260	259	249	101	80	1,567
1996	125	96	29	99	111	0	59	82	99	183	124	49	1,056
1997	23	123	95	114	117	58	96	16	69	148	63	5	927
1998	0	0	1	2	84	114	36	38	90	158	202	85	810
1999	0	34	211	423	267	282	120	221	137	189	225	137	2,246
2000	178	80	160	199	180	264	127	218	118	334	108	147	2,113
2001	69	46	160	146	287	127	232	134	306	288	148	38	1,981
2002	41	82	40	24	303	276	50	147	129	248	143	30	1,513
2003	95	17	173	140	306	147	189	240	217	213	129	157	2,023
2004	59	68	56	125	175	96	258	49	390	129	137	178	1,720
2005	34	11	54	37	288	225	242	145	106	236	93	130	1,601
2006	96	25	114	47	175	191	51	149	134	147	135	26	1,290
2007	51	34	24	72	288	174	165	315	238	172	241	79	1,853
2008	82	74	69	112	307	188	230	304	258	220	151	107	2,102
2009	144	103	142	282	262	259	240	199	130	199	191	22	2,173
2010	64	24	66	71	172	330	353	357	409	310	276	135	2,567
2011	168	328	349	392	428	425	226	385	356	364	312	208	3,941
2012	168	261	135	392	494	154	409	242	322	291	190	304	3,362
2013	266	91	274	328	484	362	472	307	251	378	293	159	3,665
2014	207	113	313	300	598	498	181	-	-	-	-	-	2,210
Ave.	83.1	69.5	94.2	122.0	212.4	207.4	177.8	169.4	173.2	206.1	151.5	97.0	1,764

Source: Climate Forecast System Reanalysis (CFSR), NCEP, US

Monthly Rainfall at Catchment Area (Station No. 23)

Unit: mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1979	83	99	175	106	652	821	600	394	646	596	462	340	4,974
1980	317	192	171	192	214	996	461	657	316	606	448	524	5,094
1981	378	129	133	232	600	546	621	120	570	916	517	230	4,992
1982	387	305	210	238	474	732	392	565	269	530	412	296	4,810
1983	42	9	25	64	197	789	811	728	5	660	464	452	4,246
1984	492	250	352	438	665	819	619	394	756	409	305	366	5,865
1985	299	368	169	627	568	381	645	567	797	742	449	399	6,011
1986	474	205	261	109	391	665	614	242	597	475	507	140	4,680
1987	70	190	53	132	500	305	621	894	244	463	554	119	4,145
1988	89	144	223	314	591	693	477	437	576	604	578	342	5,068
1989	356	449	468	318	954	752	524	492	490	783	363	-	5,949
1990	167	32	119	179	691	709	376	477	765	603	496	43	4,657
1991	201	122	62	268	551	502	506	272	243	317	362	48	3,454
1992	159	55	70	141	338	406	713	364	279	501	484	314	3,824
1993	57	281	383	207	227	479	624	414	377	450	461	503	4,463
1994	119	147	198	332	579	679	265	569	317	204	138	154	3,701
1995	185	120	216	162	443	534	634	756	665	709	483	469	5,376
1996	410	352	219	526	560	0	347	398	446	693	516	216	4,683
1997	220	306	179	271	361	272	381	154	333	538	252	61	3,328
1998	19	25	12	46	300	440	246	232	354	569	696	411	3,350
1999	0	152	664	1,002	778	811	570	720	678	601	545	554	7,075
2000	457	347	564	508	594	832	501	635	443	863	477	486	6,707
2001	245	156	507	363	833	478	654	440	863	682	426	194	5,841
2002	149	184	175	363	694	917	237	550	455	746	458	206	5,134
2003	203	82	401	363	778	537	677	821	787	643	411	467	6,170
2004	232	327	250	363	467	405	1,040	246	908	409	391	473	5,511
2005	138	83	175	363	750	833	716	489	421	715	352	542	5,577
2006	330	167	346	363	553	794	337	517	578	479	433	243	5,140
2007	180	135	127	363	915	799	579	840	650	639	690	339	6,256
2008	352	314	343	363	811	712	862	854	818	784	539	456	7,208
2009	522	326	357	363	711	759	711	609	371	543	581	144	5,997
2010	205	85	248	363	550	1,001	1,092	1,047	1,089	885	833	671	8,069
2011	796	885	908	363	1,545	1,652	1,281	1,587	1,532	1,181	1,017	908	13,655
2012	691	843	803	363	1,603	884	1,373	1,092	1,242	959	842	874	11,569
2013	817	368	719	363	1,520	1,499	1,790	1,059	1,100	1,180	955	693	12,063
2014	711	479	750	363	1,607	1,673	1,123	-	-	-	-	-	6,706
Ave.	293.1	242.0	306.5	353.3	682.4	725.2	667.2	589.5	599.4	647.9	511.3	372.9	5,991

Source: Climate Forecast System Reanalysis (CFSR), NCEP, US

Monthly Rainfall at Catchment Area (Station No. 24)

Unit: mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1979	43	58	130	74	634	760	525	333	522	367	370	268	4,084
1980	227	141	119	130	140	888	374	562	190	523	332	451	4,077
1981	290	101	93	194	474	518	513	91	451	709	376	199	4,009
1982	326	279	179	165	316	534	356	468	210	416	385	184	3,818
1983	24	5	18	58	169	592	639	589	0	603	382	337	3,416
1984	345	204	278	367	502	764	565	383	633	289	206	302	4,838
1985	178	284	119	563	454	271	498	407	587	638	339	313	4,651
1986	361	201	220	81	346	490	471	174	449	304	359	81	3,537
1987	53	106	41	113	377	290	467	794	201	391	443	82	3,358
1988	64	95	172	244	454	632	314	345	418	492	399	301	3,930
1989	274	377	345	277	825	553	411	408	355	714	286	-	4,825
1990	123	16	85	137	543	536	279	378	590	483	353	18	3,541
1991	191	97	40	214	412	348	353	229	231	286	309	32	2,742
1992	117	37	37	109	262	328	532	269	221	383	400	272	2,967
1993	41	173	309	153	157	377	533	359	278	308	369	448	3,505
1994	106	103	130	227	482	541	204	518	235	145	61	127	2,879
1995	180	70	187	152	361	409	512	550	475	682	321	388	4,287
1996	301	282	157	455	359	0	251	291	338	514	367	148	3,463
1997	136	226	192	208	306	225	291	127	293	376	161	33	2,574
1998	13	14	11	25	253	358	197	140	228	400	559	297	2,495
1999	0	110	520	769	603	627	413	587	503	430	422	425	5,409
2000	421	272	445	419	463	661	367	540	375	717	369	387	5,436
2001	205	108	377	314	718	389	592	405	739	506	352	120	4,825
2002	141	153	134	126	610	687	159	431	327	635	323	101	3,827
2003	183	49	371	263	605	378	551	712	717	470	326	392	5,017
2004	161	282	218	294	346	333	878	192	771	260	331	400	4,466
2005	98	51	131	102	565	636	508	436	370	589	251	383	4,120
2006	277	120	265	109	449	629	246	403	477	360	311	165	3,811
2007	138	72	100	241	709	580	434	703	495	517	504	220	4,713
2008	255	223	222	372	707	432	670	704	637	532	375	344	5,473
2009	370	245	231	575	573	608	535	526	241	483	486	77	4,950
2010	160	61	199	173	395	745	886	864	962	775	614	531	6,365
2011	277	452	329	350	765	652	443	461	581	549	392	271	5,522
2012	239	296	442	340	674	177	329	328	353	357	310	364	4,209
2013	349	135	326	385	693	619	687	299	431	337	293	215	4,769
2014	285	140	373	235	814	708	272	-	-	-	-	-	2,827
Ave.	193.1	156.6	209.6	250.4	486.5	507.6	451.5	428.7	425.3	472.6	355.3	255.2	4,192

Source: Climate Forecast System Reanalysis (CFSR), NCEP, US

Monthly Rainfall at Catchment Area (Station No. 28)

Unit: mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1979	133	109	222	229	704	875	649	542	731	531	443	368	5,536
1980	345	240	253	219	293	1,024	467	738	426	651	483	565	5,704
1981	387	187	185	288	691	705	796	247	710	941	496	286	5,919
1982	460	411	344	304	524	736	533	603	373	583	512	345	5,728
1983	62	22	57	99	372	920	969	932	5	751	538	456	5,183
1984	547	311	431	505	760	1,049	766	569	937	674	334	365	7,248
1985	489	419	220	673	656	566	828	789	981	821	487	453	7,382
1986	476	283	318	168	604	955	767	347	821	456	494	209	5,898
1987	122	233	120	181	609	415	696	945	333	541	618	225	5,038
1988	179	186	253	324	641	694	627	515	654	725	552	525	5,875
1989	378	502	534	338	959	719	703	668	645	749	445	-	6,640
1990	172	69	155	158	743	876	559	620	825	769	608	126	5,680
1991	236	147	125	323	554	510	560	440	463	381	496	103	4,338
1992	229	104	94	198	484	463	935	546	458	645	474	362	4,992
1993	95	422	390	261	296	592	734	522	528	521	533	685	5,579
1994	235	169	249	340	693	809	446	721	564	419	225	184	5,054
1995	267	189	298	252	582	584	667	907	812	757	459	574	6,348
1996	441	415	337	567	598	0	443	484	506	758	563	220	5,332
1997	286	360	249	254	446	426	444	266	539	566	265	115	4,216
1998	47	53	33	104	346	493	376	350	478	513	628	512	3,933
1999	0	211	696	968	669	792	605	731	725	602	475	539	7,013
2000	488	360	585	467	594	865	538	746	546	814	453	593	7,049
2001	265	225	541	425	861	550	723	605	1,060	604	384	246	6,489
2002	179	234	240	284	605	946	324	593	453	818	439	240	5,355
2003	266	132	410	400	750	581	715	938	944	626	379	621	6,762
2004	235	472	324	334	516	511	1,247	393	898	382	387	483	6,182
2005	188	142	197	194	729	837	729	584	647	739	367	556	5,909
2006	430	265	360	189	540	868	557	636	737	562	443	307	5,894
2007	300	184	162	423	990	799	650	1,031	778	750	691	338	7,096
2008	334	346	340	612	865	653	1,045	961	1,019	694	504	582	7,955
2009	469	451	331	780	734	809	665	622	407	665	691	191	6,815
2010	256	91	287	233	573	950	1,090	1,017	1,027	902	750	680	7,856
2011	981	999	1,052	700	1,244	1,266	891	1,125	1,224	978	844	808	12,112
2012	699	856	828	727	1,360	477	883	826	591	709	809	883	9,648
2013	874	391	601	704	1,315	1,190	1,412	647	790	711	865	641	10,141
2014	906	489	758	584	1,279	1,269	628	-	-	-	-	-	5,913
Ave.	346.0	296.6	349.4	383.6	699.4	743.7	713.0	663.0	675.3	665.9	518.1	423.1	6,477

Source: Climate Forecast System Reanalysis (CFSR), NCEP, US

APPENDIX-III

AGRICULTURE

APPENDIX III: AGRICULTURE

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APPENDIX III. AGRICULTURE

(It is noted that non-disclose information for 3-year is included in this appendix as procurement by the Philippines government is scheduled.)

III.1 Agriculture and Extension Development

III.1.1 No. of YLTA and Government Funded Program Beneficiaries

Table. List of IA and No. of YLTA and Government Funded Program Beneficiaries

No.	NAME OF IA	Total No. of Beneficiaries per Year & by Source of Fund								Total
		YLTA		Total YLTA	Government Funded				Total Government Funded	
		2014	2015		2014	2015	2016	2017		
1	BASBIA	0	60	60	0	0	30	0	30	90
2	MANSAPA	0	60	60	0	0	0	0	0	60
3	MRISIA DIV 5	0	0	0	60	0	0	0	60	60
4	NASFIA	0	0	0	60	0	30	0	90	90
5	KIPAN	65	0	65	0	0	0	0	0	65
6	NASGIA	66	0	66	0	30	0	0	30	96
7	MRISIA DIV 6	63	0	63	0	30	0	0	30	93
8	EDUFIA	0	0	0	0	60	30	0	90	90
9	GAGDANEN BAYA	0	0	0	60	30	30	0	120	120
10	KATINGKONGAN	0	60	60	0	0	0	0	0	60
11	MORNING LIGHT	68	0	68	0	0	0	0	0	68
12	TAFIA	0	0	0	60	0	60	0	120	120
13	DALFIA	0	0	0	0	0	0	60	60	60
14	TAMCIA	0	0	0	0	0	0	60	60	60
15	LAGUNDE PAMBUA	0	0	0	0	0	0	60	60	60
16	MALIGA LUPA	0	0	0	0	0	0	30	30	30
17	SARAPANI PANICUPAN	0	0	0	0	0	0	60	60	60
18	NALAPANI	0	0	0	0	0	0	30	30	30
19	PAIKOL	0	0	0	0	0	0	0	0	0
20	PAMALIAN TALIAWID	0	0	0	0	0	0	0	0	0
21	BAGONABATI	0	0	0	60	0	0	0	60	60
22	BALATIKAN	0	0	0	0	60	0	0	60	60
23	CHRISLAM	0	0	0	0	60	0	0	60	60
24	TAPODOC BANGSAMORO	0	0	0	0	0	0	0	0	0
25	DUNGGUAN-LANGAYEN	0	0	0	0	0	0	0	0	0
26	UBADALA FARMERS IA	0	0	0	0	0	0	0	0	0
27	LAYOG-INUG-UG IA INC	0	0	0	0	0	0	0	0	0
28	PAGALUNGAN TALIAWID IA	0	0	0	0	0	0	0	0	0
29	GLI-GLI LATERAL H & H2 FARMERS IA	0	0	0	0	0	0	0	0	0
30	BULODBULOL IA INC	0	0	0	0	0	0	0	0	0
31	TALITAY INUG-UG GLI-GLI POBLACION IA	0	0	0	0	0	0	0	0	0
32	BATULAWAN GINATILAN LADTINGAN IA	0	0	0	0	0	0	0	0	0
33	MAKAUYAG GLI-GLI LATERAL H3 IA	0	0	0	0	0	0	0	0	0
34	MAGLIB IA	0	0	0	0	0	0	0	0	0
35	MACABUAL KALTAN FARMERS IA	0	0	0	0	0	0	0	0	0
36	KALTAN BALONG FARMERS IA	0	0	0	0	0	0	0	0	0
37	TAMBAK BALONG IA	0	0	0	0	0	0	0	0	0
38	MANAULANAN IA	0	0	0	0	0	0	0	0	0
39	PROPER MACABUAL IA	0	0	0	0	0	0	0	0	0
40	SITIO GALIGAYANEN IA	0	0	0	0	0	0	0	0	0
41	NALKATAN MANAULANAN IA	0	0	0	0	0	0	0	0	0
	8 IAs to be established	0	0	0	0	0	0	0	0	0
	Total	262	180	442	300	270	180	300	1,050	1,492

Source: NIA PMO

III.1.2 Cost for Agriculture Supporting Plan

Table. Summarized Cost for Agriculture Supporting Plan

Sub-component	Items	1st Year (2020 Dry and Wet)	2nd Year (2021 Dry and Wet)	3rd Year (2022 Dry and Wet)	Total (PHP)	Total (JPY)
1) Technical Assistance for Irrigated Rice Production	1-1) Salary and Allowance for Technical Staffs	██████	██████	██████	██████	██████
	1-2) Office Equipment (including motorcycles)	██████	██████	██████	██████	██████
	1-3) Participatory Demonstration Farm & Farm Production Input Assistance	██████	██████	██████	██████	██████
	1-4) Trainings	██████	██████	██████	██████	██████
	Sub-total	██████	██████	██████	██████	██████
2) Enhancement of Agriculture Extension Services at the Municipal Level	2-1) Office Equipment (including motorcycles)	██████	██████	██████	██████	██████
	2-2) Reproduction/Printing & Distribution of Manuals & Posters	██████	██████	██████	██████	██████
	2-3) Trainings	██████	██████	██████	██████	██████
	Sub-total	██████	██████	██████	██████	██████
3) Development of Seed Production	3-1) Machineries & Equipment	██████	██████	██████	██████	██████
	3-2) Materials	██████	██████	██████	██████	██████
	3-3) Trainings	██████	██████	██████	██████	██████
	Sub-total	██████	██████	██████	██████	██████
Total		██████	██████	██████	██████	██████

Table. Detail Cost for Each Sub-component on Agriculture Supporting Plan

1) Technical Assistance for Irrigated Rice Production

1-1) Salary and Allowance for Technical Staffs	Unit Price (per person and month)	Quantity	Year 1	Year 2	Year 3	Total
Technical Staff (10 persons)	██████	12 month x 10 person	██████	██████	██████	██████
Document/Information Officer (1 person)	██████	12 month x 1 person	██████	██████	██████	██████
Support Staff/Administration (1 person)	██████	12 month x 1 person	██████	██████	██████	██████
Accounting Clerk (1 person)	██████	12 month x 1 person	██████	██████	██████	██████
Travelling Allowance						
Technical Staff & Support Staff (11 persons)	██████	192 day x 11 person	██████	██████	██████	██████
Year-end Bonus (one month salary)						
Technical Staff (10 persons)	██████	1 time x 10 person	██████	██████	██████	██████
Document/Information Officer (1 person)	██████	1 time x 1 person	██████	██████	██████	██████
Support Staff/Administration (1 person)	██████	1 time x 1 person	██████	██████	██████	██████
Accounting Clerk (1 person)	██████	1 time x 1 person	██████	██████	██████	██████
Sub-total			██████	██████	██████	██████
1-2) Office Equipment (including motorcycles)	Unit Price	Quantity	Year 1	Year 2	Year 3	Total
Motorcycle (125 cc, 4-stroke)	██████	11	██████	██████	██████	██████
Photocopying machinery	██████	1	██████	██████	██████	██████
Mobile phone	██████	12	██████	██████	██████	██████
Laptop computer	██████	3	██████	██████	██████	██████
Desktop Computer	██████	1	██████	██████	██████	██████
Computer Table with Chair	██████	1	██████	██████	██████	██████
Printer	██████	1	██████	██████	██████	██████
Sub-total			██████	██████	██████	██████
1-3) Participatory Demonstration Farm & Farm Production Input Assistance	Unit Price	Quantity	Year 1	Year 2	Year 3	Total
Participatory Demonstration Farm & Farm Production Input Assistance	██████	1,680 farmers	██████	██████	██████	██████
Sub-total			██████	██████	██████	██████
1-4) Trainings						
For Farmer Cooperator	Unit Price	No. of Participants	Year 1	Year 2	Year 3	Total
1. Orientation & Briefing of PDF & CSFS Cooperators	██████	1,770	██████	██████	██████	██████
2. Benchmarking and FGD Among Prospective PDF & FPIA Beneficiaries	██████	1,770	██████	██████	██████	██████
3. Season Long Training on Climate Smart Field School	██████	1,770	██████	██████	██████	██████
For IA officers						

4. Orientation of IA Officers	██████	762	██████	██████	██████	██████
5. Planning Workshop of Implementers	██████	376	██████	██████	██████	██████
6. Farmer-Led Extension Approach on Rice Production	██████	258	██████	██████	██████	██████
7. Enterprise Development Training	██████	258	██████	██████	██████	██████
8. Skills Training on Financial Resource Management for the Beneficiaries	██████	258	██████	██████	██████	██████
9. Soil Sampling Technique and Methodology	██████	370	██████	██████	██████	██████
10. Benchmarking/Field Tour	██████	346	██████	██████	██████	██████
11. Value Reorientation & Islamic Culture & Islamic Culture Appreciation Training	██████	370	██████	██████	██████	██████
12. Training Course on Social Mobilization for IA Officers	██████	370	██████	██████	██████	██████
For Project Management Team						
13. Project Management Team Monthly Meeting	██████	360	██████	██████	██████	██████
14. Mid- and Year-End Review & Planning WS	██████	276	██████	██████	██████	██████
			Sub-total	██████	██████	██████
			Total	██████	██████	██████

2) Enhancement of Agriculture Extension Services at the Municipal Level

2-1) Office Equipment (including motorcycles)	Unit Price	Quantity	Year 1	Year 2	Year 3	Total
Motorcycle (125 cc, 4-stroke)	██████	15	██████	██████	██████	██████
Desktop Computer	██████	5	██████	██████	██████	██████
Computer Table with Chair	██████	5	██████	██████	██████	██████
Laptop Computer	██████	5	██████	██████	██████	██████
Printer	██████	5	██████	██████	██████	██████
Internet Accessories (modem & router)	██████	5	██████	██████	██████	██████
Photocopying Machinery	██████	5	██████	██████	██████	██████
Overhead Projector	██████	5	██████	██████	██████	██████
UPS	██████	5	██████	██████	██████	██████
Digital Camera	██████	5	██████	██████	██████	██████
Refrigerator	██████	5	██████	██████	██████	██████
			Sub-total	██████	██████	██████
2-2) Reproduction/Printing & Distribution of Manuals & Posters	Unit Price	Quantity	Year 1	Year 2	Year 3	Total
Printing	██████	10,000	██████	██████	██████	██████
			Sub-total	██████	██████	██████
2-3) Trainings	Unit Price	No. of Participants	Year 1	Year 2	Year 3	Total
1. Training Needs Assessment of AEWs	██████	37	██████	██████	██████	██████
2. Skills Enhancement on Rice Production Technology	██████	50	██████	██████	██████	██████

3. Capability Training on Computer Operation and IT=Based Technology	██████	50	██████	██████	██████	██████
4. Refresher Course on the Training of Trainers (TOT)	██████	37	██████	██████	██████	██████
		Sub-total	██████	██████	██████	██████
		Total	██████	██████	██████	██████

3) Development of Seed Production

3-1) Machineries & Equipment	Unit Price	Quantity	Year 1	Year 2	Year 3	Total
Machineries						
Hand Tractor with Trailer	██████	5	██████	██████	██████	██████
Floating Turtle	██████	5	██████	██████	██████	██████
Rice Reaper	██████	5	██████	██████	██████	██████
Rice Thresher	██████	5	██████	██████	██████	██████
Mechanical Blower	██████	5	██████	██████	██████	██████
Mechanical Dryer (Solar Bubble Dryer)	██████	5	██████	██████	██████	██████
Equipment						
Thermometer	██████	10	██████	██████	██████	██████
Moisture Meter	██████	5	██████	██████	██████	██████
		Sub-total	██████	██████	██████	██████
3-2) Materials	Unit Price	Quantity	Year 1	Year 2	Year 3	Total
Seed Treatment	██████	50	██████	██████	██████	██████
Net bag	██████	2,500	██████	██████	██████	██████
Foundation/ Registered Seeds	██████	2,500	██████	██████	██████	██████
Packaging sacks (laminated)	██████	5,000	██████	██████	██████	██████
Fertilizers	██████	200	██████	██████	██████	██████
		Sub-total	██████	██████	██████	██████
3-3) Trainings	Unit Price	No. of Participants	Year 1	Year 2	Year 3	Total
1. Seed Production Training	██████	40	██████	██████	██████	██████
		Sub-total	██████	██████	██████	██████
		Total	██████	██████	██████	██████

III.1.3 Inventory of Agriculture Machineries in the MMIP area

Table. Inventory of Pre- & Post-harvest Facilities in Barangay, Influenced Areas of MMIP I & II in Pikit, Aleosan & Carmen of the Cotabato Province

No.	Municipality	Barangay	Location	Service Area	Corn Sheller	Rice Thresher	Solar Dryer	Floating Tiller	Hand Tractor w/ Trailer	Power Tiller	Shallow Tube Well	Rice Mill	Rice Reaper	Rice Combined Harvester	Flatbed Dryer	Ware-house	Corn Mill	Drum Seeder
1	Pikit	Kabasalan	MMIP II	LMSA	6	1	3	0	0	0	0	0	0	0	0	0	0	0
2	Pikit	Bulod	MMIP II	LMSA	0	0	1	0	0	1	0	1	0	0	0	0	0	0
3	Pikit	Bulol	MMIP II	LMSA	0	1	0	0	0	0	0	1	0	0	0	0	0	0
4	Pikit	Rajah Muda	MMIP II	LMSA	1	0	1	1	1	0	0	0	0	0	0	0	0	0
5	Pikit	Batulawan	MMIP II	LMSA	3	2	1	1	1	1	1	5	0	0	0	0	0	0
6	Pikit	Balantikan	MMIP I	UMSA	2	5	1	8	1	2	0	1	0	0	0	0	0	0
7	Pikit	Tinutulan	MMIP I	UMSA	1	5	1	1	4	3	0	1	2	2	1	0	0	0
8	Pikit	Nabundas	MMIP I	UMSA	0	1	1	0	2	0	0	0	0	0	0	0	0	0
9	Pikit	Balungis	MMIP I	UMSA	1	0	0	0	1	0	0	0	0	0	0	0	0	0
10	Pikit	Katilacan	MMIP II	LMSA	0	0	2	0	1	1	2	0	0	0	0	1	0	0
11	Pikit	Inug-ug	MMIP II	LMSA	0	1	4	3	0	0	1	1	0	0	0	0	0	0
12	Pikit	Gli-gli	MMIP II	LMSA	0	0	2	2	2	0	1	0	0	0	0	0	0	0
13	Pikit	Gokotan	MMIP I	UMSA	0	0	2	0	1	0	0	0	0	0	0	0	0	0
14	Pikit	Punol	MMIP II	LMSA	3	0	2	0	0	0	0	0	0	0	0	0	0	0
15	Pikit	Balong	MMIP II	LMSA	2	1	3	1	0	1	1	0	0	0	0	0	0	0
16	Pikit	Calawag	MMIP II	LMSA	0	0	1	0	1	1	1	0	0	0	0	0	0	0
17	Pikit	Talitay	MMIP II	LMSA	1	0	2	2	0	0	0	0	0	0	0	0	0	0
18	Pikit	Lagunde	MMIP II	UMSA	0	3	5	5	4	1	0	0	0	0	0	0	0	0
19	Pikit	Balungis	MMIP II	LMSA	0	1	1	0	0	0	0	1	0	0	0	0	0	0
20	Pikit	Ladtingan	MMIP II	LMSA	2	1	7	3	2	0	0	0	0	0	0	2	0	0
21	Pikit	Ginatilan	MMIP II	LMSA	1	1	3	0	1	0	0	0	0	0	0	1	0	0
22	Pikit	Balabak	MMIP I	UMSA	1	3	3	1	5	1	0	1	0	0	0	0	1	0
23	Pikit	Buliok	MMIP II	LMSA	0	3	2	1	5	0	0	0	0	0	0	1	1	0
24	Pikit	Pamalian	MMIP II	UMSA	0	0	2	0	0	0	4	0	0	0	0	1	0	0
25	Pikit	Bago-enged	MMIP II	LMSA	2	0	0	1	3	0	0	0	0	0	0	0	0	0
26	Pikit	Kolambog	MMIP II	UMSA	1	0	9	0	1	1	0	0	0	0	0	0	0	0
27	Pikit	Silik	MMIP II	LMSA	1	1	0	0	0	0	0	1	0	0	0	0	0	0
28	Pikit	Bualan	MMIP II	UMSA	2	0	4	0	1	0	0	0	0	0	0	0	1	0
29	Pikit	Langayen	MMIP II	LMSA	0	0	2	0	0	0	0	3	0	0	0	0	3	0
30	Pikit	Poblacion	MMIP II	LMSA	1	1	6	0	0	1	0	0	0	0	0	0	0	0
31	Pikit	Nalapaan	MMIP II	UMSA	0	3	4	4	0	1	1	0	0	0	0	1	0	0
32	Pikit	Nungan	MMIP II	LMSA	0	9	3	9	0	0	0	0	0	0	0	0	0	0
33	Pikit	Dalengaoen	MMIP II	UMSA	2	19	3	31	18	7	4	4	0	0	0	0	0	0
34	Pikit	Takipan	MMIP II	UMSA	0	12	10	8	1	3	7	3	0	0	1	2	0	1
35	Pikit	Panicupan	MMIP II	UMSA	1	14	5	25	18	3	0	2	0	0	0	0	0	1
36	Pikit	Macasendeg	MMIP II	LMSA	2	0	1	0	1	0	0	0	0	0	0	1	0	0
37	Pikit	Damalasak	MMIP II	LMSA	1	0	2	0	1	0	0	0	0	0	0	0	0	0

No.	Municipality	Barangay	Location	Service Area	Corn Sheller	Rice Thresher	Solar Dryer	Floating Tiller	Hand Tractor w/ Trailer	Power Tiller	Shallow Tube Well	Rice Mill	Rice Reaper	Rice Combined Harvester	Flatbed Dryer	Ware-house	Corn Mill	Drum Seeder
38	Pikit	Paidu Pulangi	MMIP II	UMSA	2	0	2	0	0	0	0	0	0	0	0	0	0	0
39	Pikit	Manaulanan	MMIP II	LMSA	1	0	2	0	0	0	1	0	0	0	0	0	0	0
40	Pikit	Macabual	MMIP II	LMSA	0	0	1	2	0	0	0	0	0	0	0	0	0	0
41	Aleosan	Dungguan	MMIP II	UMSA	0	0	2	0	0	0	0	0	0	0	0	1	0	0
42	Aleosan	Tapodoc	MMIP II	UMSA	0	0	2	0	0	0	0	0	0	0	0	0	0	0
43	Carmen	Gen. Luna	MMIP I	MSA	2	7	9	30	0	0	21	1	0	0	0	0	0	0
44	Carmen	Kibayao	MMIP I	MSA	5	5	10	15	0	0	2	1	0	0	0	3	0	0
45	Carmen	Nasapian	MMIP I	MSA	2	0	3	4	0	0	0	0	0	0	0	1	0	0
46	Carmen	Ugalingan	MMIP I	MSA	5	10	9	14	0	0	12	2	0	0	0	10	1	0
47	Pagalungan	Galakit	MMIP II	PESA	3	2	1	0	3	0	0	0	0	0	0	0	0	0
48	Pagalungan	Kudal	MMIP II	LMSA	2	3	0	0	2	0	0	0	0	0	0	0	0	0
49	Pagalungan	Linandangan	MMIP I	MSA	3	0	0	0	2	0	0	0	0	0	0	0	0	0
50	Pagalungan	Kilangan	MMIP I	MSA	0	8	2	9	5	7	0	0	2	0	0	0	0	0
51	Pagalungan	Layog	MMIP II	PESA	0	3	0	6	2	0	4	1	0	0	0	0	0	0
52	Pagalungan	Inug-ug	MMIP II	LMSA	9	0	0	9	4	0	0	0	0	0	0	0	0	0
53	Datu Montawal	Maridagao	MMIP I	MSA	0	1	3	0	0	0	0	0	0	0	0	1	0	0
Total					71	127	145	196	94	35	63	30	4	2	2	26	7	2

III.1.4 Enhancement of Agriculture Mechanization

The agricultural development strategy of the Philippine Development Plan 2017-2022 stresses agricultural mechanization as an important tool to attain improvement of the agricultural productivity. The plan expresses that the government will encourage adoption of farm machineries and equipment to reduce production costs of rice, as well as encouraging custom hiring and machinery pooling to provide alternative livelihood to low-skilled workers in rural areas. The farm mechanization will be accelerated by private service providers as envisaged in the plan. The plan states that the following government supporting measures to facilitate the use of appropriate farm machineries and equipment:

- ✓ Provision of fund to local manufacturers and assemblers,
- ✓ Intensified information, education & communication activities on available local machineries, and
- ✓ Provision of proper training and certification for machinery operation

In the Project site, it is noteworthy that out-migration of people from rural to urban centers results in scarcity of manpower working in the farms. Especially, once the prospective irrigable area of MMIP II is fully developed and operational, a problem on availability of farm workers is expected to rise. Irrigated rice production is more labor intensive than the current livelihood activities of farmers in MMIP II areas, e.g. rain-fed rice, corn farming and fisheries.

As in the results of Household Economic Survey conducted by the JICA team, very limited numbers of farmers own agriculture machineries in the MSA and almost none of them own the machineries in the LMSA. An insufficient number of them would result in reduction of production, post-harvest losses, and poor quality of rice paddy.

YLTA had agricultural machinery intervention, yet it was limited to just leasing a set of floating tiller, rotavator, hand tractor with trailer, thresher and welding machinery to the respective target IAs on the condition that it is returned after a year of utilization. A government project should pay much attention to the promotion of farm mechanization services rather than leasing farm machinery directly to farmers or farmers' group e.g. IA, not as conducted in YLTA. In case of anxious demand for farm machinery from IA members, one of alternative solution is to allow IAs to procure farm machinery and be a reliable provider of farm mechanization services.

1) Objective

The objective is to address a shortage of manpower/labor during synchronized land preparation, planting to harvesting and post-harvest activities on rice production through provision of small farm machineries appropriate to the MMIP II area. Through the provision, the IAs establish a system of farm machinery rental services to their members.

2) Approach

ATI procures and delivers pre- and post-harvest machineries to the IAs and then each IA rents the machineries to their members. First, an updated inventory of existing pre- and post-harvest machineries need to be done to determine a balance to meet the number of insufficient machineries. The minimum number of the machineries is delivered to each IA to attain 100% utilization of machineries per cropping season.

The respective IAs should store, manage and monitor them properly. Uniform policies should be in placed with regards to prioritization of usage by IA members, rental fee and/or wage for an operator, operation and management (O&M), etc. In this regards, ATI provides trainings on O&M of supplied agriculture machineries to IAs' members, those who are selected as a responsible machinery operator.

Regarding types of the machineries, of course machineries for land preparation should be installed, such as hand tractors and floating turtle. Small-size machineries are appropriate because average land owned by farmers is 1.52 ha in the project site according to the Baseline Survey. For the harvesting activity, a rice reaper and a rice thresher, as alternative to manual harvesting, could be more appropriate than a combined harvester-thresher and would lower the cost of the activity.

3) Activities

Following table shows implementation schedule of this sub component:

Table. Implementation Schedule of Enhancement of Agriculture Mechanization

Activity	2020		2021		2022		2023		2024		
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	
Inventory of existing pre- and post-harvest farm machineries owned by IAs and their members											
Calculation of additional machineries necessary for each IA based on the irrigated area and the number of members											
Formulation of uniform policies for O&M of the provided farm machineries											
5-day Intensive training of the O&M for the machinery operators											
Supporting consensus building among IAs' members on the O&M											
Identification of optimal location to store the machineries serving as a central station in each IA											
Construction of machinery storage with fencing and water supply facilities											
Provision of machineries identified by the inventory											
Monitoring of actual O&M of the provided machineries											
Evaluation and report making											

Source: JICA Survey Team

28 IAs that have not availed of YLTA and Government Funded Program will be provided with farm machineries to be procured. Following table indicates the tentative number of farm machineries to be provided to those IAs based on their capacity and results of the aforementioned inventory:

Table. Tentative Number of Farm Machineries to be Procured

Item	No. of IA	No. of Units	Total
Hand tractor with trailer*	28	2	56
Power tiller	28	2	56
Floating tiller/Rotavator	28	2	56
Mechanical planter (6-rows drum type seeder)	28	3	84
Rice reaper	28	2	56
Rice thresher	28	2	56
Solar dryer (15m x 30m dimension)	28	1	28
Rice mill (mobile)	28	1	28

Source: JICA Survey Team

According to an instructor of the College of Engineering of USM, the University is accredited by TESDA (Technical Education and Skills Development Authority) to conduct a 5-days training on the Operation and Maintenance of farm machineries. After trainees take the course, they are issued with NC II (National Certificate II) to operate agriculture machineries. Thus, USM provides the training to potential machinery operators from the respective target IAs in collaboration with ATI.

Following table shows cost for Enhancement of Agriculture Mechanization:

Table. Cost for Enhancement of Agriculture Mechanization

1) Machinery	Unit Price	Quantity	Total
Hand Tractor with Trailers	██████	56	██████
Power Tiller	██████	56	██████
Floating Tiller/ Rotavator	██████	56	██████
Mechanical Rice Seeder (drum type)	██████	84	██████
Rice Reaper	██████	56	██████
Rice Thresher	██████	56	██████
Solar Dryer (15m x 30m)	██████	28	██████
Mobile Rice Mill	██████	28	██████
2) Storage			
Storage (12m x 10m)	██████	28	██████
3) Tool			
welding machinery	██████	28	██████
4) Trainings			
Operation and Management for Agriculture Machineries	-	28	██████
Total			██████

Source: JICA Survey Team

APPENDIX-IV

IRRIGATION AND DRAINAGE

APPENDIX IV: IRRIGATION AND DRAINAGE

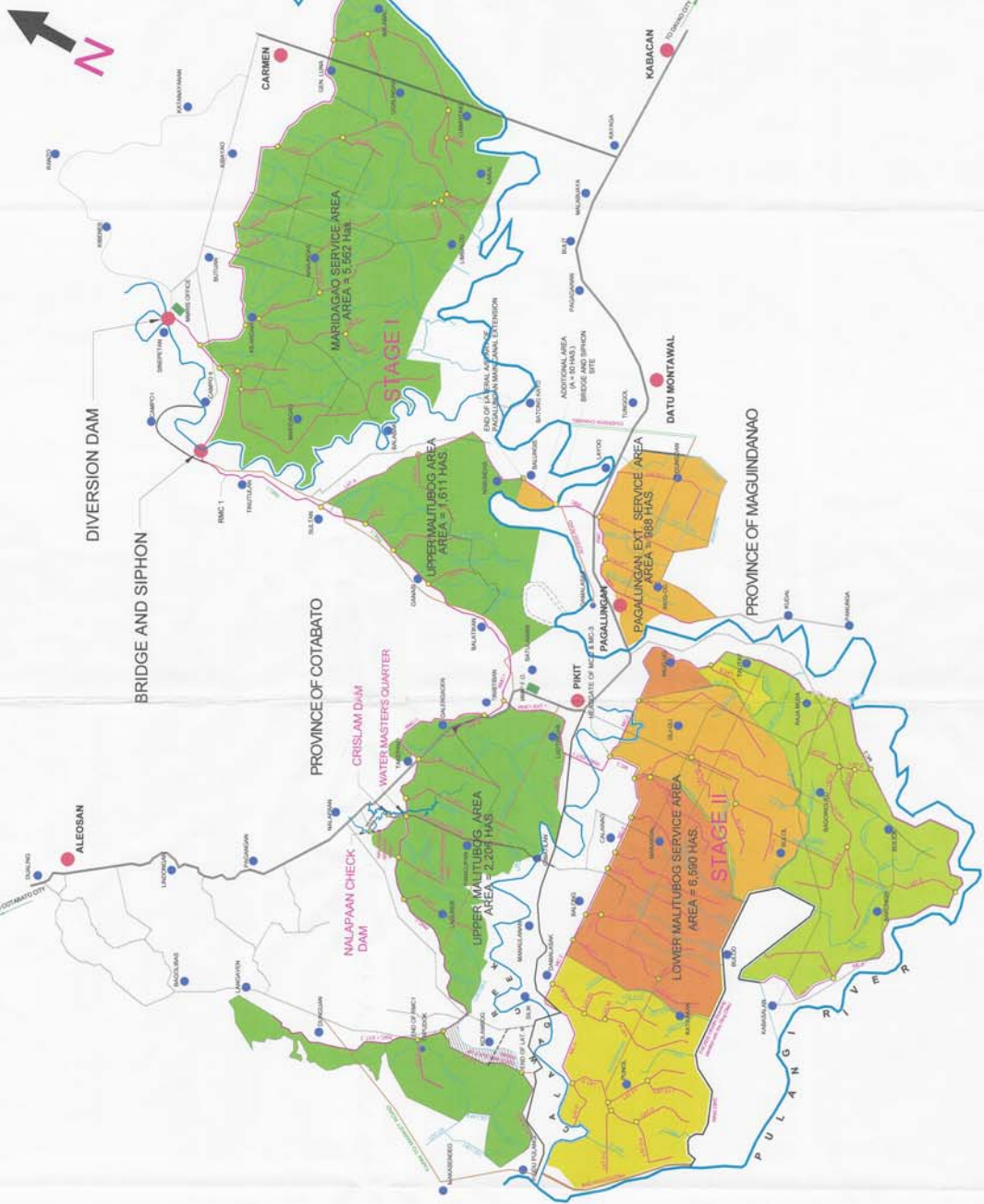
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IV.1 IRRIGATION AND DRAINAGE

IV.1.1 LOCATION MAP OF THE PROJECT

MALITUBOG MARIDAGAO IRRIGATION PROJECT



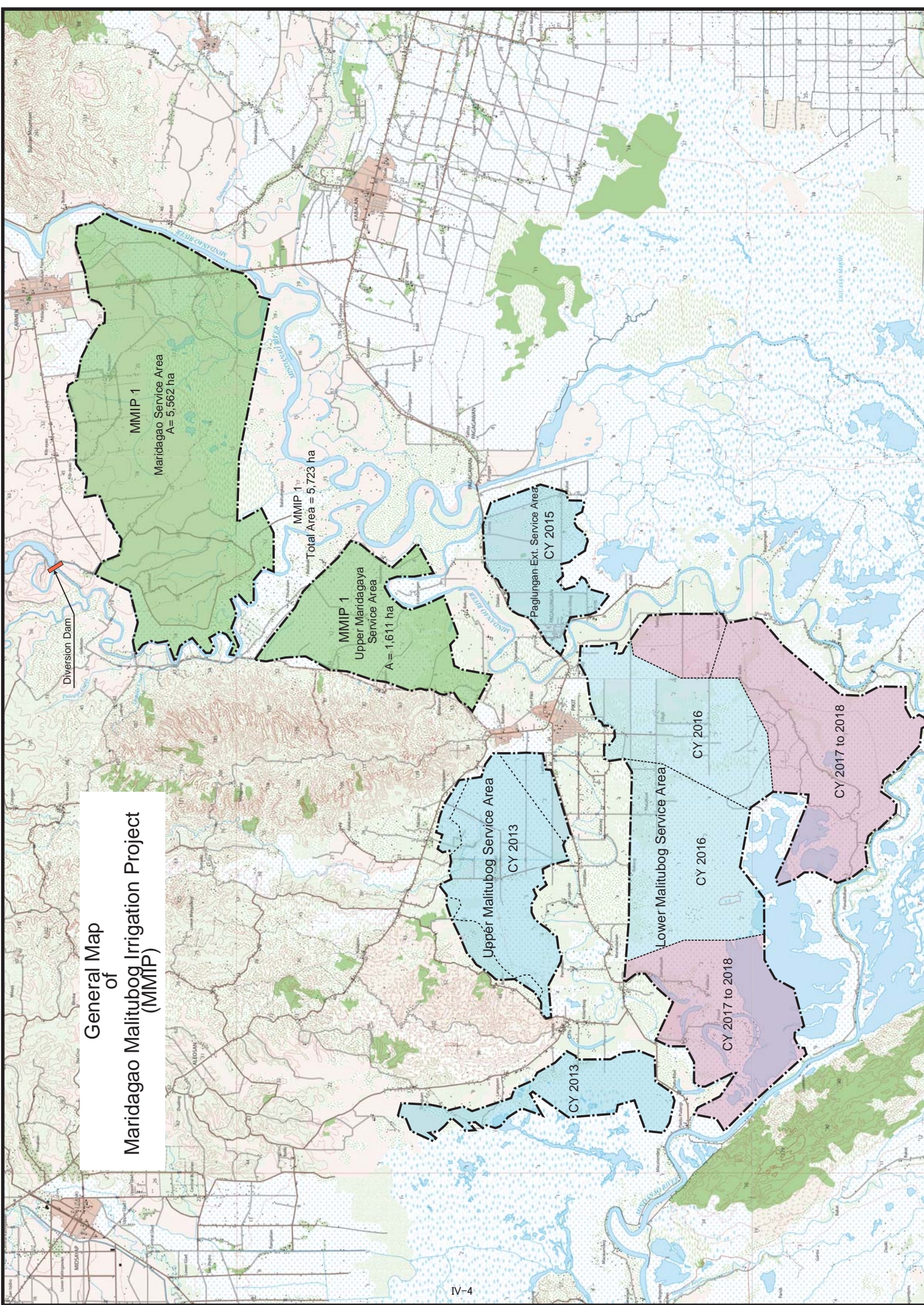
LEGEND:

- STAGE I (COMPLETED SERVICE AREA (A=7,173 HAS))
- STAGE II (COMPLETED SERVICE AREA (A=2206 HAS))
- PROPOSED NEW AREA (B=7M HAS)
- ADDITIONAL AREA (UMSA, A= 529 HAS)
- MUNICIPALITY
- BARANGAY
- NATIONAL/PROVINCIAL ROAD
- MUNICIPAL/BARANGAY ROAD
- ACCESS / FARM TO MARKET ROAD / ROAD DIKE
- RING DIKE
- RIVER / CREEKS

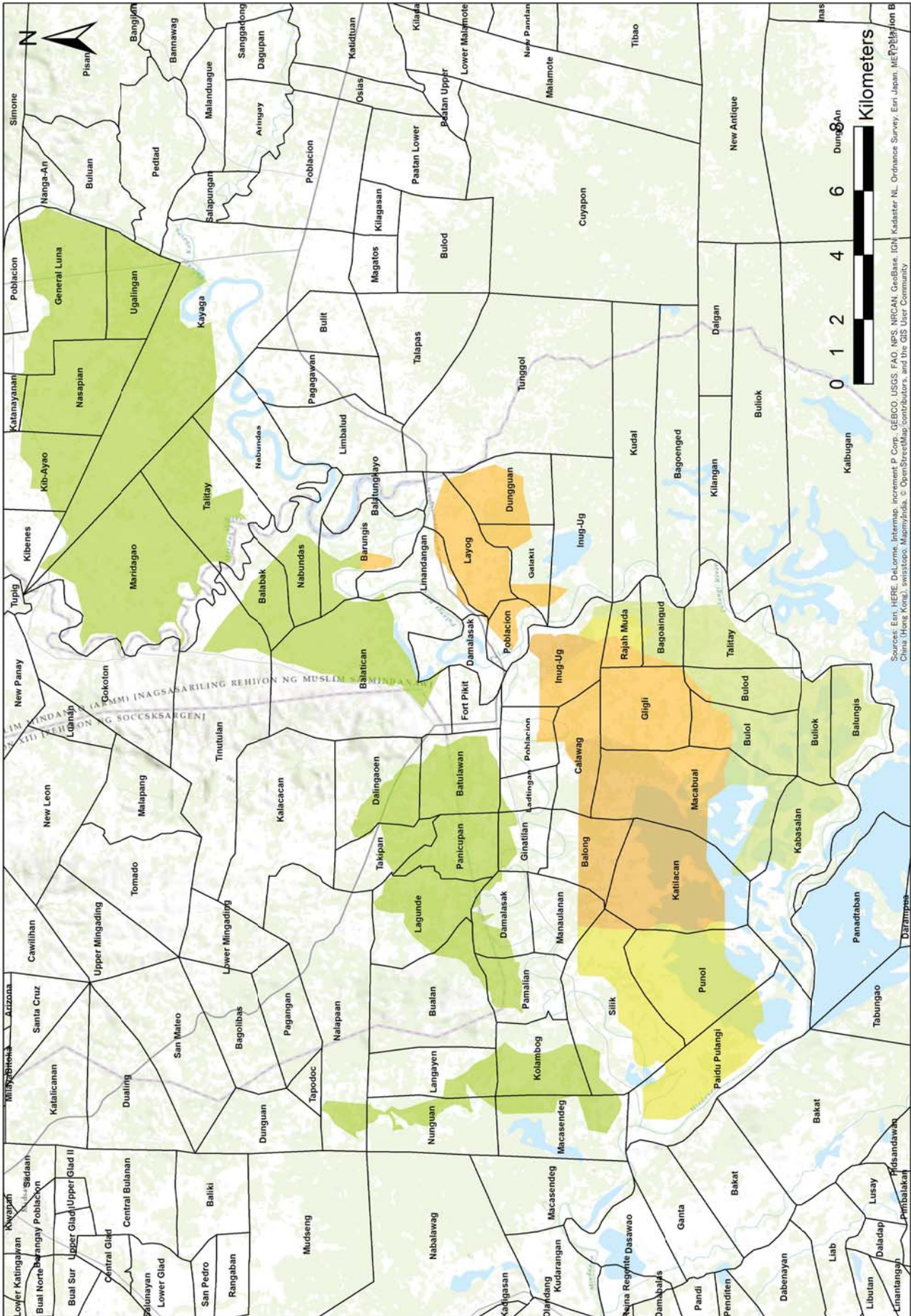
STAGE II

UPPER MALITUBOG AREA		
MAIN CANAL	LENGTH	AREA (NET)
RMC1	15.287 Kms	461 Hbs.
RMC1-EXT. 1	4.66 Kms	132 Hbs.
SUB-TOTAL	24.647 Kms	593 Hbs.
LATERAL CANAL		
LAT. E	1.366 Kms	126 Hbs.
LAT. F	2.51 Kms	106 Hbs.
LAT. G	3.506 Kms	285 Hbs.
LAT. H (PANICUPANI)	3.494 Kms	430 Hbs.
LAT. I	1.56 Kms	48 Hbs.
LAT. J	2.054 Kms	133 Hbs.
LAT. K	2.722 Kms	149 Hbs.
LAT. L	1.74 Kms	185 Hbs.
LAT. M	1.599 Kms	151 Hbs.
SUB-TOTAL	23.91 Kms	1,613 Hbs.
TOTAL	48.56 Kms	2,206 Hbs.
LOWER MALITUBOG AREA		
MAIN CANAL-2	22.79 Kms	1,107 Hbs.
MAIN CANAL-3	11.46 Kms	467 Hbs.
LAT. CANALS	81.76 Kms	5,016 Hbs.
TOTAL	116.00 Kms	6,590 Hbs.
PAGALUNGAN EXT. SERVICE AREA		
PMC	7.44 Kms	178 Hbs.
LAT. P-1	4.76 Kms	394 Hbs.
LAT. P-2	2.30 Kms	227 Hbs.
LAT. P-3	1.62 Kms	189 Hbs.
TOTAL	16.12 Kms	988 Hbs.
ADDITIONAL AREA		
RMC1-EXT. 2	4.70 Kms	191 Hbs.
LAT. A (UMSA 1,611)	50 Hbs.	50 Hbs.
LAT. K-EXT.	3.36 Kms	188 Hbs.
NALAPAAN MC	0.66 Km	100 Hbs.
TOTAL	8.72 Kms	529 Hbs.
GRAND TOTAL	189.00 Kms	10,313 Hbs.

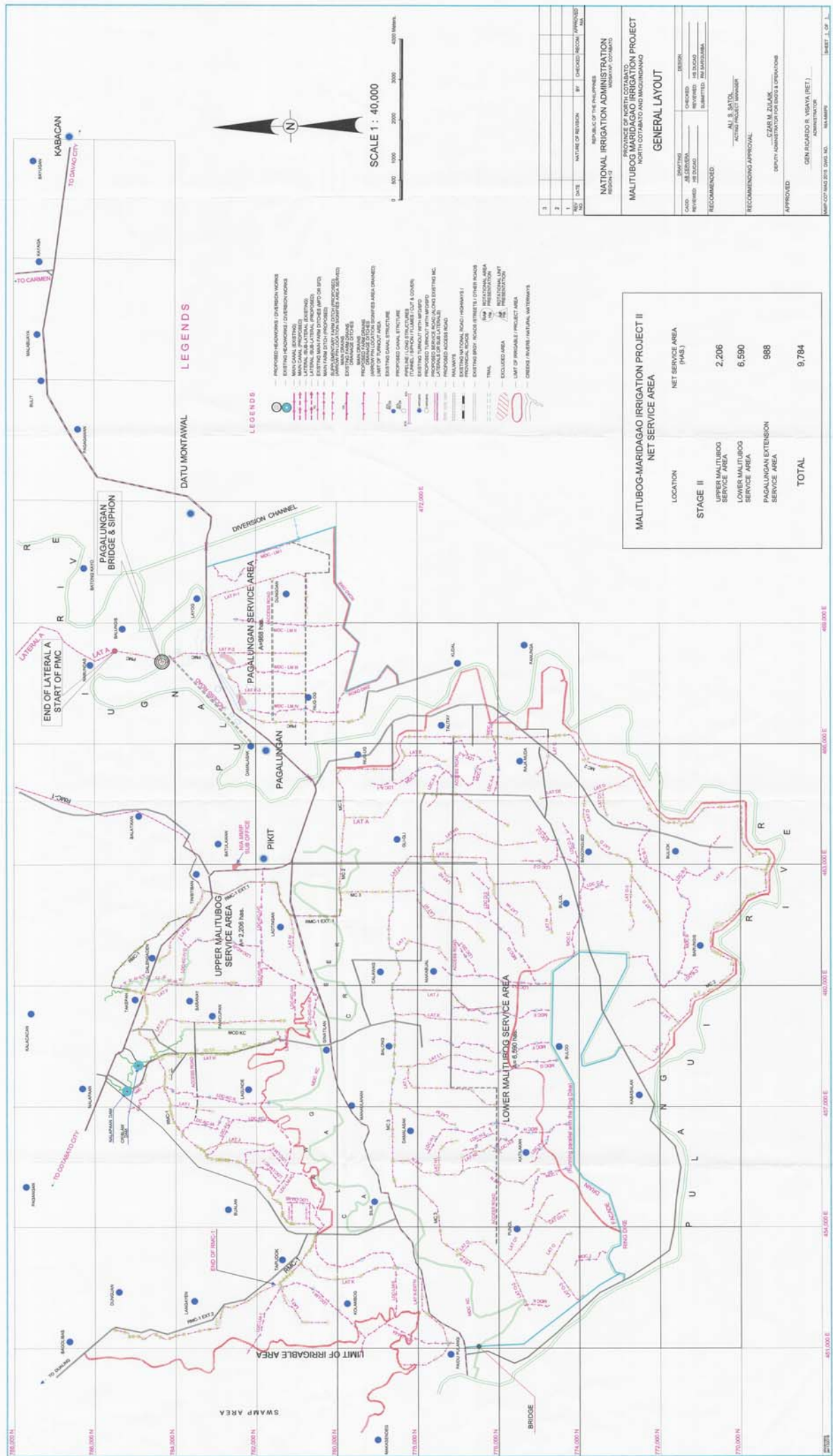
General Map Of Maridagao Malitubog Irrigation Project (MMIP)



Location Map of MMIP Project Area with Barangay boundary



Source: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, Esri, IGN, Swisstopo, Mapbox, © OpenStreetMap contributors, and the GIS User Community



LOCATION	NET SERVICE AREA (HAS.)
STAGE II	
UPPER MALTUBOG SERVICE AREA	2,206
LOWER MALTUBOG SERVICE AREA	6,590
PAGALUNGAN EXTENSION SERVICE AREA	988
TOTAL	9,784

NO.	DATE	NATURE OF REVISION	BY	CHECKED/REVISION	APPROVED
1					
2					
3					

REPUBLIC OF THE PHILIPPINES
 NATIONAL IRRIGATION ADMINISTRATION
 REGION II
 PROVINCE OF NORTH COTABATO
 MALTUBOG-MARIDAGAO IRRIGATION PROJECT
 NORTH COTABATO AND MARIDAGAO

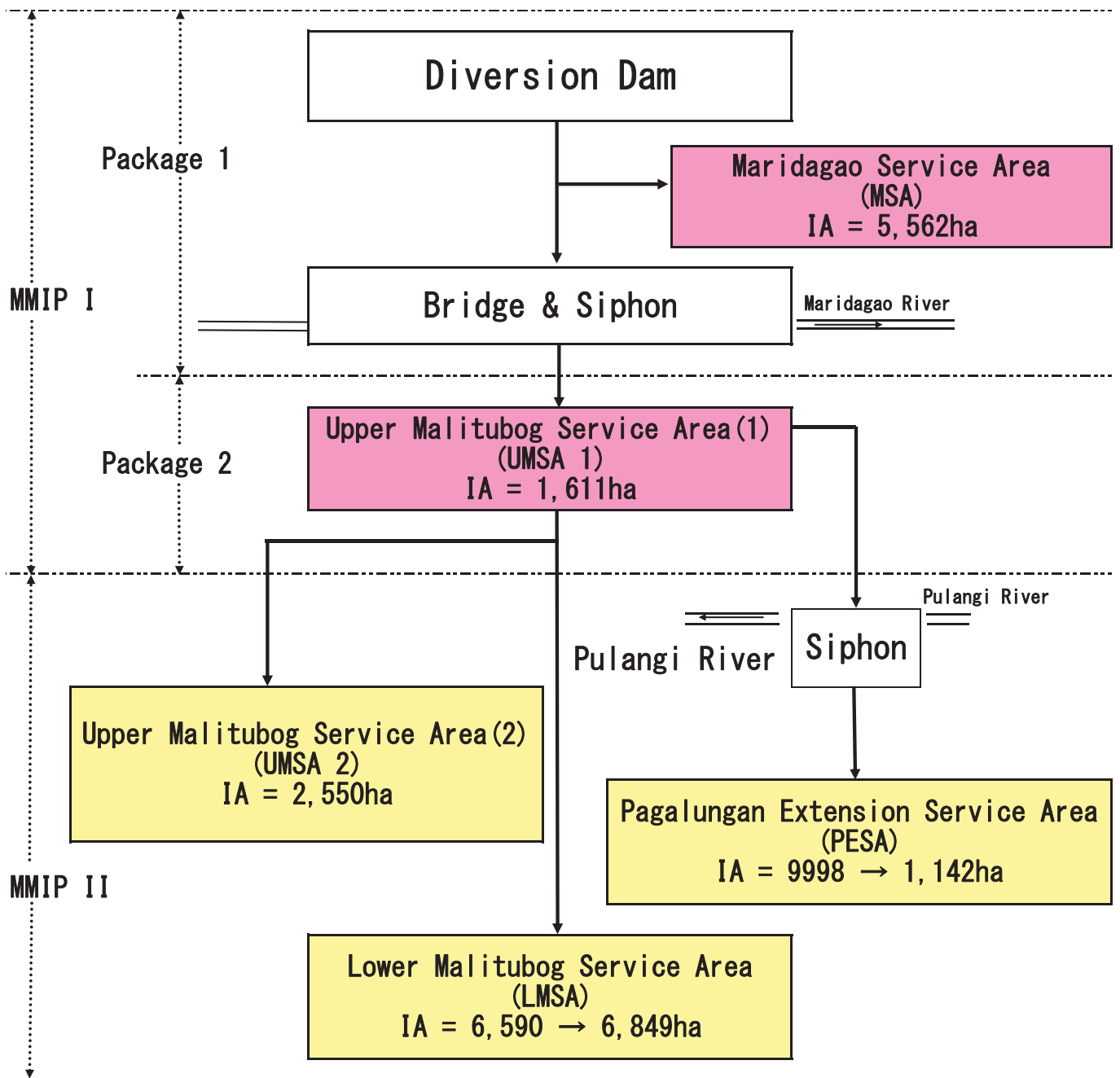
GENERAL LAYOUT

DRAWN BY: _____
 CHECKED BY: _____
 REVISIONS: _____
 SUBMITTED: _____
 RECOMMENDED: _____
 ACTIVE PROJECT MANAGER: _____
 RECOMMENDING APPROVAL: _____
 APPROVED: _____
 GEN. RICARDO B. NISWA (RET.)
 NIA REGIONAL OFFICE - MARAWAY

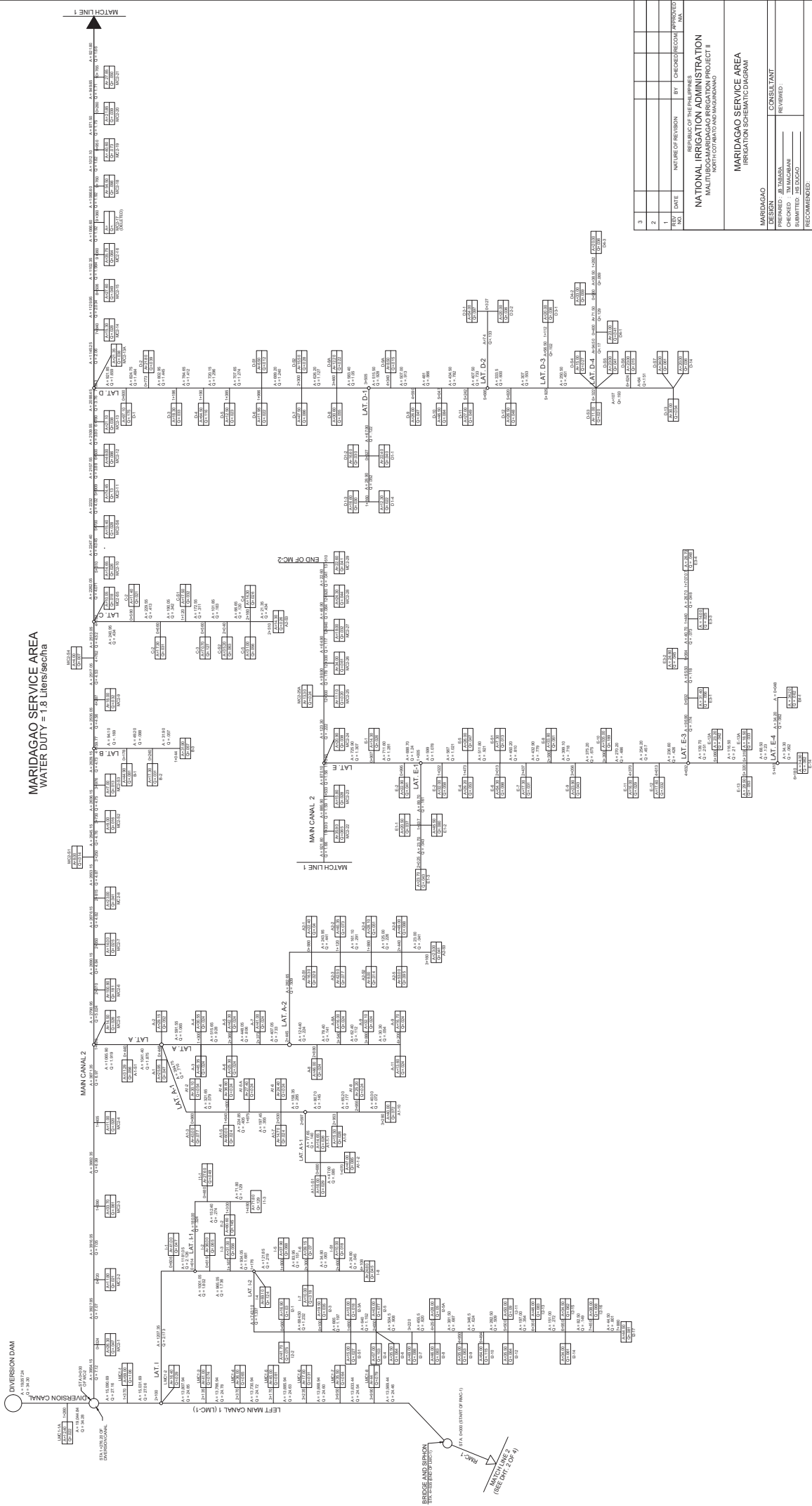
MAP-C27-042-2018-0046 VOL. _____ SHEET 1 OF 1

IV.1.3 PRESENT CONDITION OF IRRIGATION SYSTEM

Outline on Schematic Diagram of Irrigation System



MARIDAGAO SERVICE AREA
 WATER DUTY = 1.8 Liters/sec/ha



REV	DATE	NATURE OF REVISION	BY	CHECKED/RECOM	APPROVED
1					
2					
3					

NATIONAL IRRIGATION ADMINISTRATION
 MALUBOG-MARIDAGAO IRRIGATION PROJECT II
 NORTH-COTABATO AND MAGUINDANAO

MARIDAGAO SERVICE AREA	
IRRIGATION SCHEMATIC DIAGRAM	
DESIGN	CONSULTANT
PREPARED BY: <u> </u>	REVIEWED: <u> </u>
DRAWN BY: <u> </u>	APPROVED: <u> </u>
RECOMMENDED	

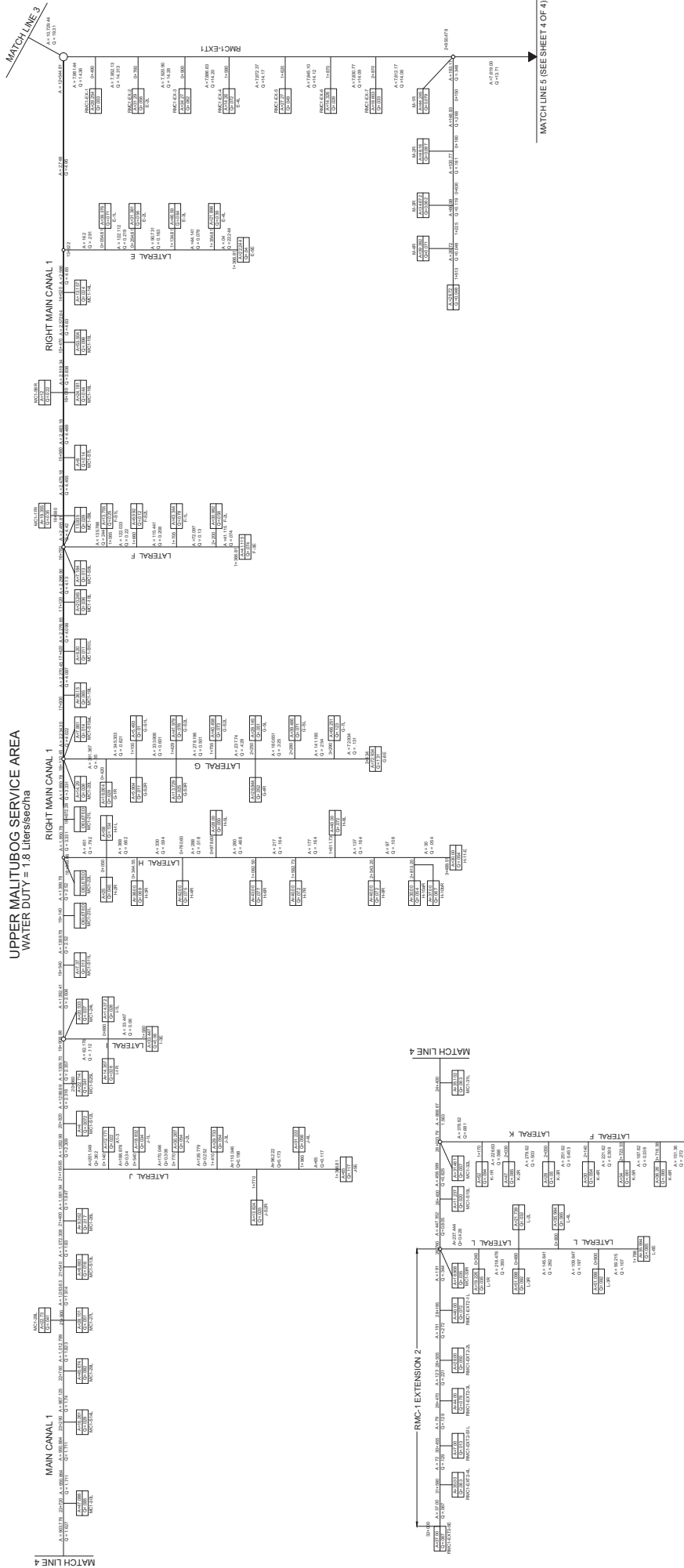
REYNALDOM SARCILUMBA
 MANAGER, ENGRG. DIVISION

APPROVED:

AKASA A. BASILAN
 ACTING PROJECT MANAGER

PAMP-CO-1 (MAG. 2014) (DWS) IN: MAR. 2, 2015 (MAG. 2014) OF 4

UPPER MALITUBOG SERVICE AREA
WATER DUTY = 1.8 Liters/Sec/ha



MATCH LINE 3

MATCH LINE 4

MATCH LINE 5 (SEE SHEET 4 OF 4)

NO.	DATE	NATURE OF REVISION	BY	CHECKED/RECOM.	APPROVED
3					
2					
1					

REVISIONS OF THE DESIGN

DESIGN	DATE	BY	CHECKED/RECOM.	APPROVED
PREPARED				
DRAWN				
REVIEWED				
SUBMITTED				
ISSUED				
RECOMMENDED				

NATIONAL IRRIGATION ADMINISTRATION
MALUBOG-MARDAGAO IRRIGATION PROJECT II
NORTH-COTABATO AND MAGUINDANAO

UPPER MALITUBOG SERVICE AREA &
PAGALJUNGAN EXTENSION SERVICE AREA

MARDAGAO
IRRIGATION SCHEMATIC DIAGRAM

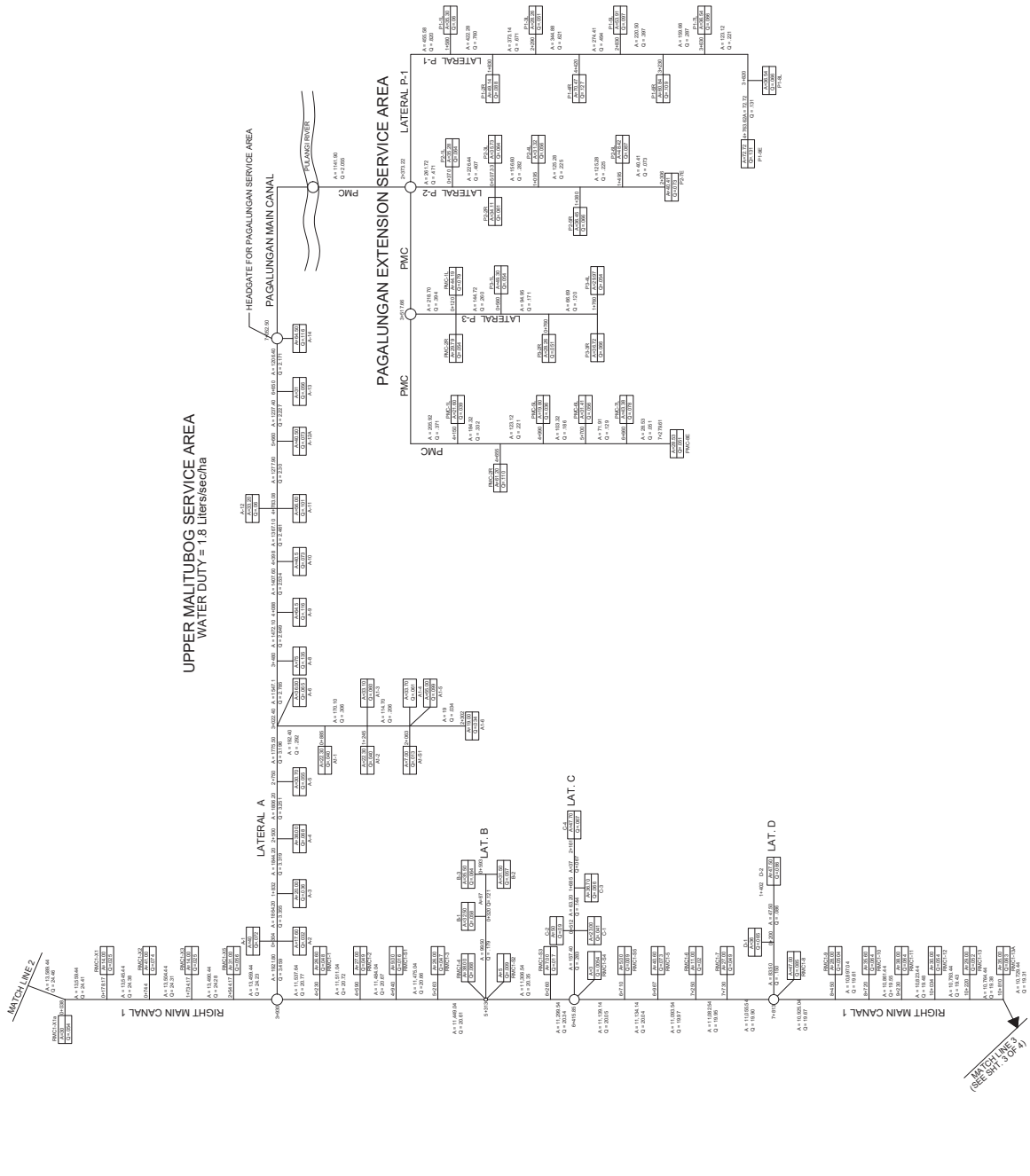
DESIGN	DATE	BY	CHECKED/RECOM.	APPROVED
PREPARED				
DRAWN				
REVIEWED				
SUBMITTED				
ISSUED				
RECOMMENDED				

REXWALDO M. SARCILIMBA
MANAGER, ENGG. DIVISION

AKASA A. BASILAN
ACTING PROJECT MANAGER

MARCO J. MARGOLLO
ENGINEER IN CHARGE, MARDAGAO

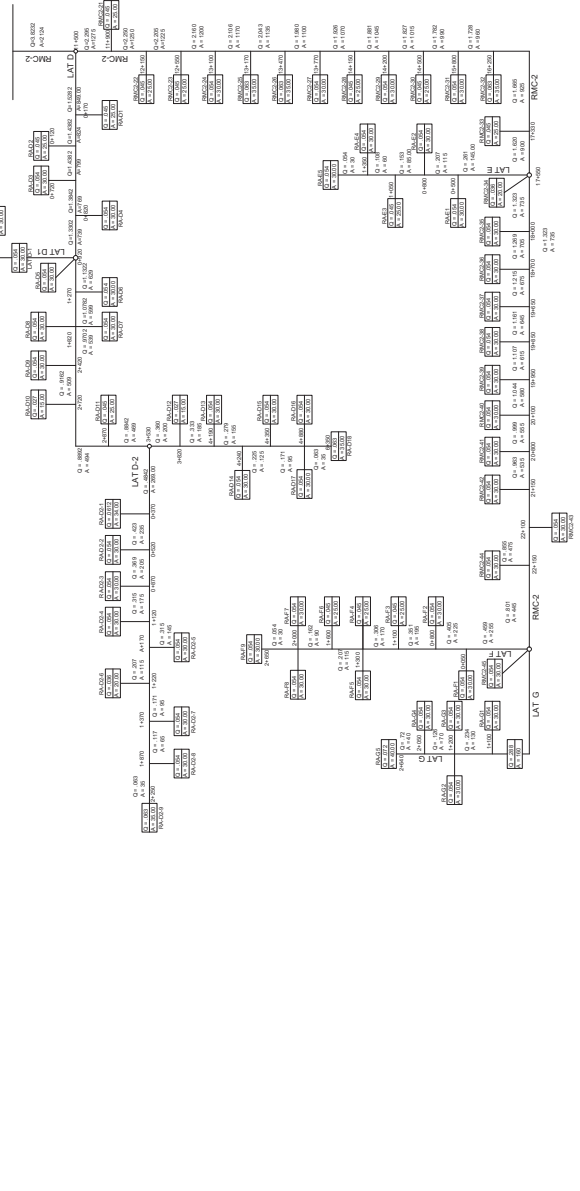
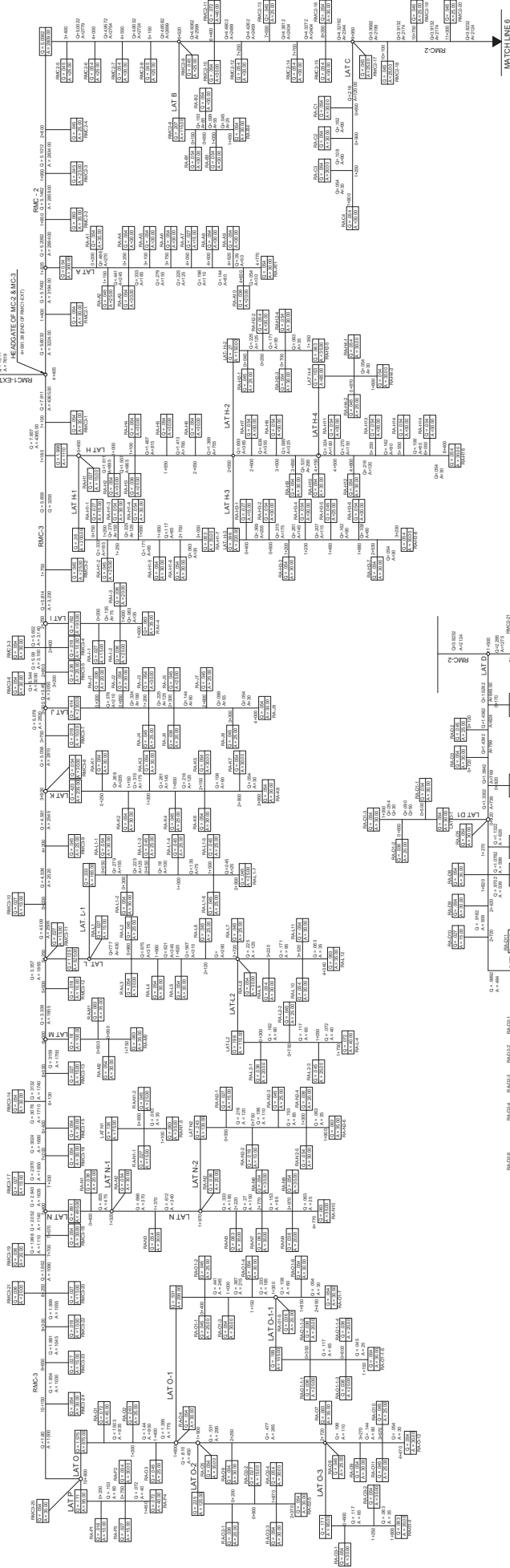
SHEET 2 OF 4



3								
2								
1	TEST DATE	DATE OF REVISION	BY	DESIGNED	REVISION	APPROVED	DATE	
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION MALITUBOG-MARIGAO IRRIGATION PROJECT I NORTH COTABATO AND MAGUINDANAO								
UPPER MALITUBOG SERVICE AREA IRRIGATION SCHEMATIC DIAGRAM								
MARIGAO DESIGN PREPARED BY: JABARA CHECKED BY: JABARA SUBMITTED BY: JABARA RECOMMENDED								
CONSULTANT REVIEWED REYNALDO M. SARIGIMBA MANAGER, ENGG. DIVISION								
APPROVED AKAS A. BASILAN ACTING PROJECT MANAGER								
IRRIGATION SCHEMATIC DIAGRAM								SHEET 3 OF 4

LOWER MALITUBOG SERVICE AREA
WATER DUTY = 1.8 Liters/sec/ha

MATCH LINE 5



TEST NO.	DATE	BY	CHECKED	REVISION	APPROVED
3					
2					

REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION
MALITUBOG IRRIGATION PROJECT I
NORTH COTABATO AND MAGSAYSAY

LOWER MALITUBOG SERVICE AREA
IRRIGATION SCHEMATIC DIAGRAM

MARDIAGAO
DESIGN
PREPARED BY: J. TABARA
CHECKED BY: J. TABARA
SUBMITTED BY: J. TABARA
TELECOMMENCED

REYNALDO M. SARGIEMBA
MANAGER, ENCG DIVISION

APPROVED:
AKAS A. BASILAN
ACTING PROJECT MANAGER

IV.1.4 ORIGINAL PLAN OF IRRIGATION AND DRAINAGE NETWORK

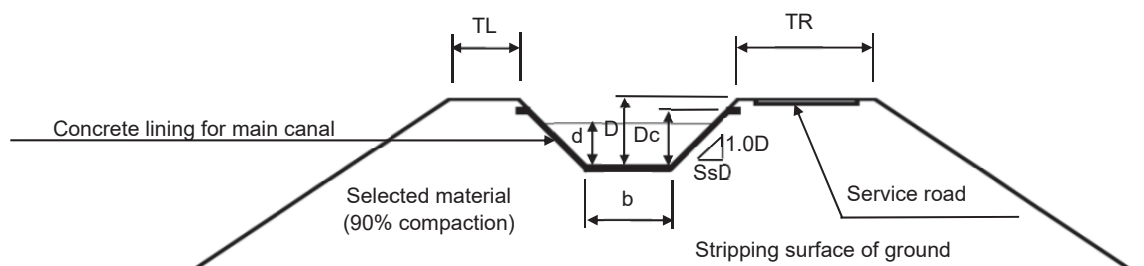
Irrigable Area under LMSA and Progress of the construction work

NO.	CANAL	Original Plan (Construction of Dike)			Condition of the contract work			Plan without construction of dike			Difference		
		STATION	Length (m)	Irrigable area (ha)	STATION	Length (m)	Irrigable area (ha)	Completion of works	STATION	Length (m)	Irrigable area (ha)	Canal length (m)	Irrigable area (ha)
1	RMC-2	0+000	1,867	75	0+000	1,867	75	84.1%	0+000	1,867	75	0	0
1	RMC-2	1+867	2,253	105	1+867	2,253	105	43.5%	1+867	4+120	105	0	0
1	RMC-2	4+120	1,700	295	4+120	1,700	295	8.2%	4+120	5+820	295	0	0
1	RMC-2	5+820	2,860	293	5+820	2,860	293	0.0%	5+820	8+680	293	0	0
1	RMC-2	8+680	2,920	162	8+680	2,920	162		8+680	11+600	162	0	0
1	RMC-2	11+600	11,189	634	11+600	11,189	634						
2	RMC-3	0+000	1,317	30	0+000	1,317	30	89.5%	0+000	1+317	30	0	-634
2	RMC-3	1+317	5,643	260	1+317	5,643	260	9.5%	1+317	6+960	260	0	0
2	RMC-3	6+960	4,426	174	6+960	4,426	174	4.0%	6+960	11+386	174	0	0
3	LATERAL A	0+000	4,770	300	0+000	4,442	300	62.1%	0+000	4+442	300	0	0
4	LATERAL B	0+000	1,450	115	0+000	1,369	115	0.0%	0+000	1+369	115	0	0
5	LATERAL C	0+000	1,800	108	0+000	1,677	108		0+000	1+677	108	0	0
6	LATERAL D	0+000	6,350	390	0+000	6,341	390		0+000	4+640	272	-1,701	-118
7	LATERAL D-1	0+000	1,350	75	0+000	1,299	75		0+000	1+299	75	0	0
8	LATERAL D-2	0+000	2,250	141	0+000	2,250	141		0+000	2+250	141	0	0
9	LATERAL D-3	0+000	2,288	243	0+000	2,288	243		0+000	2+288	243	0	0
10	LATERAL E	0+000	1,350	145	0+000	1,948	145		0+000	0+000	0	-1,948	-145
11	LATERAL F	0+000	2,650	255	0+000	1,990	255		0+000	0+000	0	-1,990	-255
12	LATERAL G	0+000	2,640	160	0+000	2,653	160		0+000	0+000	0	-2,653	-160
13	LATERAL H	0+000	6,400	455	0+000	5,987	455		0+000	5+987	455	0	0
14	LATERAL H-1	0+000	3,050	200	0+000	3,037	200		0+000	3+037	200	0	0
15	LATERAL H-2	0+000	1,350	150	0+000	1,248	150	43.2%	0+000	1+248	150	0	0
16	LATERAL H-3	0+000	3,230	220	0+000	3,007	220		0+000	3+007	220	0	0
17	LATERAL H-4	0+000	1,600	85	0+000	1,606	85		0+000	1+606	85	0	0
18	LATERAL I	0+000	1,600	90	0+000	1,648	90	32.8%	0+000	1+648	90	0	0
19	LATERAL J	0+000	4,000	230	0+000	2,849	230	30.2%	0+000	1+200	105	-1,649	-125
20	LATERAL K	0+000	3,950	235	0+000	2,302	235	22.9%	0+000	1+300	120	-1,002	-115
21	LATERAL L	0+000	4,340	440	0+000	2,360	440	19.8%	0+000	2+360	150	0	-290
22	LATERAL L-1	0+000	2,900	185	0+000	2,114	185	25.3%	0+000	1+000	110	-1,114	-75
23	LATERAL M	0+000	1,750	100	0+000	1,702	100	39.9%	0+000	1+702	100	0	0
24	LATERAL N	0+000	4,770	285	0+000	3,510	285		0+000	2+500	135	-1,010	-150
25	LATERAL N-1	0+000	1,100	75	0+000	1,120	75	41.9%	0+000	1+120	75	0	0
26	LATERAL N-2	0+000	1,900	135	0+000	1,921	135		0+000	1+000	100	-921	-35
27	LATERAL O	0+000	4,470	255	0+000	4,542	255		0+000	1+400	100	-3,142	-155
28	LATERAL O-1	0+000	2,450	295	0+000	2,320	295		0+000	0+000	0	-2,320	-295
29	LATERAL O1-1	0+000	1,150	105	0+000	1,077	105	20.2%	0+000	0+000	0	-1,077	-105
30	LATERAL O-2	0+000	2,370	125	0+000	1,210	125		0+000	0+000	0	-1,210	-125
31	LATERAL O-3	0+000	1,800	95	0+000	1,794	95		0+000	0+000	0	-1,794	-95
32	LATERAL P	0+000	1,450	171	0+000	1,488	171		0+000	1+488	171	0	0
TOTAL			116,703	7,891		107,272	7,891			72,554	5,014	-34,718	-2,877

Note: Irrigable area is based on the Schematic Diagram of Irrigation System. Present design area is 6,590ha.

- Construction from 2015
- Construction from 2016
- Construction from 2017
- Construction from 2018

Dimension of typical cross section of irrigation canal



Main canal MC-2

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	n
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	1+867	5.80	0.92	6.29	2.80	1.47	2.10	1.80	0.90	4.00	2.00	1.0	0.00025	0.0016
1+867	4+911	5.26	0.90	5.83	2.60	1.44	2.00	1.70	0.87	4.00	2.00	1.0	0.00025	0.0016
4+911	9+018	5.06	0.89	5.65	2.50	1.40	2.00	1.70	0.86	4.00	2.00	1.0	0.00025	0.0016
9+018	11+586	4.84	0.88	5.47	2.50	1.40	2.00	1.70	0.86	4.00	2.00	1.0	0.00025	0.0016
11+586	17+198	3.31	0.86	3.85	2.10	1.17	1.70	1.50	0.71	4.00	2.00	1.0	0.00030	0.0016
17+198	22+789	3.05	0.84	3.61	2.00	1.15	1.60	1.40	0.69	4.00	2.00	1.0	0.00030	0.0016

Note: Q: Discharge, V: Velocity, A: Flow area, b: Canal bed width, d: water depth, D: canal depth, TR: Width of right canal bank, TL: Width of left canal bank, Ss: Slope of canal side slope, S: Slope of canal, n: Coefficient of friction

Lateral canal LAT-A

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	n
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+366	0.653	0.592	1.248	1.00	0.64	0.95	-	0.378	1.50	4.00	1.5:1	0.0008	0.025
0+366	1+360	0.610	0.563	1.085	1.00	0.58	0.90	-	0.351	1.50	4.00	1.5:1	0.0008	0.025
1+360	1+644.30	0.543	0.548	0.991	0.90	0.56	0.90	-	0.337	1.50	4.00	1.5:1	0.0008	0.025
1+644.30	2+300	0.427	0.516	0.827	0.80	0.52	0.85	-	0.308	1.50	4.00	1.5:1	0.0008	0.025
2+300	3+120	0.374	0.498	0.750	0.80	0.49	0.80	-	0.293	1.50	4.00	1.5:1	0.0008	0.025
3+120	3+463	0.278	0.464	0.601	0.70	0.44	0.75	-	0.263	1.50	4.00	1.5:1	0.0008	0.025
3+463	3+901.91	0.206	0.431	0.480	0.60	0.40	0.70	-	0.235	1.50	4.00	1.5:1	0.0008	0.025
3+901.91	4+065	0.135	0.385	0.351	0.60	0.32	0.70	-	0.199	1.50	4.00	1.5:1	0.0008	0.025
4+065	4+442.25	0.103	0.358	0.288	0.60	0.28	0.60	-	0.177	1.50	4.00	1.5:1	0.0008	0.025

Lateral canal LAT-B

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	n
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+520	0.179	0.412	0.435	0.70	0.35	0.65	-	0.220	1.50	3.00	1.5:1	0.0008	0.025
0+520	1+369	0.125	0.377	0.331	0.60	0.31	0.65	-	0.193	1.50	3.00	1.5:1	0.0008	0.025

Lateral canal LAT-C

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	n
From	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+510	0.194	0.459	0.421	0.60	0.36	0.65	-	0.219	1.50	3.00	1.5:1	0.0010	0.025
0+510	1+100	0.138	0.420	0.328	0.60	0.31	0.60	-	0.19	1.50	3.00	1.5:1	0.0010	0.025
1+100	1+676.76	0.053	0.330	0.164	0.50	0.20	0.50	-	0.133	1.50	3.00	1.5:1	0.0010	0.025

Lateral canal LAT-D

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	n
From	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+500	1.528	0.634	2.411	1.60	0.84	1.20	-	0.52	1.50	4.00	1.5:1	0.0006	0.025
0+500	0+850	1.428	0.622	2.294	1.60	0.81	1.20	-	0.506	1.50	4.00	1.5:1	0.0006	0.025
0+850	1+300	1.199	0.595	2.012	1.50	0.76	1.10	-	0.474	1.50	4.00	1.5:1	0.0006	0.025
1+300	2+235	1.048	0.576	1.818	1.40	0.73	1.05	-	0.451	1.50	4.00	1.5:1	0.0006	0.025
2+235	2+700	0.970	0.565	1.719	1.40	0.70	1.00	-	0.438	1.50	4.00	1.5:1	0.0006	0.025
2+700	3+125	0.869	0.550	1.579	1.30	0.68	1.00	-	0.421	1.50	4.00	1.5:1	0.0006	0.025
3+125	3+930	0.770	0.533	1.446	1.30	0.64	1.00	-	0.401	1.50	4.00	1.5:1	0.0006	0.025
3+930	4+590	0.317	0.427	0.742	0.90	0.46	0.80	-	0.288	1.50	4.00	1.5:1	0.0006	0.025
4+590	5+205	0.175	0.369	0.475	0.70	0.36	0.70	-	0.231	1.50	4.00	1.5:1	0.0006	0.025
5+205	5+760	0.123	0.338	0.365	0.60	0.34	0.65	-	0.203	1.50	3.00	1.5:1	0.0006	0.025
5+760	6+341.38	0.089	0.310	0.289	0.60	0.28	0.60	-	0.179	1.50	3.00	1.5:1	0.0006	0.025

Lateral canal LAT-D1

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+610	0.083	0.366	0.227	0.60	0.24	0.60	-	0.156	1.00	3.00	1.5:1	0.0010	0.025
0+610	1+299.18	0.036	0.299	0.121	0.40	0.18	0.50	-	0.115	1.00	3.00	1.5:1	0.0010	0.025

Lateral canal LAT-D2

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+260	0.177	0.41	0.429	0.70	0.35	0.70	-	0.219	1.50	3.00	1.5:1	0.0008	0.025
0+260	0+560	0.121	0.374	0.324	0.60	0.31	0.60	-	0.190	1.50	3.00	1.5:1	0.0008	0.025
0+560	1+009.102	0.082	0.339	0.241	0.50	0.27	0.60	-	0.165	1.50	3.00	1.5:1	0.0008	0.025

Lateral canal LAT-D3

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+530	0.438	0.515	0.850	1.00	0.49	0.80	-	0.307	1.00	4.00	1.5:1	0.0008	0.025
0+530	1+008	0.331	0.480	0.686	0.90	0.44	0.70	-	0.277	1.00	4.00	1.5:1	0.0008	0.025
1+008	1+360	0.192	0.420	0.457	0.70	0.37	0.70	-	0.226	1.00	3.00	1.5:1	0.0008	0.025
1+360	2+287.57	0.045	0.315	0.139	0.40	0.20	0.50	-	0.124	1.00	3.00	1.5:1	0.0008	0.025

Lateral canal LAT-E

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	1+000	0.264	0.455	0.580	0.80	0.41	0.70	-	0.255	3.00	1.00	1.5:1	0.0008	0.025
1+000	1+947.68	0.186	0.417	0.446	0.70	0.36	0.70	-	0.223	3.00	1.00	1.5:1	0.0008	0.025

Lateral canal LAT-F

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+078	0.368	0.378	0.894	1.20	0.50	0.80	-	0.325	1.50	4.00	1.5:1	0.0004	0.025
0+078	1+140	0.274	0.352	0.727	1.00	0.45	0.80	-	0.292	1.00	3.00	1.5:1	0.0004	0.025
1+140	1+160	0.223	0.335	0.616	0.90	0.43	0.70	-	0.271	1.00	3.00	1.5:1	0.0004	0.025
1+160	1+990.76	0.115	0.282	0.378	0.80	0.32	0.60	-	0.210	1.00	3.00	1.5:1	0.0004	0.025

Lateral canal LAT-G

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+293	0.336	0.432	0.779	1.00	0.46	0.80	-	0.293	4.00	1.50	1.5:1	0.0006	0.025
0+293	1+000	0.217	0.388	0.558	0.80	0.40	0.70	-	0.249	3.00	1.50	1.5:1	0.0006	0.025
1+000	2+000	0.134	0.346	0.389	0.60	0.35	0.70	-	0.210	3.00	1.50	1.5:1	0.0006	0.025
2+000	2+652.55	0.052	0.316	0.163	0.40	0.22	0.60	-	0.135	3.00	1.50	1.5:1	0.0006	0.025

Main canal MC-3

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	1+317.242	7.810	1.065	7.332	3.00	1.60	2.30	1.90	0.976	2.50	4.00	1.5:1	0.0003	0.016
1+317.42	2+915.223	5.560	0.975	5.702	2.80	1.37	2.00	1.70	0.855	2.50	4.00	1.5:1	0.0003	0.016
2+915.223	3+953.042	5.276	0.963	5.476	2.70	1.35	2.00	1.70	0.840	2.50	4.00	1.5:1	0.0003	0.016
3+953.042	4+565.311	4.849	0.946	5.128	2.50	1.34	2.00	1.65	0.816	2.50	4.00	1.5:1	0.0003	0.016
4+565.311	5+864.328	4.226	0.913	4.628	2.40	1.26	1.90	1.60	0.746	2.50	4.00	1.5:1	0.0003	0.016
5+864.328	6+820.085	3.206	0.854	3.756	2.10	1.15	1.75	1.45	0.700	2.50	4.00	1.5:1	0.0003	0.016
6+820.085	8+252.184	2.882	0.830	3.47	2.10	1.09	1.70	1.40	0.670	2.50	4.00	1.5:1	0.0003	0.016
8+252.184	11+589.55	1.929	0.750	2.57	1.80	0.94	1.50	1.25	0.280	1.50	4.00	1.5:1	0.0003	0.016

Lateral canal LAT-H

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+506	1.791	0.613	2.92	1.90	0.90	1.30	-	0.568	1.50	4.00	1.5:1	0.0005	0.025
0+506	1+584.91	1.708	0.607	2.813	1.80	0.89	1.30	-	0.559	1.50	4.00	1.5:1	0.0005	0.025
1+584.91	2+640	0.960	0.525	1.829	1.50	0.71	1.00	-	0.450	1.50	4.00	1.5:1	0.0005	0.025
2+640	3+609.96	0.868	0.513	1.693	1.40	0.69	1.00	-	0.434	1.50	4.00	1.5:1	0.0006	0.025
3+609.96	4+560	0.503	0.479	1.051	1.10	0.55	0.90	-	0.342	1.50	4.00	1.5:1	0.0006	0.025
4+560	5+060	0.388	0.448	0.864	1.10	0.50	0.80	-	0.310	1.50	4.00	1.5:1	0.0006	0.025
5+060	5+760	0.230	0.394	0.583	0.80	0.41	0.70	-	0.255	1.50	3.00	1.5:1	0.0006	0.025
5+760	5+987.12	0.077	0.301	0.256	0.50	0.28	0.60	-	0.170	1.00	3.00	1.5:1	0.0006	0.025

Lateral canal LAT-H1

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	1+131	0.439	0.539	0.817	1.00	0.48	0.80	-	0.301	1.00	4.00	1.5:1	0.0009	0.025
1+131	1+840	0.372	0.519	0.720	0.90	0.45	0.80	-	0.283	1.00	4.00	1.5:1	0.0009	0.025
1+840	2+380	0.291	0.507	0.576	0.80	0.41	0.70	-	0.254	1.00	4.00	1.5:1	0.0010	0.025
2+380	2+770	0.185	0.451	0.410	0.70	0.34	0.70	-	0.213	1.00	3.00	1.5:1	0.0010	0.025
2+770	3+037.23	0.137	0.419	0.326	0.60	0.31	0.60	-	0.191	1.00	3.00	1.5:1	0.0010	0.025

Lateral canal LAT-H2

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+080	0.198	0.424	0.469	0.70	0.37	0.70	-	0.229	1.00	3.00	1.5:1	0.0008	0.025
0+080	0+637	0.151	0.394	0.382	0.70	0.32	0.70	-	0.205	1.00	3.00	1.5:1	0.0008	0.025
0+637	1+020	0.108	0.363	0.398	0.60	0.29	0.60	-	0.182	1.00	3.00	1.5:1	0.0008	0.025
1+020	0+247.67	0.081	0.335	0.241	0.60	0.25	0.60	-	0.161	1.00	3.00	1.5:1	0.0008	0.025

Lateral canal LAT-H3

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+720	0.392	0.500	0.785	1.00	0.46	0.80	-	0.294	1.50	4.00	1.5:1	0.0008	0.025
0+720	1+060	0.325	0.477	0.679	0.90	0.44	0.80	-	0.274	1.50	4.00	1.5:1	0.0008	0.025
1+060	1+580	0.287	0.465	0.617	0.80	0.43	0.75	-	0.263	1.50	4.00	1.5:1	0.0008	0.025
1+580	2+014	0.197	0.424	0.467	0.70	0.37	0.70	-	0.229	1.00	3.00	1.5:1	0.0008	0.025
2+014	2+570	0.161	0.401	0.402	0.70	0.33	0.65	-	0.211	1.00	3.00	1.5:1	0.0008	0.025
2+570	3+006.73	0.120	0.373	0.322	0.60	0.30	0.60	-	0.190	1.00	3.00	1.5:1	0.0008	0.025

Lateral canal LAT-H4

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+ 000	0+480	0.232	0.439	0.528	0.80	0.38	0.70	-	0.242	1.00	3.00	1.5:1	0.0008	0.025
0+480	1+160	0.187	0.417	0.449	0.70	0.36	0.70	-	0.224	1.00	3.00	1.5:1	0.0008	0.025
1+160	1+606.28	0.062	0.300	0.208	0.50	0.24	0.50	-	0.151	1.00	3.00	1.5:1	0.0008	0.025

Lateral canal LAT-I

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+882	0.162	0.400	0.399	0.60	0.35	0.70	-	0.213	1.50	3.00	1.5:1	0.0008	0.025
0+882	1+578.18	0.083	0.340	0.243	0.50	0.27	0.60	-	0.165	1.50	3.00	1.5:1	0.0008	0.025

Lateral canal LAT-K

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+420	0.435	0.539	0.807	0.90	0.49	0.80	-	0.302	4.00	1.50	1.5:1	0.0009	.0.025
0+420	0+735	0.356	0.511	0.695	0.90	0.44	0.80	-	0.278	4.00	1.50	1.5:1	0.0009	0.025
0+735	1+155	0.264	0.474	0.556	0.80	0.40	0.70	-	0.249	3.00	1.00	1.5:1	0.0009	0.025
1+155	1+680	0.214	0.432	0.495	0.70	0.39	0.70	-	0.236	3.00	1.00	1.5:1	0.0008	0.025
1+680	2+301.72	0.139	0.388	0.358	0.60	0.33	0.60	-	0.201	3.00	1.00	1.5:1	0.0008	0.025

Lateral canal LAT-L

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+334.25	0.926	0.621	1.489	1.30	0.65	1.00	-	0.407	1.50	4.00	1.5:1	0.0008	0.025
0+334.25	0+840	0.631	0.565	1.116	1.10	0.57	0.90	-	0.354	1.50	4.00	1.5:1	0.0008	0.025
0+840	2+000	0.539	0.542	0.995	1.10	0.53	0.90	-	0.332	1.50	4.00	1.5:1	0.0008	0.025
2+000	2+360	0.422	0.509	0.826	1.00	0.48	0.80	-	0.302	1.50	4.00	1.5:1	0.0008	0.025
2+360	2+862	0.318	0.475	0.669	0.90	0.43	0.80	-	0.272	1.50	4.00	1.5:1	0.0008	0.025
2+862	3+160.109	0.269	0.457	0.589	0.80	0.41	0.70	-	0.257	1.00	3.00	1.5:1	0.0008	0.025

Lateral canal LAT-L1

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+060	0.248	0.447	0.556	0.80	0.40	0.70	-	0.249	1.50	3.00	1.5:1	0.0008	0.025
0+060	0+940	0.194	0.421	0.460	0.70	0.37	0.70	-	0.227	1.50	3.00	1.5:1	0.0008	0.025
0+940	2+113.937	0.147	0.394	0.374	0.60	0.34	0.70	-	0.206	1.50	3.00	1.5:1	0.0008	0.025

Lateral canal LAT-M

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+970	0.18	0.431	0.416	0.70	0.34	0.70	-	0.215	1.00	3.00	1.5:1	0.0009	0.025
0+970	1+702.51	0.09	0.362	0.252	0.60	0.26	0.60	-	0.166	1.00	3.00	1.5:1	0.0009	0.025

Lateral canal LAT-N

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+722	0.779	0.596	1.307	1.20	0.62	1.00	-	0.382	1.50	4.00	1.5:1	0.0008	0.025
0+722	1+269.96	0.712	0.539	1.218	1.10	0.61	0.90	-	0.371	1.50	4.00	1.5:1	0.0008	0.025
1+269.96	1+917.13	0.529	0.540	0.931	0.90	0.54	0.90	-	0.326	1.50	4.00	1.5:1	0.0009	0.025
1+917.13	2+168	0.234	0.460	0.511	0.80	0.38	0.80	-	0.237	1.50	4.00	1.5:1	0.0009	0.025
2+168	2+940	0.180	0.431	0.417	0.70	0.34	0.70	-	0.215	1.00	3.00	1.5:1	0.0009	0.025
2+940	3+509.75	0.153	0.416	0.369	0.60	0.33	0.65	-	0.204	1.00	3.00	1.5:1	0.0009	0.025

Lateral canal LAT-N1

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+680	0.123	0.374	0.325	0.60	0.31	0.60	-	0.191	1.00	3.00	1.5:1	0.0008	0.025
0+680	1+120.02	0.066	0.321	0.206	0.50	0.24	0.60	-	0.151	1.00	3.00	1.5:1	0.0008	0.025

Lateral canal LAT-N2

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+680	0.257	0.451	0.568	0.80	0.40	0.70	-	0.252	1.00	3.00	1.5:1	0.0008	0.025
0+680	1+340	0.209	0.430	0.488	0.70	0.38	0.70	-	0.234	1.00	3.00	1.5:1	0.0008	0.025
1+340	1+*20.85	0.058	0.391	0.151	0.50	0.19	0.50	-	0.127	1.00	3.00	1.5:1	0.0008	0.025

Lateral canal LAT-O

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	1+483.238	1.575	0.521	3.019	1.60	0.94	1.30	-	0.582	1.50	4.00	1.5:1	0.00035	0.025
1+483.238	1+730.82	1+060	0.472	2.247	1.60	0.80	1.10	-	0.500	1.50	4.00	1.5:1	0.00035	0.025
1+730.82	2+795.64	0.545	0.400	1.362	1.20	0.63	1.00	-	0.391	1.00	4.00	1.5:1	0.00035	0.025
2+795.64	3+760	0.329	0.353	0.933	1.00	0.52	0.90	-	0.323	1.00	4.00	1.5:1	0.00035	0.025

Lateral canal LAT-O1

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	1+459.942	0.515	0.538	0.957	1.00	0.53	0.90	-	0.328	1.50	4.00	1.5:1	0.0008	0.025
1+459.942	1+760	0.329	0.482	0.684	0.80	0.46	0.80	-	0.278	1.50	4.00	1.5:1	0.0008	0.025

Lateral canal LAT-O1-1

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+280	0.254	0.379	0.670	0.80	0.45	0.80	-	0.254	1.50	3.00	1.5:1	0.0004	0.025
0+280	0+800	0.204	0.356	0.553	0.70	0.42	0.80	-	0.204	1.50	3.00	1.5:1	0.0004	0.025

Lateral canal LAT-O2

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	0+340	0+254	0.379	0.670	0.80	0.45	0.80	-	0.275	1.50	3.00	1.5:1	0.0005	0.025
0+340	0+880	0.197	0.356	0.553	0.70	0.42	0.80	-	0.251	1.50	3.00	1.5:1	0.0005	0.025

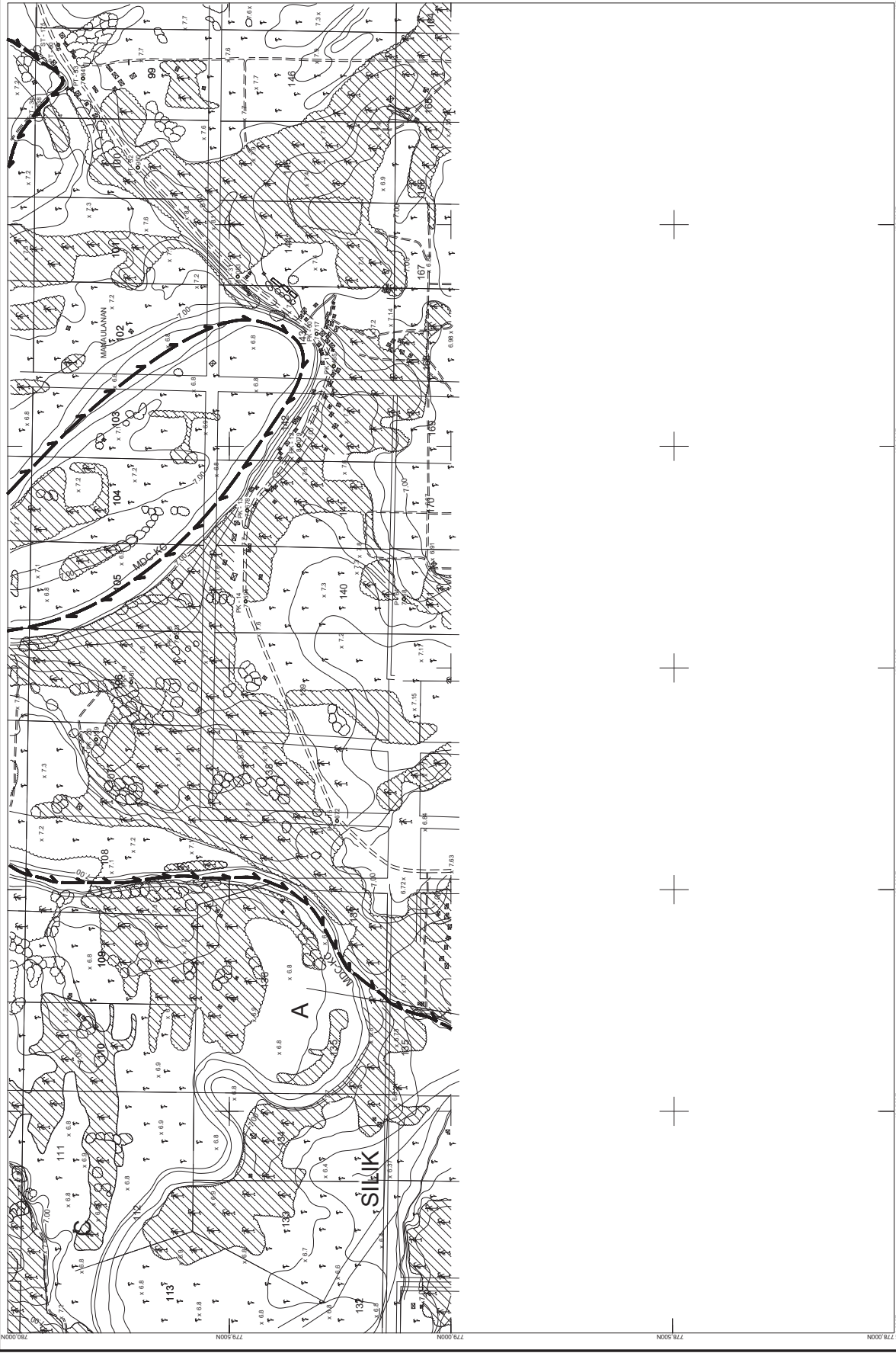
Lateral canal LAT-O3

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	1+420	0.216	0.363	0.597	0.80	0.42	0.80	-	0.237	3.00	1.50	1.5:1	0.0005	0.025

Lateral canal LAT-P

Station		Q	V	A	b	d	D	Dc	R	TR	TL	Ss	S	N
from	to	m ³ /s	m/s	m	m	m	m	m	m	m	m			
0+000	1+317.242	0.167	0.343	0.489	0.60	0.40	0.65	-	0.237	3.00	1.50	1.5:1	0.0005	0.025

IV.1.5 ORIGINAL PLAN OF PROTECTION DIKE AND RING DIKE



1	2	3	4	5	6	7
14	13	12	11	10	9	8
15	16	17	18	19	20	21
27	26	25	24	23	22	
28	29	30	31	32		
					34	33

INDEX TO ADJOINING SHEETS

- LEGEND
- PROPOSED HEADWORKS / OVERFLOW WORKS
 - EXISTING HEADWORKS / OVERFLOW WORKS
 - MAIN CANAL (EXISTING)
 - LATERAL (EXISTING)
 - LATERAL (SUB-LATERAL) (EXISTING)
 - EXISTING MAIN CANAL (PIPE OR SPI)
 - EXISTING MAIN CANAL (OPEN OR SPI)
 - MAIN CANAL (PROPOSED)
 - LATERAL (PROPOSED)
 - SUB-LATERAL (PROPOSED)
 - EXISTING CANAL STRUCTURE
 - PROPOSED CANAL STRUCTURE
 - PIPELINE / UNDER STRUCTURES (IF COVER)
 - PROPOSED TUNNOUT WITH INFOSD
 - EXISTING TUNNOUT WITH INFOSD
 - LATERALS OF THE LATERALS
 - ACCESS ROAD
 - NATIONAL ROAD / HIGHWAYS
 - EXISTING BRIDGES / STREETS / OTHER ROADS
 - TUNNEL
 - EXCLUDED AREA
 - LIMIT OF IRRIGABLE / PROJECT AREA
 - CREEKS / RIVERS / NATURAL WATERWAYS

SCALE 1 : 4,000

3						
2						
1						
NO.	DATE	NATURE OF REVISION	BY	CHECKED	REVISION	DATE

NATIONAL IRRIGATION ADMINISTRATION
REGIONAL OFFICE - MARICOR

PROVINCE OF NORTH COTABATO
MALITUBOG MARDAGAO IRRIGATION PROJECT
LOWER MALITUBOG SERVICE AREA
LOWER MALITUBOG DESIGN AND CONSTRUCTION

DRAFTING: _____
DESIGN: _____
CHECKED: _____
REVIEWED: _____
SUBMITTED: _____

DESIGN: _____
CHECKED: _____
REVIEWED: _____
REVIEWED: _____

ACTING PROJECT MANAGER:
ALIS. SULTO

RECOMMENDING APPROVAL:
LYDIA S. ESCLERA
MANAGER, ENGINEERING DEPARTMENT

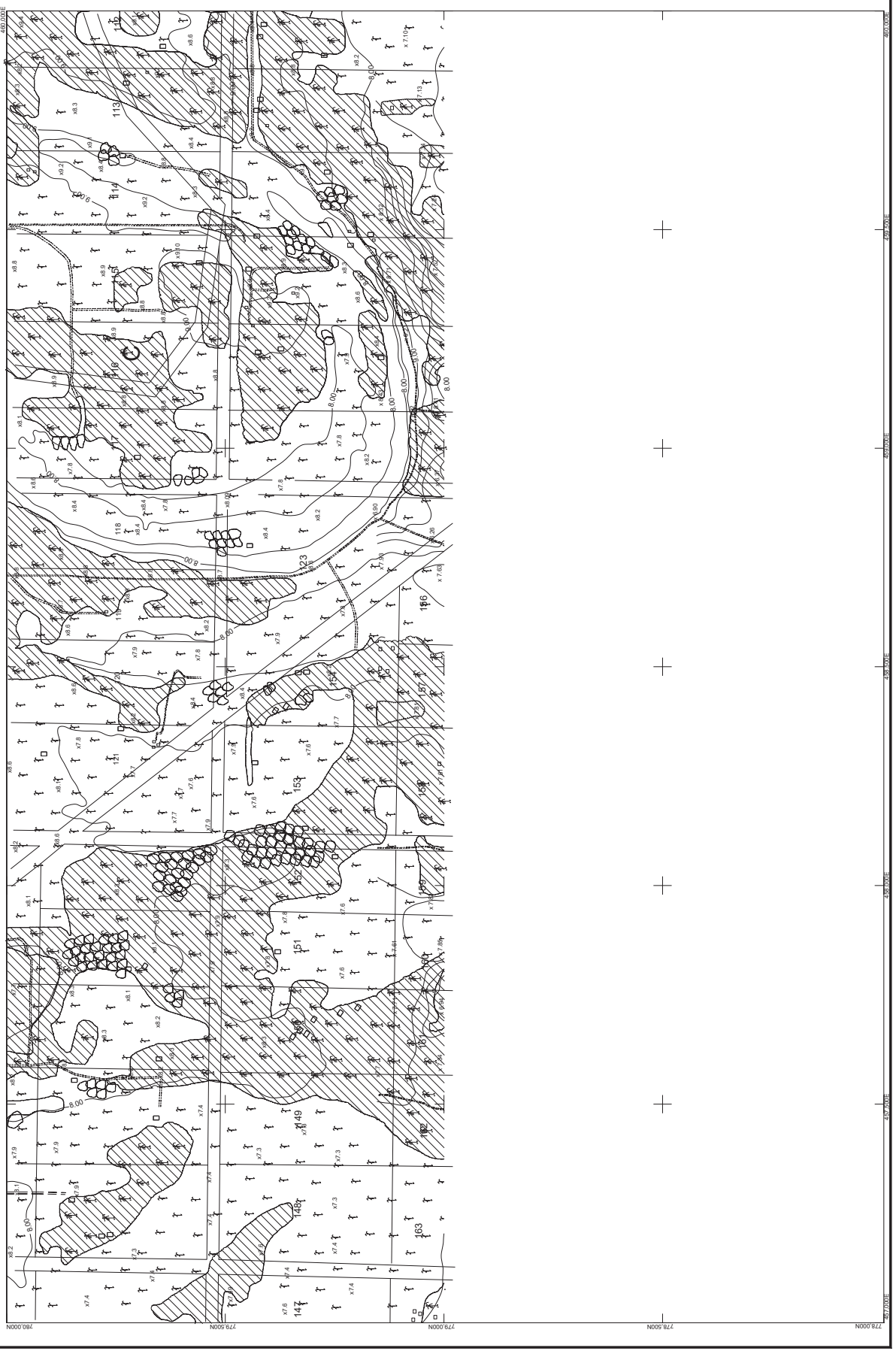
APPROVED:
CIZAR M. SULAK
DEPUTY ADMINISTRATOR FOR ENGINEERING & OPERATION

REPUBLIC OF THE PHILIPPINES
MARICOR (AGS 100) (DAWG NO. 04-112-AMAR) (M.A. 02)

457.000E 458.000E 459.000E 460.000E 461.000E 462.000E

457.000N 458.000N 459.000N 460.000N 461.000N 462.000N

457.000E 462.000E



1	2	28	29	30	31	7
14	13	11	10	9	8	
15	16	17	18	19	20	21
27	26	25	24	23	22	
28	29	30	31	32		
					34	33

INDEX TO ADJOINING SHEETS

- LEGENDS**
- PROPOSED HEADWORKS / DIVERSION WORKS
 - EXISTING HEADWORKS / DIVERSION WORKS
 - MAIN CANAL (EXISTING)
 - NEW MAIN CANAL
 - LATERAL (SUB-NATURAL EXISTING)
 - NEW LATERAL
 - EXISTING MAIN FARM LOTS (E-W OR N-S)
 - NEW MAIN FARM LOTS (E-W OR N-S)
 - EXISTING IRRIGATION SERVICE AREAS (E-W OR N-S)
 - NEW IRRIGATION SERVICE AREAS (E-W OR N-S)
 - DRAINAGE DITCHES
 - PROPOSED DRAINAGE CANALS
 - EXISTING DRAINAGE CANALS
 - PROPOSED CANAL STRUCTURE
 - EXISTING CANAL STRUCTURE
 - PRELIMINARY / LONG STRUCTURES (E-W OR N-S)
 - EXISTING TUNNELS WITH INFRASTRUCTURE
 - PROPOSED TUNNELS WITH INFRASTRUCTURE
 - LATERALS OR SUB-LATERALS
 - RAILWAYS
 - ACCESS ROAD
 - EXISTING NATIONAL ROAD HIGHWAYS / OTHER ROADS
 - EXISTING BURY ROADS / BREEZES / OTHER ROADS
 - TRAIL
 - EXCLUDED AREA
 - LIMIT OF IRREVERSIBLE / PROJECT AREA
 - CHIEFS / RIVERS / NATURAL WATERWAYS



NO.	DATE	NATURE OF REVISION	BY	CHECKED	RECORD	FORWARDED	NO.
1							
2							
3							

REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION
REGIONAL OFFICE
DIVISION OFFICE
PROVINCE OF NORTH COTABATO
MANTUA, COTABATO

MALITUBOG MARDIGAO IRRIGATION PROJECT
LOWER MALITUBOG IRRIGATION SERVICE AREA
LOWER MALITUBOG MAIN CANAL IRRIGATION SERVICE AREA

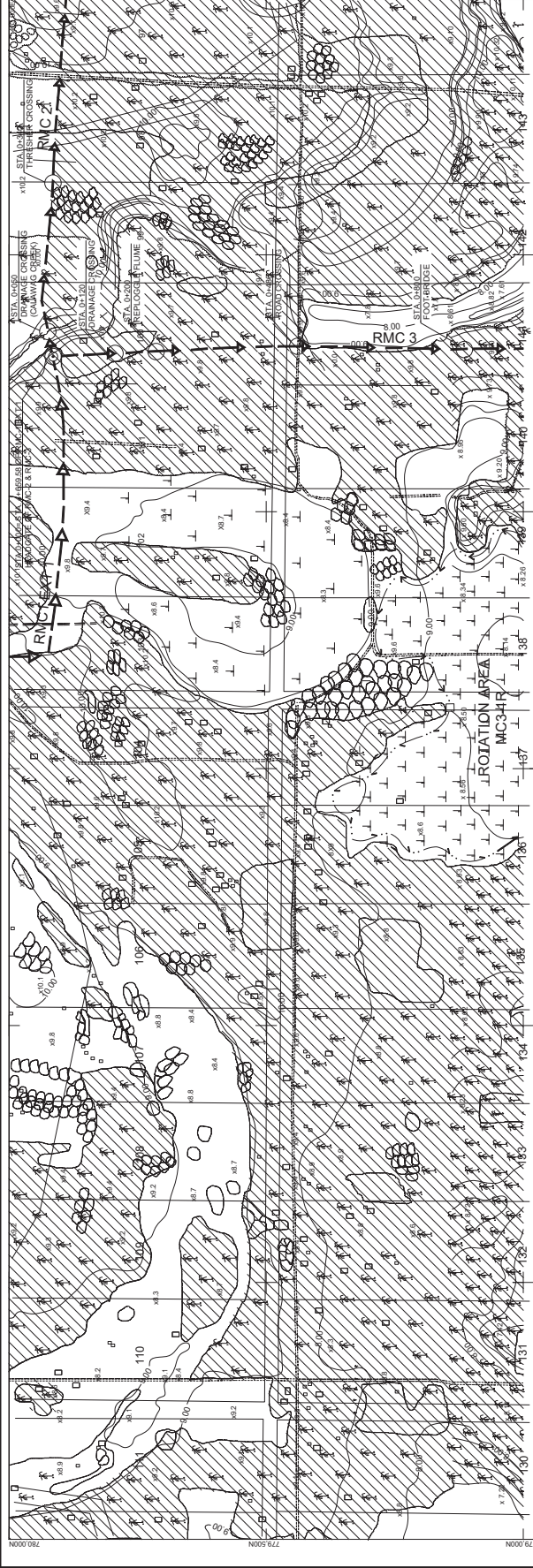
DRAFTING: _____
DESIGN: _____
CHECKED: _____
REVIEWED: _____
SUBMITTED: _____

ALL S. SAJOL
ACTING PROJECT MANAGER

RECOMMENDING APPROVAL:
LYDIA S. ESCOLERA
MANAGER/ENGINEERING DEPARTMENT

APPROVED:
CZAR M. SILAK
DEPUTY ADMINISTRATOR FOR ENGINEERING & OPERATION

MALITUBOG IRRIGATION DIVISION OFFICE, MANTUA, COTABATO



1	2	3	4	5	6	7
14	13	12	11	10	9	8
15	16	17	18	19	20	21
27	26	25	24	23	22	
28	29	30	31	32		
					34	33

INDEX TO ADJOINING SHEETS

- LEGENDS
- PROPOSED HEADWORKS / DIVERSION WORKS
 - EXISTING HEADWORKS / DIVERSION WORKS
 - MAIN CANAL (EXISTING)
 - BRANCH CANAL (EXISTING)
 - LATERAL / SUB-LATERAL (EXISTING)
 - EXISTING MAIN FARM LATCHES (MFO OR FFO)
 - MAINFARM LATCH (PROPOSED)
 - FARM LATCH (EXISTING OR PROPOSED)
 - EXISTING CANALS / STRUCTURES
 - PROPOSED CANALS / STRUCTURES
 - PROPOSED CANAL STRUCTURE
 - EXISTING CANAL STRUCTURE
 - PRELIMINARY LOWS STRUCTURES (A, C, COVER)
 - PROPOSED TURNOUT WITH MFO/FFO
 - EXISTING TURNOUT WITH MFO/FFO
 - LATERAL OF SUB-LATERALS
 - PROPOSED ACCESS ROAD
 - EXISTING NATIONAL ROAD / HIGHWAYS /
 - EXISTING BRIDGES / OTHER ROADS
 - TRAIL
 - EXCLUDED AREA
 - LIMIT OF IRRIGABLE / PROJECT AREA
 - CREAKS / RIVERS / NATURAL WATERWAYS
 - ROTATIONAL AREA
 - PROPOSED ROTATIONAL PRESENTATION



NO.	DATE	NATURE OF REVISION	BY	CHECKED/REVISION	DATE
1					
2					

REPUBLIC OF THE PHILIPPINES
 NATIONAL IRRIGATION ADMINISTRATION
 REGION 10
 PROVINCE OF NORTH COTABATO
 MEDIANO, COTABATO

MALITUBOG MARIDAGAO IRRIGATION PROJECT
 NORTH COTABATO PROVINCE
LOWER MALITUBOG SERVICE AREA

DESIGN
 DRAWN BY: _____
 CHECKED BY: _____
 REVISIONS: _____

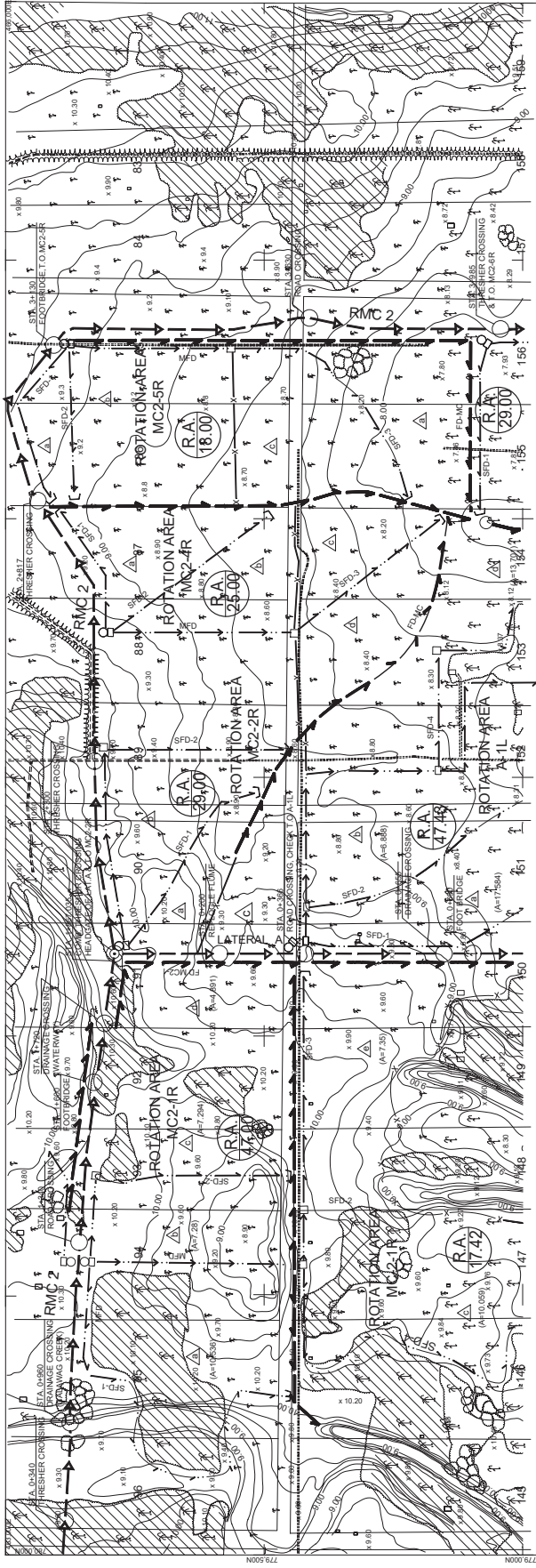
DESIGN
 DESIGNED BY: _____
 CHECKED BY: _____
 REVISIONS: _____

SUBMITTED:
 NAME: _____
 TITLE: _____

RECOMMENDING APPROVAL:
 NAME: _____
 TITLE: _____

APPROVED:
 NAME: _____
 TITLE: _____

DESIGN/ADMINISTRATOR FOR ENGINEERING & OPERATION
 NAME: _____
 TITLE: _____



1	2	3	4	5	6	7
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15	16	17	18	19	20	21
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- LEGENDS
- PROPOSED HEADWORKS / DIVERSION WORKS
 - EXISTING HEADWORKS / DIVERSION WORKS
 - EXISTING CANALS
 - PROPOSED CANALS
 - EXISTING MAIN CANALS (WITH OR WITHOUT COVER)
 - PROPOSED MAIN CANALS (WITH OR WITHOUT COVER)
 - EXISTING LATERAL CANALS (WITH OR WITHOUT COVER)
 - PROPOSED LATERAL CANALS (WITH OR WITHOUT COVER)
 - EXISTING RAILS
 - PROPOSED RAILS
 - EXISTING ROAD / HIGHWAYS / OTHER ROADS
 - PROPOSED ROAD / HIGHWAYS / OTHER ROADS
 - EXISTING BIRY / RIGID STRIP / OTHER ROADS
 - PROPOSED BIRY / RIGID STRIP / OTHER ROADS
 - EXISTING TRAIL
 - PROPOSED TRAIL
 - EXISTING EXCLUDED AREA
 - PROPOSED EXCLUDED AREA
 - LIMIT OF IRRIGABLE / PROJECT AREA
 - EXISTING CREEKS / RIVERS / NATURAL WATERWAYS
 - PROPOSED CREEKS / RIVERS / NATURAL WATERWAYS



3						
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REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION
REGION VI

PROVINCE OF NORTH COTABATO
MALUBOG CANTON
AGRI-CULTURAL AND RURAL INFRASTRUCTURE DIVISION
LOWER MALUBOG SERVICE AREA
IRRIGATION AND DRAINAGE NETWORK

DESIGN: _____
CHECKED: _____
REVIEWED: _____
APPROVED: _____

ACTING PROJECT MANAGER: ALLS. SATOL

APPROVED: _____
MANAGER, ENGINEERING DEPARTMENT: LYDIA S. ESQUEJA

DEPUTY ADMINISTRATOR FOR ENGINEERING & OPERATION: CIZAR M. SILLAK

PROJECT NO.: MALUBOG-2018-001
DATE: _____

	15					
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 - LATERAL CANAL (EXISTING)
 - LATERAL CANAL (PROPOSED)
 - LATERAL CANAL (EXISTING) WITH SPUR
 - LATERAL CANAL (PROPOSED) WITH SPUR
 - MAIN FARM DITCH (PROPOSED)
 - MAIN FARM DITCH (EXISTING)
 - SPUR CANAL (PROPOSED)
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 - EXISTING CANALS (AREA DRAINAGE)
 - PROPOSED CANALS (AREA DRAINAGE)
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 - PROPOSED CANAL STRUCTURE
 - TUNNEL/SPRINT/TUBES CUT & COVER
 - PROPOSED TURNOUT WITH ASPHALT
 - PROPOSED TURNOUT WITH GRAVEL
 - PROPOSED TURNOUT WITH GRAVEL AND ASPHALT
 - PROPOSED ACCESS ROAD
 - PROPOSED ACCESS ROAD WITH ASPHALT
 - RAILWAYS
 - NATIONAL ROAD (HIGHWAYS / PROVINCIAL ROADS)
 - EXISTING ROAD
 - STREET OF THE PROPOSAL
 - EXCLUDED AREA
 - LIMIT OF IRIGABLE PROJECT AREA
 - LIMIT OF IRIGABLE PROJECT AREA (REVERSE)
 - CREEKS (RIVERS) NATURAL WATERWAYS



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2					
1					
NO.	DATE	NATURE OF REVISION	BY	CHECKED	APPROVED

NATIONAL IRRIGATION ADMINISTRATION
REGIONAL OFFICE - COTABATO
MIDWAY, COTABATO

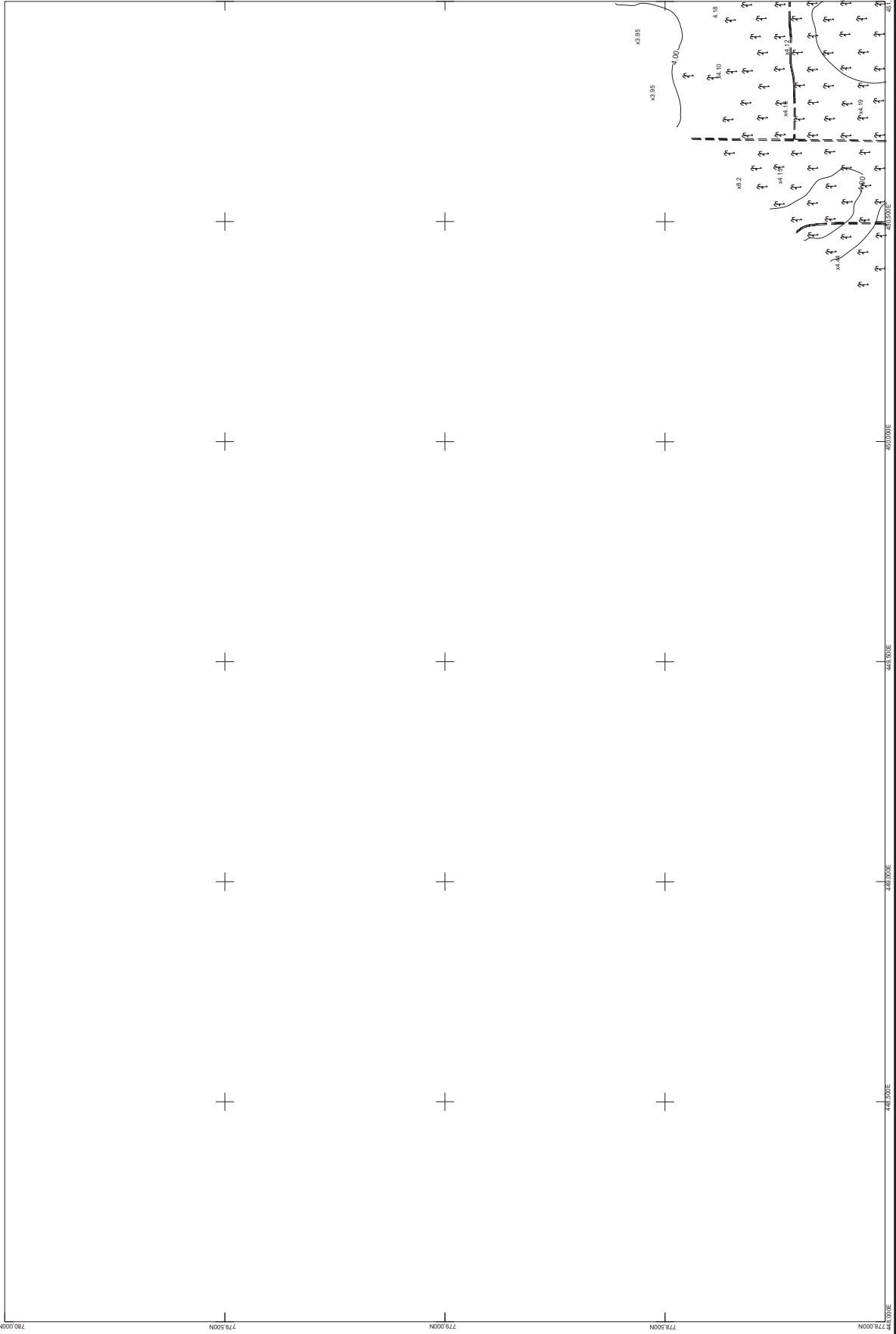
PROVINCE OF NORTH COTABATO
MULTITUBOG MARDAGAO IRRIGATION PROJECT
NORTH COTABATO AND MAGINDANAO
LOWER MALITUBOG SERVICE AREA
IRRIGATION AND DRAINAGE NETWORK

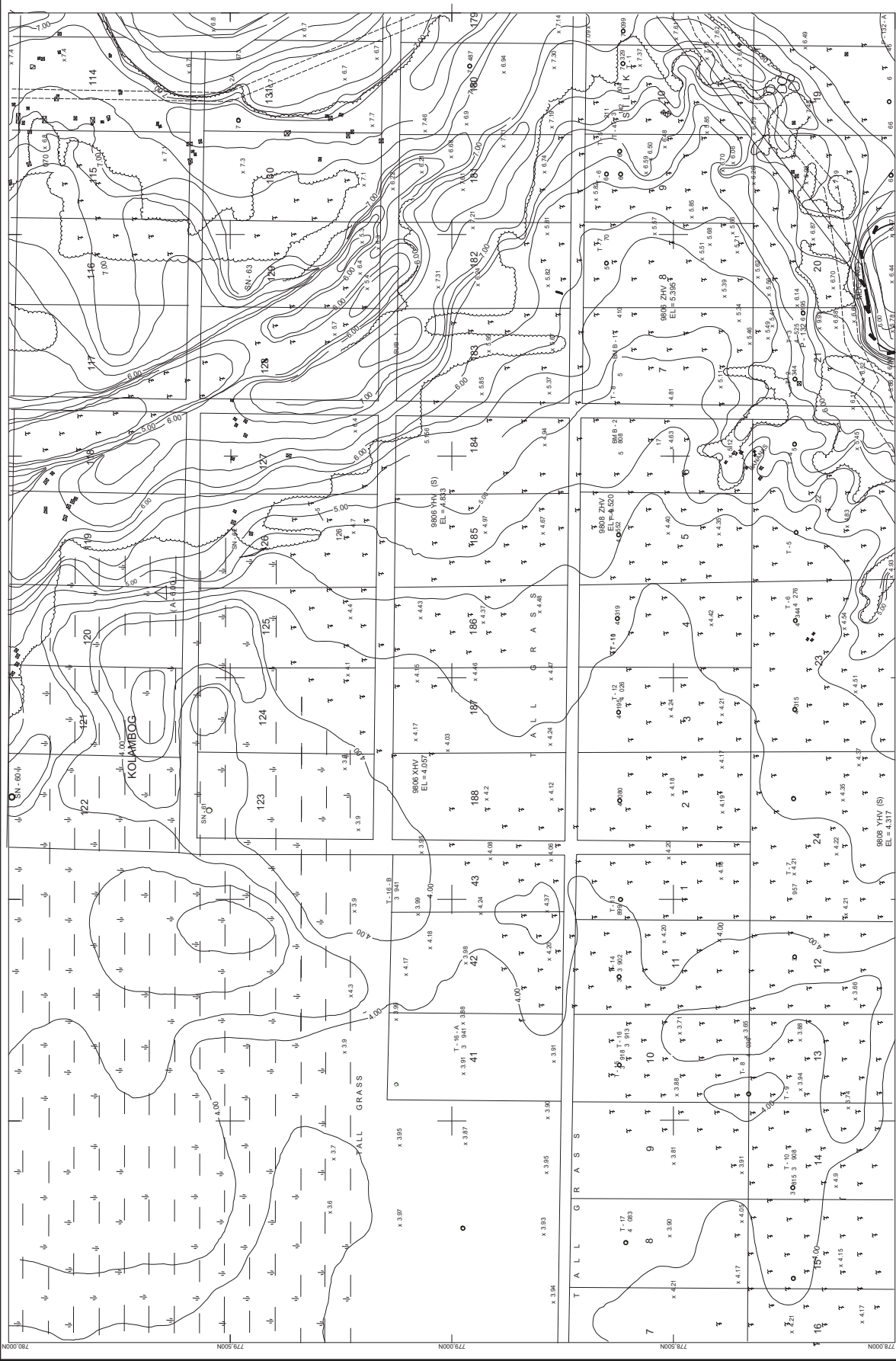
DESIGNER: ALBERTO S. ESCOBAR
CHECKED: ALBERTO S. ESCOBAR
DRAWN: ALBERTO S. ESCOBAR
SUBMITTED: _____

ACTING PROJECT MANAGER: ALIS BATOL
RECOMMENDING APPROVAL: _____
APPROVED: LYNDA S. ESCOBAR
MANAGEMENT ENGINEERING DEPARTMENT

CYRIL M. SUJAK
DEPUTY ADMINISTRATOR FOR ENGINEERING & OPERATION
MAGDAGAO IRRIGATION DISTRICT OFFICE

SHEET 4 OF 38





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 - GRAVEL CANAL (EXISTING)
 - LATERAL (SUB-LATERAL (EXISTING))
 - EXISTING MAIN PIPES (UP TO 8FT)
 - MAINT. POND / TRENCH (PROPOSED)
 - EXISTING POND / TRENCH (EXISTING)
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 - PROPOSED VALVE HOUSE
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 - PROPOSED HEADWORKS / DIVERSION WORKS (DRAINAGE)
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 - LIMIT OF IRRIGABLE PROJECT AREA
 - CHIEFS / RIVERS / NATURAL WATERWAYS



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NO.	DATE	VALUE OF REVISION	BY	CHECKED	RECORD	APPROVED	INITIALS

NATIONAL IRRIGATION ADMINISTRATION
 REPUBLIC OF THE PHILIPPINES
 PROVINCE OF NORTH COTABATO
 NORTH COTABATO AND LAAGUIGAN
LOWER MALITBOG SERVICE AREA
 LOWER MALITBOG IRRIGATION AND DRAINAGE NETWORK

DESIGN
 DRAWN BY: []
 CHECKED BY: []
 REVISED BY: []
 APPROVED BY: []

SUBMITTED: []
 ALE S. SALVO
 ACTING PROJECT MANAGER

RECOMMENDING APPROVAL: []
 LYDA S. ESCHEIRA
 MANAGER, ENGINEERING DEPARTMENT

APPROVED: []
 CESAR M. SILLAN
 CHIEF ADMINISTRATOR FOR ENGINEERING & OPERATION

MALITBOG IRRIGATION AND DRAINAGE NETWORK
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 - EXISTING MAIN FAN LINES (MFL OR BFL)
 - MAIN FAN LINES (PROPOSED)
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 - EXISTING SUB-MAIN LINES (PROPOSED)
 - EXISTING CANALS
 - PROPOSED CANALS
 - PROPOSED CANAL STRUCTURES (ARROW POINTING TO SPAN AREA DRAINED)
 - EXISTING CANAL STRUCTURE
 - PROPOSED CANAL STRUCTURE
 - PERMANENT LONG STRUCTURES (E.G. COVER)
 - EXISTING TURNOUT WITH ARROD
 - PROPOSED TURNOUT WITH ARROD
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 - RAINFALL
 - EXISTING NATIONAL ROAD / HIGHWAYS /
 - EXISTING BICYCLE ROADS / OTHER ROADS
 - TRAIL
 - EXCLUDED AREA
 - LIMIT OF IRRIGABLE / PROJECT AREA
 - RESERVATION LIMIT
 - CREWS / RIVERS / NATURAL WATERWAYS



NO.	DATE	DESCRIPTION	BY	CHECKED	RECORD	APPROVED
1						
2						

NATIONAL IRRIGATION ADMINISTRATION
 REGION 12
 PROVINCE OF NORTH COTABATO
 MALTUBOG MARIKAGAO IRRIGATION PROJECT
 NORTH COTABATO PROVINCE
 LOWER MALTUBOG IRRIGATION AND DRAINAGE SYSTEM
 LOWER MALTUBOG SERVICE AREA

DESIGNED	DESIGNER
DRAWN	DRAWER
CHECKED	CHECKER
REVIEWED	REVIEWER

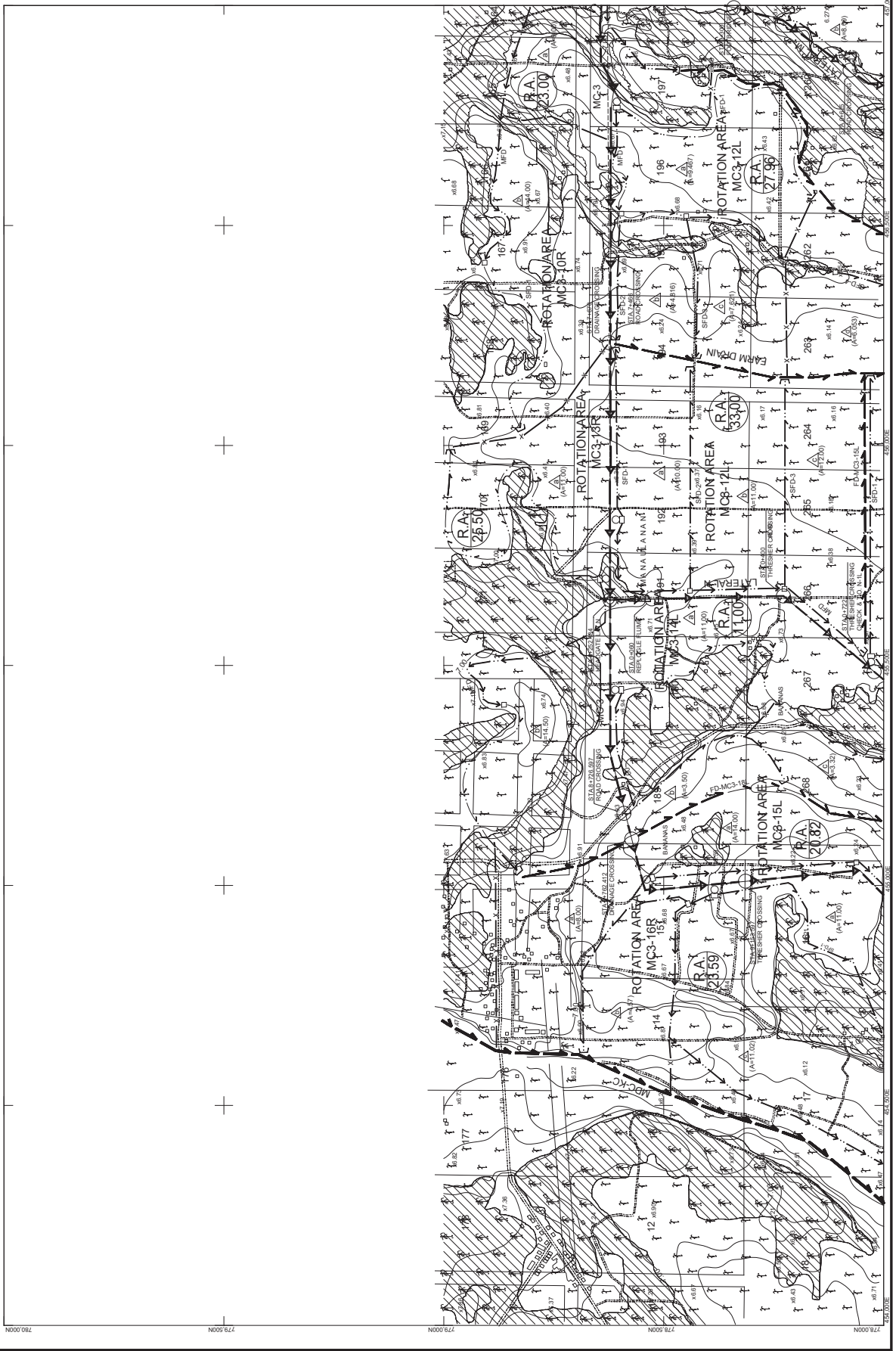
SUBMITTED: _____
 A.L.S. SALAS

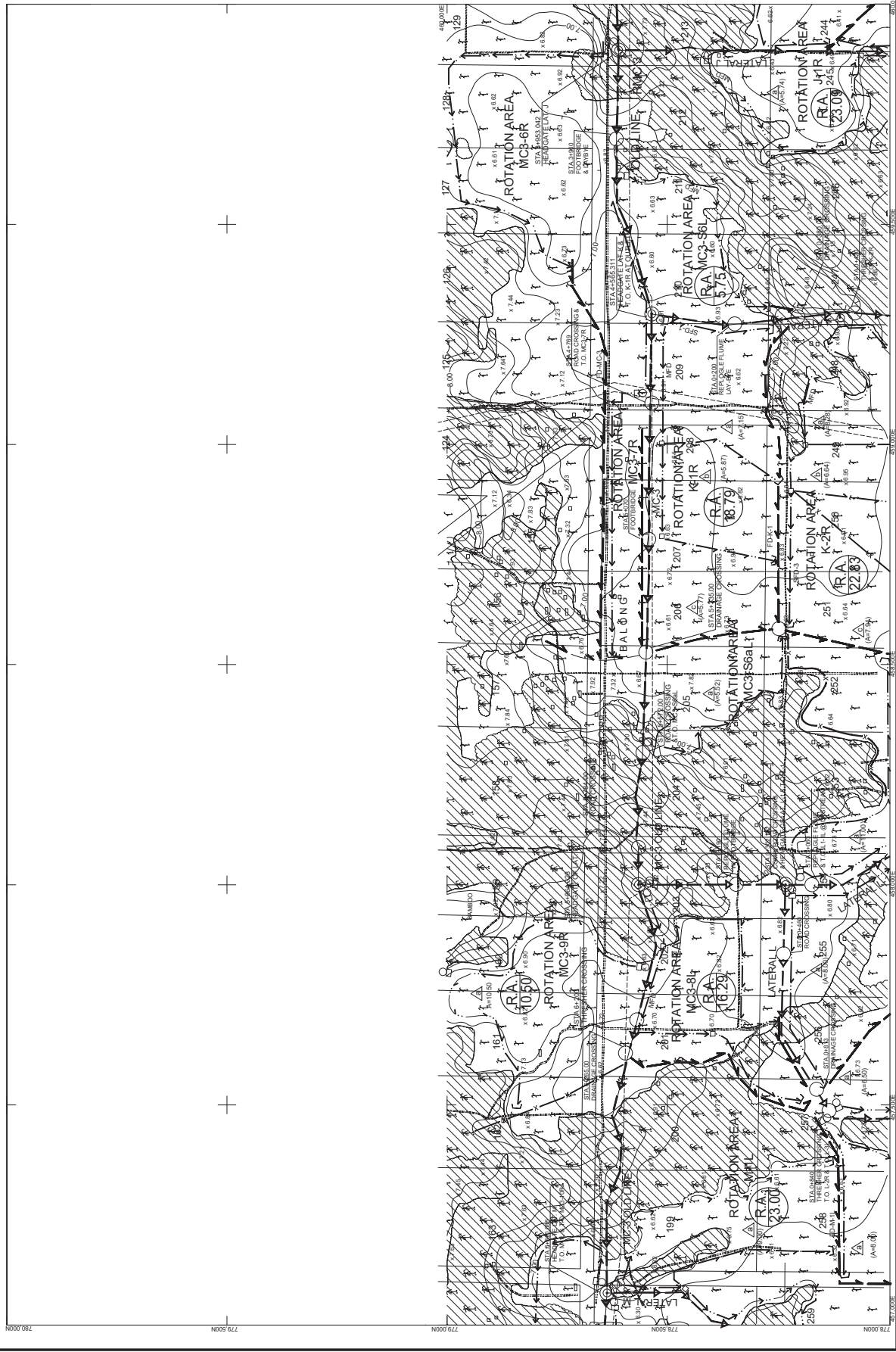
RECOMMENDING APPROVAL: _____
 ACTING PROJECT MANAGER

APPROVED: _____
 LYDIA S. EGBERHA
 MANAGER ENGINEERING DEPARTMENT

IDENTITY ADMINISTRATOR FOR ENGINEERING & OPERATION
 CECILIA M. DELA CRUZ

MANAGEMENT INFORMATION SYSTEMS & COMMUNICATIONS
 JESSICA M. DELA CRUZ

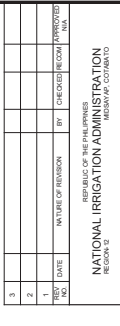




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 - PROPOSED MAIN CANAL
 - LATERAL (EXISTING)
 - PROPOSED LATERAL (EXISTING)
 - EXISTING MAIN FARM DITCH (EMFD OR SFD)
 - PROPOSED MAIN FARM DITCH (EMFD OR SFD)
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 - AREAS UNDER PRODUCTION (EXISTING)
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 - PROPOSED DRAINAGE DITCHES
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 - PROPOSED TURNOUT WITH WEIR (EXISTING)
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 - CHIEFS / RIVERS / NATURAL WATERWAYS



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NATIONAL IRRIGATION ADMINISTRATION
 PROVINCE OF NORTH COCABAUTO
 MULTITUBOCS MARIADGAGO IRRIGATION PROJECT
 LOWER MALITUBOG SERVICE AREA
 LOWER MALITUBOCS IRRIGATION MANAGEMENT PLAN

DESIGN
 CHECKED BY: [Name]
 REVISIONS: [Table]
 SUBMITTED: [Date]

RECOMMENDING APPROVAL:
 ACTING PROJECT MANAGER: [Name]

APPROVED:
 MANAGER, ENGINEERING DEPARTMENT: [Name]

DEF. DUTY ADMINISTRATOR FOR ENGINEERING & OPERATION: [Name]

