Tables

Table A2.1 Comparison of Work Quantities in Original Contract and Amended Contract for Topographic Survey

Item	Unit	Quantity		Remarks
		Original Contract	Amended Contract	
I Ground Control Survey for Aerial-Photo Mapping				
1) Leveling	km	175	175	All works were done
2) Traversing by GPS	Points	70	70	- do above -
II Installation of New Bench Marks and	Nos.	25	25	- do above -
III Aerial Photography (1:10,000), Including Installation of Marking Points for the Aerophoto Mapping Areas of Items IV and V below				
1) Agos River Basin	L. S.	100%	34.4%	Scheduled quantity not accomplished due to weather condition
2) Water Conveyance Route	L. S.	100%	83.5%	- do above -
IV Aerial-Photo Mapping at a Scale 1:5,000				
1) Lower Agos River Basin (Infanta Peninsula) with contour line interval of 1 m	km^2	60	30	Quantity reduced due to unavailability of aerial photos. The balance is included in Item VIII.(4)
2) Reservoir Area of Agos Dam with contour line interval of 5m	km^2	90	0	Mapping cancelled due to unavailability of aerial photos
3) Water Conveyance Route (1 km wide) with contour line interval of 5 m	km^2	35	30	Minor reduction of mapping area due to unavailabiltiy of aerial photos for the most upstream part of waterway tunnel.
4) Field Identification Survey	L. S.	100%	100%	
V Aerial-Photo Mapping of Structure Sites at a Scale 1:2,000				
1) Agos Dam Site	km^2	6	6	
2) Agos Afterbay Weir Site	km^2	2	2	
3) Kaliwa Low Dam/Intake Site	km^2	2	1.5	Quantity reduced due to cloud cover.
4) Powerhouse on Waterway for Metro Manila	km^2	22	22	
Water Treatment, Main Pipeline, Pump				
Station, Service Reservoir (Antipolo),				
Pipeline (Pump Station-Antipolo)				
5) Service Reservoir (Angono)	km^2	2	2	
VI River Cross Section Survey	Sections	35	35	
VII Preparation of Reports				
1) Draft Final Report	Nos.	2	2	
2) Final Report	Nos.	5	5	
VIII Additional Works (New Items added in Amendment)				
1) Photography (Using Helicopter and Ordinary Camera)				
1.1 Helicopter Hire	Hour	-	10	
1.2 Photographer/Assistant	Day	-	5	
1.3 Film and Photo Processing	Roll	-	30	
1.4 Officework (Interpretation, Plotting, Editing)	Site	-	50	
2) Satellite Image/Mapping		-		
2.1 Satellite Image (SPOT Scene)	Scene	-	1	
2.2 Production of Lancover/Landuse Map including 40-m contours on project area (up to elev. 280 m.)	L. S.	-	100%	Needed for mapping of isolated area
3) Additional GPS Control Points (Kaliwa Low Dam Site)	L. S.	-	100%	
4) 1:5,000 Mapping Lower Agos River Basin (Infanta Peninsula) using Existing NAMRIA Photos 1:25,000 Scale	km^2	-	30	A part of Work Item VI. (1) is classified into this work item.
5) Agos Reservoir Area				Conversion/Revision of Existing Maps
5.1 Check Survey of Datum points	L. S.	-	100%	
5.2 Digitizing/Realignment of Contours	L. S.	-	100%	
5.3 Production of New Contour Maps	L. S.	-	100%	

Table A3.1 Misclosures of GPS Observation (1/9)

Date	Session	Station		Distance		Misclosure			Accuracy	Base Line File	Solution	Data File		Result	Remark
	No.	From	To	Slope	Total	dN	dE	dZ	(ppm)	(SSF)	Type	Station	File Name		
3-Mar-02	062-0	A3	A5	4929.876	4929.876	0.0021	0.0019	0.0095	0.3772	00004732.SSF	L1 fixed	A3	A3-062-0		OK
		A5	N3	4480.342	9410.218					00004728.SSF	L1 fixed	A5	A5-062-0		
		N3	A9	4417.284	13827.502					00004724.SSF	L1 fixed	N3	N3-062-0		
		A9	A7	5146.577	18974.079					00004812.SSF	L1 fixed	A9	A9-062-0		
		A7	A6	2459.182	21433.261					00004808.SSF	L1 fixed	A7	A7-062-0		
		A6	A3	4909.757	26343.018					00004720.SSF	L1 fixed	A6	A6-062-0		
3-Mar-02	062-1	A7	A9	5146.577	5146.577	0.0231	0.0033	-0.1181	4.2148	00004812.SSF	L1 fixed	A7	A7-062-1		OK
		A9	A16	4743.177	9889.754					00004820.SSF	L1 fixed	A9	A9-062-1		
		A16	A19	4080.540	13970.294					00004824.SSF	L1 fixed	A16	A16-062-1		
		A19	A20	3146.337	17116.631					00004748.SSF	L1 fixed	A19	A19-062-1		
		A20	A18	2914.838	20031.469					00004744.SSF	L1 fixed	A20	A20-062-1		
		A18	A8	3134.310	23165.779					00004740.SSF	L1 fixed	A18	A18-062-1		
		A8	A7	5385.997	28551.776					00004736.SSF	L1 fixed	A8	A8-062-1		
4-Mar-02	063-0	A19	A16	4080.549	4080.549	0.0003	-0.0033	-0.0001	0.1545	00004652.SSF	L1 fixed	A19	A19-063-0		OK
		A16	N1	3648.448	7728.997					00004648.SSF	L1 fixed	A16	A16-063-0		
		N1	A10	1768.348	9497.345					00004644.SSF	L1 fixed	N1	N1-063-0		
		A10	A15	5391.854	14889.199					00004664.SSF	L1 fixed	A10	A10-063-0		
		A15	A17	2972.153	17861.352					00004660.SSF	L1 fixed	A15	A15-063-0		
		A17	A19	3511.856	21373.208					00004656.SSF	L1 fixed	A17	A17-063-0		

Table A3.1 Misclosures of GPS Observation (2/9)

Date	Session	Station		Distance		Misclosure			Accuracy	Base Line File	Solution	Data File		Result	Remark
	No.	From	To	Slope	Total	dN	dE	dZ	(ppm)	(SSF)	Type	Station	File Name		
4-Mar-02	063-1	A15	A10	5391.811	5391.811	0.0063	-0.0035	0.0792	4.0600	00004692.SSF	L1 fixed	A15	A15-063-1		OK
		A10	N3	1267.971	6659.782					00004688.SSF	L1 fixed	A10	A10-063-1		
		N3	N2	3975.751	10635.533					00004684.SSF	L1 fixed	N3	N3-063-1		
		N2	A12	1183.291	11818.824					00004680.SSF	L1 fixed	N2	N2-063-1		
		A12	A13	1913.854	13732.678					00004676.SSF	L1 fixed	A12	A12-063-1		
		A13	A14	3312.431	17045.109					00004672.SSF	L1 fixed	A13	A13-063-1		
		A14	A15	2545.315	19590.424					00004668.SSF	L1 fixed	A14	A14-063-1		
6-Mar-02	065-0	A11	A12	3738.681	3738.681	0.0650	-0.0263	-0.1635	6.0941	00004716SSF	L1 fixed	A11	A11-065-0		OK
		A12	N2	1183.291	4921.972					00004680.SSF	L1 fixed	A12	A12-065-0		
		N2	N3	3975.751	8897.723					00004684.SSF	L1 fixed	N2	N2-065-0		
		N3	A5	4480.342	13378.065					00004728.SSF	L1 fixed	N3	N3-065-0		
		A5	A3	4929.876	18307.941					00004732.SSF	L1 fixed	A5	A5-065-0		
		A3	N6	2535.133	20843.074					00004780.SSF	L1 fixed	A3	A3-065-0		
		N6	N5	1957.434	22800.508					00004700.SSF	L1 fixed	N6	N6-065-0		
		N5	N4	901.183	23701.691					00004704.SSF	L1 fixed	N5	N5-065-0		
		N4	A4	639.282	24340.973					00004708.SSF	L1 fixed	N4	N4-065-0		
		A4	A11	4854.134	29195.107					00004712.SSF	L1 fixed	A4	A4-065-0		

Table A3.1 Misclosures of GPS Observation (3/9)

Date	Session	Station		Distance		Misclosure			Accuracy	Base Line File	Solution	Data File		Result	Remark
	No.	From	To	Slope	Total	dN	dE	dZ	(ppm)	(SSF)	Type	Station	File Name		
7-Mar-02	066-0	N6	A3	2535.133	2535.133	0.0007	-0.0125	-0.0289	2.3423	00004780.SSF	L1 fixed	N6	N6-066-0		OK
		A3	N7	2667.100	5202.233					00004756.SSF	L1 fixed	A3	A3-066-0		
		N7	A1	1114.461	6316.694					00004760.SSF	L1 fixed	N7	N7-066-0		
		A1	N9	578.637	6895.331					00004764.SSF	L1 fixed	A1	A1-066-0		
		N9	N8	2443.244	9338.575					00004768.SSF	L1 fixed	N9	N9-066-0		
		N8	A2	772.472	10111.047					00004772.SSF	L1 fixed	N8	N8-066-0		
		A2	N6	3338.674	13449.721					00004776.SSF	L1 fixed	A2	A2-066-0		
8-Mar-02	067-0	A1	L1	1537.274	1537.274	0.3260	0.3376	-0.3186	39.7210	00004784.SSF	L1 fixed	A1	A1-067-0		OK
		L1	L3	2880.732	4418.006					00005240.SSF	L1 float	L1	L1-067-0		
		L3	L2	2008.283	6426.289					00005244.SSF	L1 fixed	L3	L3-067-0		
		L2	R1	4442.467	10868.756					00004788.SSF	L1 fixed	L2	L2-067-0		
		R1	N9	2833.235	13701.991					00004792.SSF	L1 fixed	R1	R1-067-0		
		N9	A1	578.676	14280.667					00004796.SSF	L1 fixed	N9	N9-067-0		
10-Mar-02	069-0	A7	A9	5146.559	5146.559	0.0020	0.0138	-0.0274	1.0765	00004816.SSF	L1 fixed	A7	A7-069-0		OK
		A9	A16	4743.177	9889.736					00004820.SSF	L1 fixed	A9	A9-069-0		
		A16	A19	4080.540	13970.276					00004824.SSF	L1 fixed	A16	A16-069-0		
		A19	A20	3146.337	17116.613					00004748.SSF	L1 fixed	A19	A19-069-0		
		A20	A18	2914.838	20031.451					00004744.SSF	L1 fixed	A20	A20-069-0		
		A18	A8	3134.310	23165.761					00004740.SSF	L1 fixed	A18	A18-069-0		
		A8	A7	5385.997	28551.758					00004736.SSF	L1 fixed	A8	A8-069-0		

Table A3.1 Misclosures of GPS Observation (4/9)

Date	Session	Station		Distance		Misclosure			Accuracy	Base Line File	Solution	Data File		Result	Remark
	No.	From	To	Slope	Total	dN	dE	dZ	(ppm)	(SSF)	Type	Station	File Name		
20-Mar-02	079-1	P17	N24	1750.491	1750.491					00004828.SSF	L1 fixed	P17	P17-079-1		OK
		N24	P14	3247.174	4997.665					00004832.SSF	L1 fixed	N24	N24-079-1		
		P14	P15	3184.460	8182.125					00004916.SSF	L1 fixed	P14	P14-079-1		
		P15	P17	4141.745	12323.870					00005068.SSF	L1 fixed	P15	P15-079-1		
21-Mar-02	080-0	N20	P14	792.513	792.513	0.0062	-0.0021	0.0422	5.7225	00004912.SSF	L1 fixed	N20	N20-080-0		OK
		P14	P15	3184.460	3976.973					00004916.SSF	L1 fixed	P14	P14-080-0		
		P15	N23	1330.171	5307.144					00004904.SSF	L1 fixed	P15	P15-080-0		
		N23	N20	2157.574	7464.718					00004908.SSF	L1 fixed	N23	N23-080-0		
21-Mar-02	080-1	N20	N23	2157.570	2157.570	-0.0145	-0.0321	-0.0426	7.0839	00004844.SSF	L1 fixed	N20	N20-080-1		OK
		N23	N20	1873.154	4030.724					00004848.SSF	L1 fixed	N23	N23-080-1		
		N22	N21	1535.872	5566.596					00004980.SSF	L1 fixed	N22	N22-080-1		
		N21	N20	2232.566	7799.162					00004900.SSF	L1 float	N21	N21-080-1		
21-Mar-02	080-2	N21	N22	1535.872	1535.872	0.0001	0.0002	0.0076	0.8684	00004980.SSF	L1 fixed	N21	N21-080-2		OK
		N22	P16	1924.660	3460.532					00004976.SSF	L1 fixed	N22	N22-080-2		
		P16	P11	2292.997	5753.529					00004972.SSF	L1 fixed	P16	P16-080-2		
		P11	N21	2992.382	8745.911					00004984.SSF	L1 fixed	P11	P11-080-2		
22-Mar-02	081-0	N21	P11	2993.451	2993.451	-0.0842	1.1117	0.5571	106.5297	00004892.SSF	L1 float	N21	N21-081-0		OK
		P11	N17	2988.373	5981.824					00004852.SSF	L1 fixed	P11	P11-081-0		
		N17	N19	2494.624	8476.448					00004856.SSF	L1 fixed	N17	N17-081-0		
		N19	N20	990.444	9466.892					00004936.SSF	L1 fixed	N19	N19-081-0		
		N20	N21	2232.566	11699.458					00004900.SSF	L1 float	N20	N20-081-0		

Table A3.1 Misclosures of GPS Observation (5/9)

Date	Session	Station		Distance		Misclosure			Accuracy	Base Line File	Solution	Data File		Result	Remark
	No.	From	To	Slope	Total	dN	dE	dZ	(ppm)	(SSF)	Type	Station	File Name		
22-Mar-02	081-1	N19	N17	2494.616	2494.616	0.0001	0.0005	0.0096	1.1049	00004872.SSF	L1 fixed	N19	N19-081-1		OK
		N17	N16	1722.093	4216.709					00004860.SSF	L1 fixed	N17	N17-081-1		
		N16	N18	2968.746	7185.455					00004864.SSF	L1 fixed	N16	N16-081-1		
		N18	N19	1473.151	8658.606					00004868.SSF	L1 fixed	N18	N18-081-1		
23-Mar-02	081-2	N16	N17	1722.132	1722.132	-0.0004	-0.0009	-0.0083	0.9786	00004876.SSF	L1 fixed	N16	N16-081-2		OK
		N17	N15	2646.495	4368.627					00004888.SSF	L1 fixed	N17	N17-081-2		
		N15	N14	2029.799	6398.426					00004884.SSF	L1 fixed	N15	N15-081-2		
		N14	N16	2113.630	8512.056					00004880.SSF	L1 fixed	N14	N14-081-2		
23-Mar-02	082-0	P13	P12	4850.817	4850.817	0.0456	0.0734	-0.2386	9.6252	00004968.SSF	L1 fixed	P13	P13-082-0		OK
		P12	P10	5435.890	10286.707					00004964.SSF	L1 fixed	P12	P12-082-0		
		P10	N16	2448.729	12735.436					00004960.SSF	L1 fixed	P10	P10-082-0		
		N16	N18	2968.746	15704.182					00004864.SSF	L1 fixed	N16	N16-082-0		
		N18	N19	1473.151	17177.333					00004868.SSF	L1 fixed	N18	N18-082-0		
		N19	N20	990.444	18167.777					00004936.SSF	L1 fixed	N19	N19-082-0		
		N20	P14	792.513	18960.290					00004912.SSF	L1 fixed	N20	N20-082-0		
		P14	N24	3247.174	22207.464					00004832.SSF	L1 fixed	P14	P14-082-0		
		N24	N25	2886.101	25093.565					00004956.SSF	L1 fixed	N24	N24-082-0		
		N25	P13	1274.893	26368.458					00004952.SSF	L1 fixed	N25	N25-082-0		

Table A3.1 Misclosures of GPS Observation (6/9)

Date	Session	Station		Distance		Misclosure			Accuracy	Base Line File	Solution	Data File		Result	Remark
	No.	From	To	Slope	Total	dN	dE	dZ	(ppm)	(SSF)	Type	Station	File Name		
23-Mar-02	082-1	N15	N14	2029.785	2029.785	-0.0003	-0.0053	0.0139	1.2768	00005000.SSF	L1 fixed	N15	N15-082-1		OK
		N14	P7	3121.038	5150.823					00004946.SSF	L1 fixed	N14	N14-082-1		
		P7	P9	4686.793	9837.616					00004992.SSF	L1 fixed	P7	P7-082-1		
		P9	N15	1793.357	11630.973					00004988.SSF	L1 fixed	P9	P9-082-1		
23-Mar-02	082-2	P9	P6	3794.227	3794.227	-0.0251	0.2574	-0.2588	25.8680	0004928.SSF	L1 float	P9	P9-082-2		OK
		P6	P8	3005.095	6799.322					00004924.SSF	L1 fixed	P6	P6-082-2		
		P8	P7	2657.790	9457.112					00004920.SSF	L1 fixed	P8	P8-082-2		
		P7	P9	4686.793	14143.905					00004992.SSF	L1 fixed	P7	P7-082-2		
24-Mar-02	083-0	P11	N19	3103.375	3103.375					00004940.SSF	L1 fixed	P11	P11-083-0		OK
		N19	N20	990.444	4093.819					00004936.SSF	L1 fixed	N19	N19-083-0		
		N20	N21	2232.566	6326.385					00004900.SSF	L1 float	N20	N20-083-0		
		N21	P11	2992.382	9318.767					00004984.SSF	L1 fixed	N21	N21-083-0		
24-Mar-02	083-1	P17	P13	2728.454	2728.454	-0.0005	0.0007	-0.0184	2.1317	00004948.SSF	L1 fixed	P17	P17-083-1		OK
		P13	N25	1274.893	4003.347					00004952.SSF	L1 fixed	P13	P13-083-1		
		N25	N24	2886.101	6889.448					00004956.SSF	L1 fixed	N25	N25-083-1		
		N24	P17	1750.511	8639.959					00004944.SSF	L1 fixed	N24	N24-083-1		
25-Mar-02	084-0	P8	P6	3005.103	3005.103	-0.0025	-0.0183	0.0143	1.6215	00005012.SSF	L1 fixed	P8	P8-084-0		OK
		P6	P4	4379.978	7385.081					00005024.SSF	L1 fixed	P6	P6-084-0		
		P4	P5	1925.719	9310.800					00005020.SSF	L1 fixed	P4	P4-084-0		
		P5	P8	5096.831	14407.631					00005016.SSF	L1 fixed	P5	P5-084-0		

Table A3.1 Misclosures of GPS Observation (7/9)

Date	Session	Station		Distance		Misclosure			Accuracy	Base Line File	Solution	Data File		Result	Remark
	No.	From	To	Slope	Total	dN	dE	dZ	(ppm)	(SSF)	Type	Station	File Name		
25-Mar-02	084-1	P5	P4	1925.708	1925.708	0.0022	-0.0027	0.0343	2.9371	00005028.SSF	L1 fixed	P5	P5-084-1		OK
		P4	P2	3391.555	5317.263					00005040.SSF	L1 fixed	P4	P4-084-1		
		P5	P3	3320.024	8637.287					00005036.SSF	L1 fixed	P5	P5-084-1		
		P3	P5	3090.677	11727.964					00005032.SSF	L1 fixed	P3	P3-084-1		
25-Mar-02	084-2	P3	P2	3320.028	3320.028	-0.0159	-0.0103	0.0029	1.2393	00005044.SSF	L1 fixed	P3	P3-084-2		OK
		P2	L10	4870.669	8190.697					00005352.SSF	L1 fixed	P2	P2-084-2		
		L10	P1	3793.600	11984.297					00005348.SSF	L1 fixed	L10	L10-084-2		
		P1	P3	3476.163	15460.460					00005056.SSF	L1 fixed	P1	P1-084-2		
27-Mar-02	086-0	A20	A6	12669.143	12669.143	0.1830	0.1468	0.0464	1.9451	00005064.SSF	L1 fixed	A20	A20-086-0		OK
		A6	QZN6	54374.017	67043.160					00004640.SSF	L1 float	A6	A6-086-0		
		QZN6	A20	55876.914	122920.074					00004636.SSF	Iono free fixed	QZN6	QZN6-086-0		
28-Mar-02	087-0	P17	MMA0	13043.414	13043.414	-0.0062	0.0373	0.0795	2.7551	00005072.SSF	L1 fixed	P17	P17-087-0		OK
		MMA0	P15	14778.026	27821.440					00005076.SSF	Iono free fixed	MMA0	MMA0-087-0		
		P15	P17	4141.745	31963.185					00005068.SSF	L1 fixed	P15	P15-087-0		
1-Apr-02	091-0	P2	L11	1750.809	1750.809	0.0238	0.0070	0.0001	1.7073	00005092.SSF	L1 fixed	P2	P2-091-0		OK
		L11	N13	4525.052	6275.861					00005088.SSF	L1 fixed	L11	L11-091-0		
		N13	N12	1461.160	7737.021					00005100.SSF	L1 fixed	N13	N13-091-0		
		N12	L10	1919.192	9656.213					00005356.SSF	L1 fixed	N12	N12-091-0		
		L10	P2	4870.669	14526.882					00005352.SSF	L1 fixed	L10	L10-091-0		

Table A3.1 Misclosures of GPS Observation (8/9)

Date	Session	Station		Distance		Misclosure			Accuracy	Base Line File	Solution	Data File		Result	Remark
	No.	From	To	Slope	Total	dN	dE	dZ	(ppm)	(SSF)	Type	Station	File Name		
1-Apr-02	091-1	N13	L11	4525.030	4525.030	0.0012	-0.0006	0.0080	0.4840	00005104.SSF	L1 fixed	N13	N13-091-1		OK
		L11	L12	2211.640	6736.670					00004596.SSF	L1 fixed	L11	L11-091-1		
		L12	L13	4666.630	11403.300					00005116.SSF	L1 fixed	L12	L12-091-1		
		L13	L7	2911.837	14315.137					00005112.SSF	L1 fixed	L13	L13-091-1		
		L7	N13	2428.855	16743.992					00004584.SSF	L1 fixed	L7	L7-091-1		
3-Apr-02	093-0	N12	BH1	1381.067	1381.067	-0.0050	0.2165	0.0090	10.6900	00005192.SSF	L1 float	N12	N12-093-0		OK
		BH1	L8	4090.687	5471.754					00005188.SSF	L1 fixed	BH1	BH1-093-0		
		L8	L9	2808.060	8279.814					00004616.SSF	L1 fixed	L8	L8-093-0		
		L9	BH2	1385.708	9665.522					00004612.SSF	L1 fixed	L9	L9-093-0		
		BH2	P1	4895.076	14560.598					00005364.SSF	L1 fixed	BH2	BH2-093-0		
		P1	L10	3793.600	18354.198					00005348.SSF	L1 fixed	P1	P1-093-0		
		L10	N12	1919.192	20273.390					00005356.SSF	L1 fixed	L10	L10-093-0		
5-Apr-02	095-0	L8	BH1	4090.696	4090.696	-0.0367	0.4334	0.1894	17.9472	00005212.SSF	L1 fixed	L8	L8-095-0		OK
		BH1	L6	6188.335	10279.031					00005312.SSF	L1 fixed	BH1	BH1-095-0		
		L6	L5	3534.853	13813.884					00005316.SSF	L1 fixed	L6	L6-095-0		
		L5	L4	4432.183	18246.067					00005308.SSF	L1 float	L5	L5-095-0		
		L4	N10	3720.059	21966.126					00005224.SSF	L1 fixed	L4	L4-095-0		
		N10	N11	1566.132	23532.258					00005220.SSF	L1 fixed	N10	N10-095-0		
		N11	L8	2899.466	26431.724					00005216.SSF	L1 fixed	N11	N11-095-0		

Table A3.1 Misclosures of GPS Observation (9/9)

Date	Session	Station		Distance		Misclosure			Accuracy	Base Line File	Solution	Data File		Result	Remark
	No.	From	To	Slope	Total	dN	dE	dZ	(ppm)	(SSF)	Type	Station	File Name		
6-Apr-02	096-0	L5	L2	5139.590	5139.590	-0.0313	-0.4114	0.0394	20.3917	00005340.SSF	L1 fixed	L5	L5-096-0		OK
		L2	L1	2689.729	7829.319					00005260.SSF	L1 fixed	L2	L2-096-0		
		L1	L3	2881.231	10710.550					00005320.SSF	L1 fixed	L1	L1-096-0		
		L3	L4	5183.543	15894.093					00005344.SSF	L1 float	L3	L3-096-0		
		L4	L5	4432.183	20326.276					00005308.SSF	L1 float	L4	L4-096-0		
13-Apr-02	103-0	P11-A	N21	3373.937	3373.937	-0.0286	0.0136	0.0453	7.6284	00005392.SSF	L1 fixed	P11-A	P11A-103-0		OK
		N21	P11	2992.382	6366.319					00004984.SSF	L1 fixed	N21	N21-103-0		
		P11	P11-A	881.780	7248.099					00005368.SSF	L1 fixed	P11	P11-103-0		
27-Apr-02	117-0	N8	N7	1034.061	1034.061	0.0002	-0.0164	0.0740	14.6596	00005480.SSF	L1 fixed	N8	N8-117-0		OK
		N7	A1	1114.486	2148.547					00005476.SSF	L1 fixed	N7	N7-117-0		
		A1	N9	578.637	2727.184					00004764.SSF	L1 fixed	A1	A1-117-0		
		N9	N8	2443.244	5170.428					00004768.SSF	L1 fixed	N9	N9-117-0		

Table A3.2 Observation Standard and Measurement Accuracy of Leveling

Item	Third Order	Minor Order
Observation	Double-Running	Single Running In case there are no existing known points to close to, double running shall be required.
Given Point	Existing BM	Existing BM Third Order Leveling Point
Maximum distance between level and staff in case of direct leveling	60m	
Distance between backsight and foresight	Distance between backsight and foresight shall be equalized.	
Minimum unit of measurement	1mm	1mm
Readable range of staff	The bottom 10cm and top 10cm of the staves shall be avoided in reading.	
Allowable double-run error	12mm x sqrt(S) S= length in km.	20mm x sqrt(S), S= length in km.
Allowable closing error	12mm x sqrt(S) S= length in km.	20mm x sqrt(S), S= length in km.

Table A3.3 Check Sheet for Leveling Accuracy (1/3)

- Location : INFANTA - GEN. NAKAR Area
- Period : 01 Feb 2002 - 30 April 2002
- Route : i) BM3 to A5 to BM1 to TBM1 to TBM2 to P13 to TBM3 to TBM4 to TBM5 to A17 to BM-QZ234, ii) BM1 to P30 to TBM6 to V31 to V32 to V34 to AR35 (=A1) to AL35, TBM2 to P12 to A10, iii) A10 to AR11 to NWRB3, P12 to TBM7 to AL6 to V43 to A13, AL6 to AL5 to AR4 to AR1
- Total Diastance : 88.60 (km)

Section No.	From Sta. to Sta.	Distance (km)	Misclosure	Allowable (+/-)	Remarks
BM3	BM3 to BM-QZ234	17.6	-0.039	0.050	OK
	BM QZ234 to A20	5.6	0.009	0.028	OK
	BM1 to AL35	15.2	0.032	0.047	OK
	AL35 to AL32	1.3	0.007	0.014	OK
	J31 to AR28	1.7	0.002	0.016	OK
	J32 to A3	1.1	0.009	0.013	OK
	J34 to AR29	0.8	0.001	0.010	OK
	J43 to A14	1.8	0.001	0.016	OK
	P12 to A13	10.6	0.005	0.039	OK
	P13 to P25	1.4	0.004	0.014	OK
	P30 to AR13	2.2	-0.003	0.017	OK
	TBM1 to A9	3.5	0.002	0.022	OK
	TBM1 to BM5	0.1	-0.002	0.003	OK
	TBM2 to A10	3.1	-0.003	0.021	OK
	TBM3 to A16	3.5	0.001	0.022	OK
	TBM4 to A15	3.3	0.016	0.022	OK
	TBM7 to A12	4.1	0.010	0.024	OK
	TBM 7 to NWRB2	2.1	-0.003	0.017	OK
	AL6 to AR1	2.6	0.001	0.019	OK
	AL5 to P25	1.7	0.009	0.016	OK
	A10 to NWRB3	3.6	-0.012	0.023	OK
AR11	AR11 to AL12	1.8	0.000	0.016	OK

Table A3.3 Check Sheet for Leveling Accuracy (2/3)

- Location : TAYTAY Area
- Period : 01 Feb 2002 - 30 April 2002
- Route : BM-RZ36 to NWRB25, ANT20 to M30 to M31 to C32
- Total Diastance : 43.30 (km)

Section No.	From Sta. to Sta.	Distance (km)	Misclosure	Allowable (+/-)	Remarks
BM-RZ36	BM-RZ36 to NWRB25	9.1	0.009	0.036	OK
	RZL9 to NWRB24	8.2	0.000	0.024	OK
	M30 to P15	3.5	-0.010	0.022	OK
	M31 to NWRB21	3.1	0.002	0.021	OK
	NWRB21 to P16	2.1	-0.008	0.017	OK
	P16 to TBM3	0.8	0.002	0.011	OK
	TBM3 to NWRB22	4.1	0.000	0.240	OK
	ANT20 to C32	4.4	0.001	0.025	OK
	ANT22 to NWRB18	5.4	-0.005	0.028	OK
P11A	ANT36 to P11A	2.6	-0.002	0.019	OK

- Location : BARAS - ANTIPOLO Area
- Period : 01 Feb 2002 - 30 April 2002
- Route : BM-PVC103 to P10, M22 to M3 to P8, ANT38 to H5 to NWRB17
- Total Diastance : 30.90 (km)

Section No.	From Sta. to Sta.	Distance (km)	Misclosure	Allowable (+/-)	Remarks
BM-PVC102	BM-PVC102 to P10	6.6	-0.002	0.031	OK
	M3 to P7	3.7	0.000	0.023	OK
	M5 to M8	1.2	0.008	0.013	OK
	M22- to P8	2.1	0.000	0.017	OK
	ANT21 to P12	0.9	0.000	0.011	OK
	ANT38 to NWRB17	3.3	-0.012	0.022	OK
	ANT38 to P9	2.6	0.007	0.019	OK
	P9 to P6	8.4	0.002	0.035	OK
NWRB14	P9 to NWRB14	2.1	0.000	0.017	OK

Table A3.3 Check Sheet for Leveling Accuracy (3/3)

- Location : TANAY Area
- Period : 01 Feb 2002 - 30 April 2002
- Route : BM-PVC 105 to K10 to TBM8 to TBM9 to L10, TBM8 to G3 to L12, G3 to G13 to P4
- Total Diastance : 65.60 (km)

Section No.	From Sta. to Sta.	Distance (km)	Misclosure	Allowable (+/-)	Remarks
BM-PVC 105	BM-PVC 105 to K10	8.6	0.008	0.035	OK
	K10 to L10	18.7	0.005	0.052	OK
	L10 to NWRB12	2.5	0.012	0.019	OK
	NWRB12 to NWRB13	2.7	0.012	0.020	OK
	TBM8 to L12	12.4	0.026	0.042	OK
	TBM9 to L8	13.7	0.009	0.044	OK
	G3 to P4	5.6	0.180	0.028	OK
P5	G13 to P5	1.4	-0.004	0.014	OK

Table A3.4 Final Results of Ground Control Survey (1/4)

(1) Existing NAMRIA Geodetic Control Station Used as Reference Stations for Coordinates

Station	Northing (m)	Easting (m)	Elevation (m) (Above m.s.l.)
M MA0	1,618,610.526	504,490.729	-
Q ZN6	1,569,268.431	578,508.911	-
RZL-10	1,613,530.654	544,934.952	-

Note: PTM on PRS'92, C.M. 121

(2) Existing NAMRIA Benchmarks Used as Reference Benchmarks

Station	Northing (m)	Easting (m)	Elevation (m) (Above m.s.l.)
BM-234	-	-	2.520
BM-3	-	-	4.470
RZ-29	-	-	9.082
PVC-103	-	-	8.665
PV3-105	-	-	8.126

(3) Coordinates and Elevations of Main Control Stations (Permanent Monument) Newly Established in This Study

	Station	Northing (m)	Easting (m)	Elevation (m) (Above m.s.l.)
N	WRB-1	1,630,038.646	568,683.764	6.934
N	WRB-2	1,633,596.109	566,609.052	131.034
N	WRB-3	1,629,723.547	565,710.095	93.378
N	WRB-4	1,626,418.265	563,079.472	89.529 *
N	WRB-5	1,626,568.405	563,968.022	98.161
N	WRB-6	1,625,669.608	562,229.168	92.978
N	WRB-7	1,624,684.954	557,911.246	203.108 *
N	WRB-8	1,625,402.635	558,655.640	204.566 *
N	WRB-9	1,624,781.268	556,292.954	229.073 *
N	WRB-10	1,616,515.349	551,283.269	272.471 *
N	WRB-11	1,615,181.275	550,464.178	229.760 *
N	WRB-12	1,614,954.735	546,221.299	166.934
N	WRB-13	1,616,099.802	545,316.543	237.738
N	WRB-14	1,611,716.590	528,228.109	235.053
N	WRB-15	1,613,154.570	526,801.751	103.728
N	WRB-16	1,610,961.213	526,257.506	122.360
N	WRB-17	1,611,601.637	524,659.005	117.625
N	WRB-18	1,610,828.732	523,292.831	46.203
N	WRB-19	1,611,774.808	522,171.306	177.448 *
N	WRB-20	1,612,305.063	521,335.263	150.979 *
N	WRB-21	1,614,459.272	520,760.212	260.928
N	WRB-22	1,615,704.319	519,862.159	216.377
N	WRB-23	1,613,832.040	519,812.088	202.748
N	WRB-24	1,611,971.889	517,356.744	180.908
N	WRB-15	1,609,205.302	516,538.703	108.037

Table A3.4 Final Results of Ground Control Survey (2/4)

(4) Coordinates and Elevations of Photogrammetric Control Stations (Marked/Monumented)

	Station	Northing (m)	Easting (m)	Elevation (m) (Above m.s.l.)
A	1	1,624,594.854	556,810.925	50.746
A	2	1,626,124.445	558,925.752	256.734 *
A	3	1,623,866.809	560,449.661	192.021
A	4	1,626,690.852	562,506.103	164.335 *
A	5	1,625,276.828	565,169.743	4.014
A	6	1,621,927.409	564,956.070	3.014
A	7	1,621,226.789	567,313.338	1.710 *
A	8	1,624,615.924	571,499.424	2.707 *
A	9	1,626,249.309	568,436.626	3.270
A	10	1,630,103.944	566,916.620	8.101
A	11	1,631,122.915	564,485.530	170.980
A	12	1,634,568.307	565,936.753	185.982
A	13	1,636,163.346	566,978.483	1.939
A	14	1,634,564.253	569,879.395	2.416
A	15	1,632,718.546	571,632.151	1.853
A	16	1,629,117.858	572,214.142	2.512
A	17	1,630,466.583	573,571.888	3.397
A	18	1,625,838.611	574,385.475	2.329 *
A	19	1,628,098.638	576,165.423	2.132
A	20	1,625,131.891	577,213.411	2.020
B	H1	1,613,885.490	547,057.216	421.215 *
B	H2	1,611,516.126	547,787.274	382.651
L	1	1,623,111.742	557,211.499	106.072 *
L	2	1,622,404.490	554,627.454	343.354 *
L	3	1,620,691.296	555,674.235	386.694 *
L	4	1,615,570.065	554,880.946	291.309 *
L	5	1,618,369.916	551,446.980	204.133 *
L	6	1,619,944.093	548,304.637	579.369 *
L	7	1,618,357.749	544,423.300	188.032
L	8	1,612,321.297	550,835.135	525.350
L	9	1,610,488.129	548,715.731	349.921
L	**10 = RZL10**	1,613,530.654	544,934.952	182.039
L	11	1,614,713.050	541,009.544	242.874
L	12	1,616,764.629	541,833.939	196.722
L	13	1,621,121.116	543,506.020	203.342 *
P	1	1,610,229.925	543,066.570	245.098
P	2	1,613,259.750	540,087.101	562.008
P	3	1,609,976.476	539,606.866	463.868
P	4	1,612,973.811	536,712.223	392.089
P	5	1,611,049.814	536,712.664	314.954
P	6	1,613,403.494	532,357.244	217.768
P	7	1,608,889.323	529,534.361	35.255
P	8	1,610,483.892	531,648.028	264.838
P	9	1,613,471.324	528,564.134	200.524
P	10	1,608,622.892	525,531.955	85.183
P	11	1,614,446.451	523,745.910	64.925
P	11-A	1,613,608.007	524,018.775	63.620
P	12	1,609,101.275	520,118.729	199.280
P	13	1,609,099.877	515,271.868	12.246
P	14	1,612,010.826	520,603.144	224.632

(to be continued)

Table A3.4 Final Results of Ground Control Survey (3/4)

(4) Coordinates and Elevations of Photogrammetric Control Stations (Marked/Monumented)

	Station	Northing (m)	Easting (m)	Elevation (m) (Above m.s.l.)
P	15	1,614,565.456	518,702.512	202.238
P	16	1,615,630.276	521,783.832	142.177
P	17	1,611,805.447	515,617.349	77.548
R	1	1,626,812.980	554,417.529	845.946 *
R	2	1,629,242.509	558,189.377	111.292 *
R	3	1,630,771.368	554,537.909	196.413 *
R	4	1,632,060.264	556,602.207	134.337 *
R	5	1,633,870.582	554,496.036	185.012 *
R	6	1,634,846.822	555,485.546	158.790 *
R	7	1,639,139.159	552,136.602	184.422 *
R	8	1,638,769.463	555,086.181	169.767 *
R	9	1,641,541.362	549,792.788	240.033 *
R	10	1,642,794.067	551,098.693	210.651 *

(5) Supplementary GPS Control Stations (River Cross-Section Stations)

	Station	Northing (m)	Easting (m)	Elevation (m) (Above m.s.l.)
A	L-1	1,634,025.157	570,847.367	0.236 *
A	L-2	1,633,772.995	570,005.508	2.821
A	L-3	1,633,512.867	568,977.968	2.598
A	L-4	1,633,097.248	568,727.141	4.258
A	L-5	1,632,455.644	568,256.557	5.026
A	L-6	1,632,082.919	568,096.190	4.506
A	L-7	1,631,811.479	567,881.645	4.034
A	L-8	1,631,434.075	567,402.106	7.824
A	L-9	1,631,714.727	566,628.077	11.204
A	L-10	1,631,724.233	566,003.942	11.577
A	L-11	1,630,947.935	565,420.697	14.921
A	L-12	1,629,886.837	565,327.671	14.076
A	L-13	1,629,156.627	565,200.227	13.785
A	L-14	1,628,160.583	564,558.207	18.198
A	L-15	1,627,379.946	564,414.959	17.802 *
A	L-16	1,626,916.025	563,627.908	37.645 *
A	L-17	1,626,028.010	563,303.614	26.814 *
A	L-18	1,625,983.731	563,075.205	28.890 *
A	L-19	1,626,054.694	562,808.725	28.795 *
A	L-20	1,626,263.062	562,353.244	65.213 *
A	L-21	1,625,915.854	561,912.861	29.523 *
A	L-22	1,625,572.156	561,274.539	27.647
A	L-23	1,625,744.154	560,630.207	28.923
A	L-24	1,625,268.620	560,347.791	35.564
A	L-25	1,625,111.856	560,449.074	36.750
A	L-26	1,625,002.932	560,066.594	33.220
A	L-27	1,625,230.088	559,612.122	34.442
A	L-28	1,625,103.179	559,199.141	48.818
A	L-29	1,624,482.997	559,248.637	46.821
A	L-30	1,624,509.845	559,070.913	78.019

(to be continued)

Table A3.4 Final Results of Ground Control Survey (4/4)

(5) Supplementary GPS Control Stations (River Cross-Section Stations)

	Station	Northing (m)	Easting (m)	Elevation (m) (Above m.s.l.)
A	L-31	1,624,545.934	558,922.138	50.061
A	L-32	1,625,168.620	557,985.409	50.662
A	L-33	1,625,145.658	557,746.679	49.314
A	L-34	1,625,010.785	557,449.924	49.878
A	L-35	1,624,789.934	556,862.462	47.519
A	R-1	1,633,880.478	570,703.302	1.810
A	R-2	1,633,515.879	570,138.108	2.050
A	R-3	1,633,197.222	569,209.057	3.332
A	R-4	1,632,664.760	568,897.575	5.412
A	R-5	1,632,384.046	568,542.018	3.924
A	R-6	1,632,065.006	568,386.046	4.466
A	R-7	1,631,636.983	568,317.512	6.485
A	R-8	1,631,169.161	567,478.883	7.749
A	R-9	1,631,502.007	566,576.536	9.998
A	R-10	1,631,484.955	566,139.312	10.770
A	R-11	1,630,868.970	565,713.961	9.587
A	R-12	1,629,974.754	565,534.869	12.486
A	R-13	1,628,943.575	565,281.769	13.804
A	R-14	1,627,965.026	564,763.844	12.098
A	R-15	1,627,208.655	564,568.180	14.405
A	R-16	1,626,759.767	563,719.464	24.237
A	R-17	1,625,973.998	563,462.382	41.387
A	R-18	1,625,803.858	563,264.288	44.031
A	R-19	1,625,771.641	562,774.488	34.716
A	R-20	1,626,120.899	562,362.237	26.206
A	R-21	1,625,778.427	562,031.615	33.754
A	R-22	1,625,438.146	561,438.128	46.892
A	R-23	1,625,383.080	560,796.554	70.121
A	R-24	1,625,456.492	560,498.779	34.177
A	R-25	1,624,821.303	560,511.272	37.843
A	R-26	1,624,901.318	560,036.222	31.508
A	R-27	1,625,083.439	559,525.143	39.706
A	R-28	1,625,018.610	559,363.273	42.826
A	R-29	1,624,464.291	559,372.479	34.541
A	R-30	1,624,226.896	559,097.936	45.216
A	R-31	1,624,456.173	558,733.029	44.232
A	R-32	1,624,996.706	558,109.568	45.974
A	R-33	1,624,985.083	557,840.028	48.468
A	R-34	1,624,788.207	557,381.739	54.782
A	R-35	1,624,594.849	556,810.940	50.746

Notes: * - Station elevation above mean sea level is derived from spheoidal height determined from GPS observations.

Guide to Control Station Names:

NWRB - Permanent Reference Station
A - Control point in the Agos Lower Basin Area (including Infanta Peninsula)
R - Control point in Kanan River area
L - Control point in Kaliwa River area
P - Control point in the Pipeline route area
AL - Cross Section Station along the left bank of Agos River
AR - Cross Section Station along the right bank of Agos River

Table A3.5 Quality Control Sheet for Aerial Photography

Project		JICA-MMWRDP		Aircraft	AeroCmdr 500 U		No.	RPC 621	Film Type & No.	KODAK DXX 2405			
Designation		Quezon/Infanta		Camera	WILD RC 10		No.	15 UAG I	Length of Film	240 mm x 76 m			
Date of Flight		Mar.,May, June'02		Lens	f = 152 mm		No.	6055	Filter No.				
Judgement		Line	Flight	Exposure No.	Number of	O. L. (%)		S. L. (%)		Quality of Forms			
OK	No Good	No.	Direction	0000~0000	Photographs	Max	Min	Max	Min	Clouds	Smokes	Haze	Roll No.
*		1	E-W	4717-4734	18	65	65	35	34	No	No	No	1118
*		2	W-E	4735-4772	38	65	65	35	34	No	No	No	1118
*		5	E-W	4773-4790	18	65	65	35	34	No	No	No	1118
13 May '02													
*		10	W-E	5443-5448	6	65	65	35	34	No	No	No	1120
27 June '02													
*		9	W-E	5883-5897	15	65	65	35	34	No	No	No	1118
*		21	S-N	5898-5915	18	65	65	35	34	No	No	No	1118
*		22	N-S	5916-5933	18	65	65	35	34	No	No	No	1118
*		19	E-W	5934-5945	12	65	65	35	34	No	No	No	1118
*		11	S-N	5946-5958	13	65	65	35	34	No	No	No	1118
*		8	E-W	5959-5971	13	65	65	35	34	No	No	No	1118
*		7	W-E	5972-5985	14	65	65	35	34	No	No	No	1118

Remarks:	Remarks: Photographs are of good condition and appropriate for use in photogrammetric mapping	Contractor	CERTEZA SURVEYING AND AEROPHOTO SYSTEMS, INC.
		Checked by	Teddy Lucas
		Inspected by	

Table A3.6 Standard and Accuracy of Mapping

No.	Item		Standards and Accuracy	
1	Map scale		1:2,000	1:5,000
2	Contour interval	Index contour	5 m	25 m
		Intermediate contour	1 m	5 m
		Supplementary contour	-	(2.5 m)*
3	Required accuracy (Standard deviation)	Planimetry	0.5 mm on the map	
		Spot elevation	0.1 m	0.1 m, (0.5 m)*
		Contour line	0.3 m	0.3 m, (0.8 m)*
4	Map style and symbol		Standards of NAMRIA except those provided by the JICA Study Team	
5	Interval of grid ticks		0.1 km	1 km

Note: *Accuracy standard adopted for the low-lying areas of the Lower Agos River Basin (Infanta Peninsula) mapped using 1:25,000 photos.

Figures

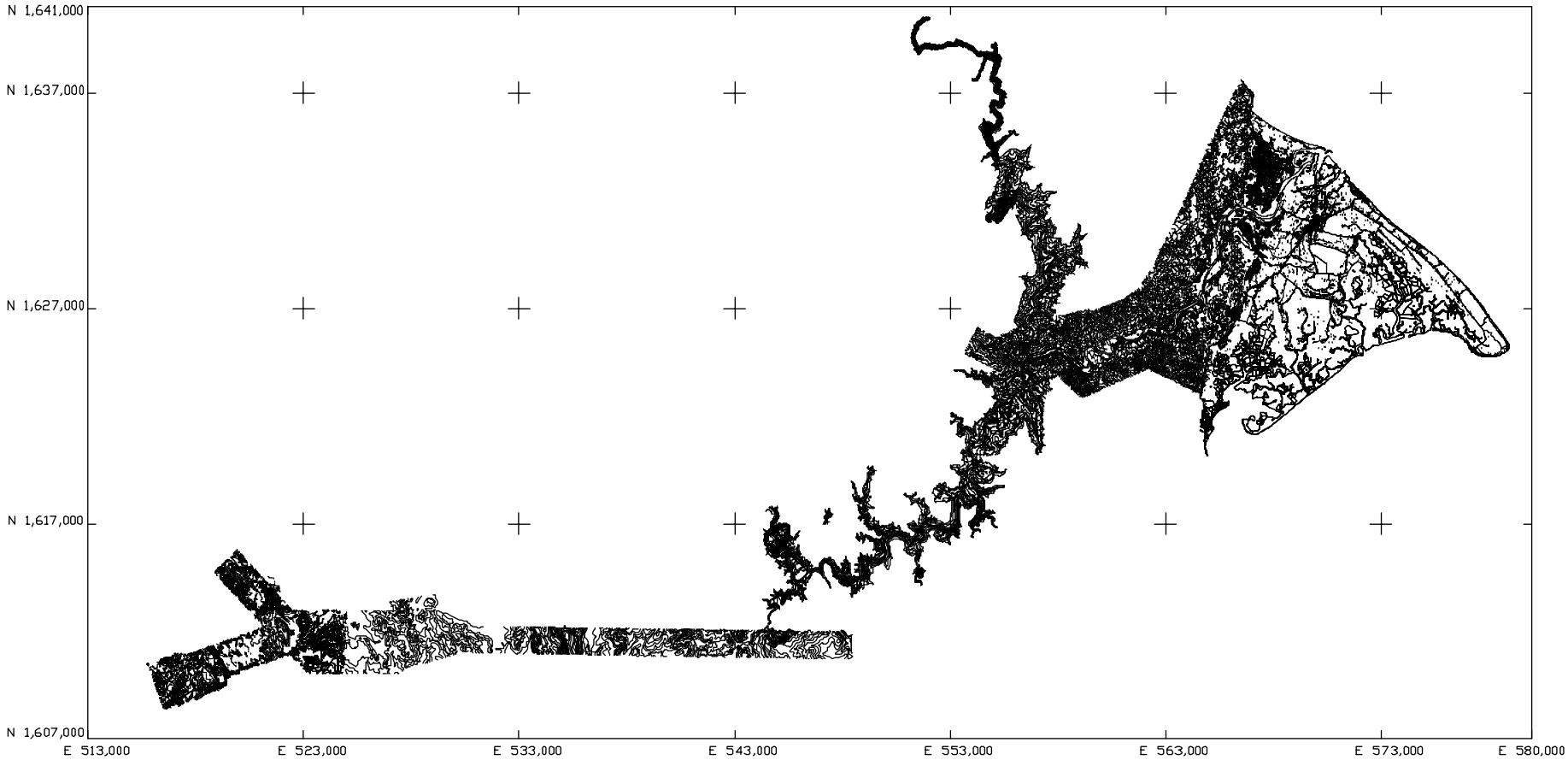

Figure A1.1 Survey Area

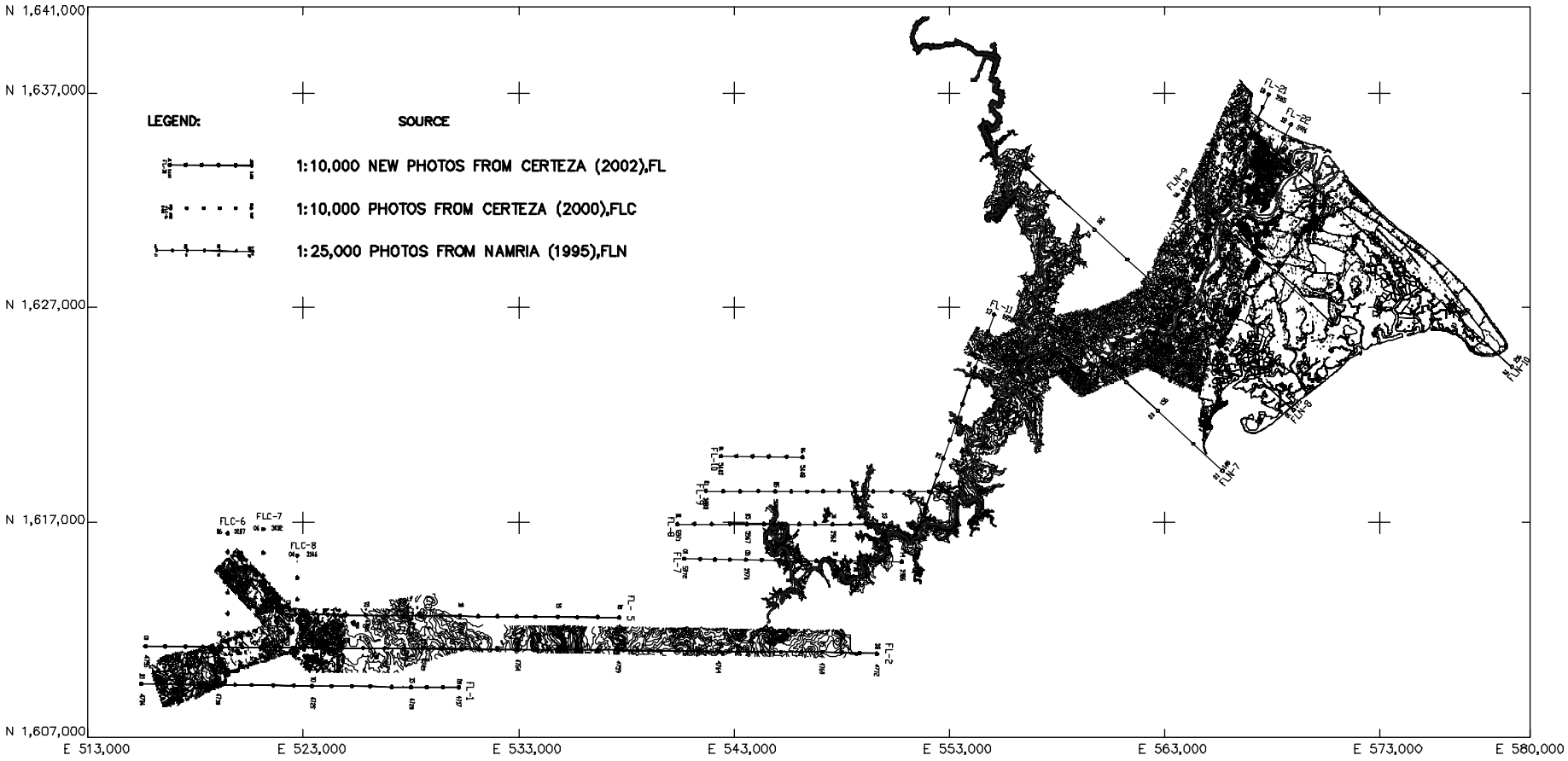

Figure A2.1 Coverage of New Photographs and Other Photographs Used for Photogrammetric Mapping

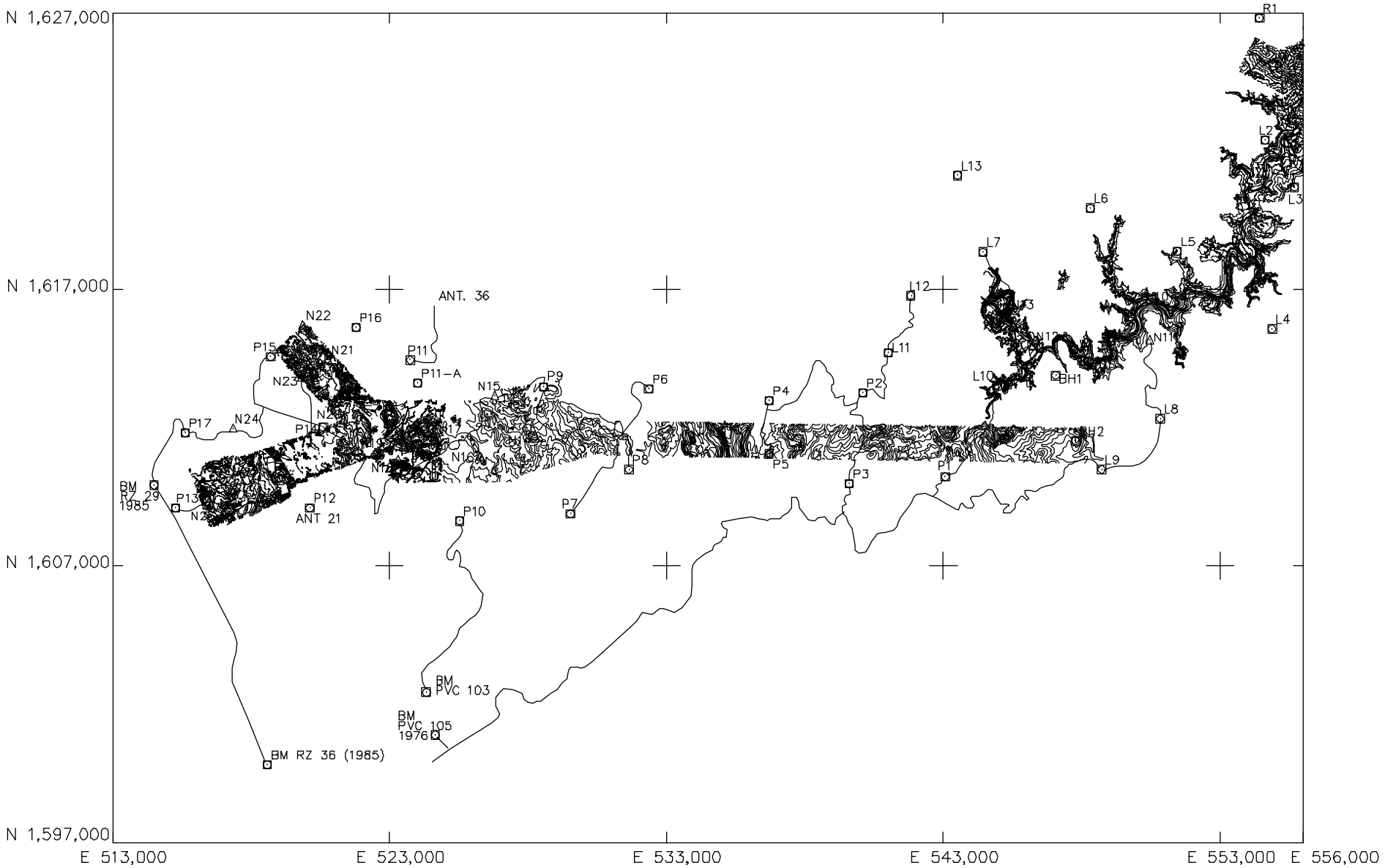

Figure A3.1 Distribution of New Benchmark, Control Points and Leveling Route (1/2)

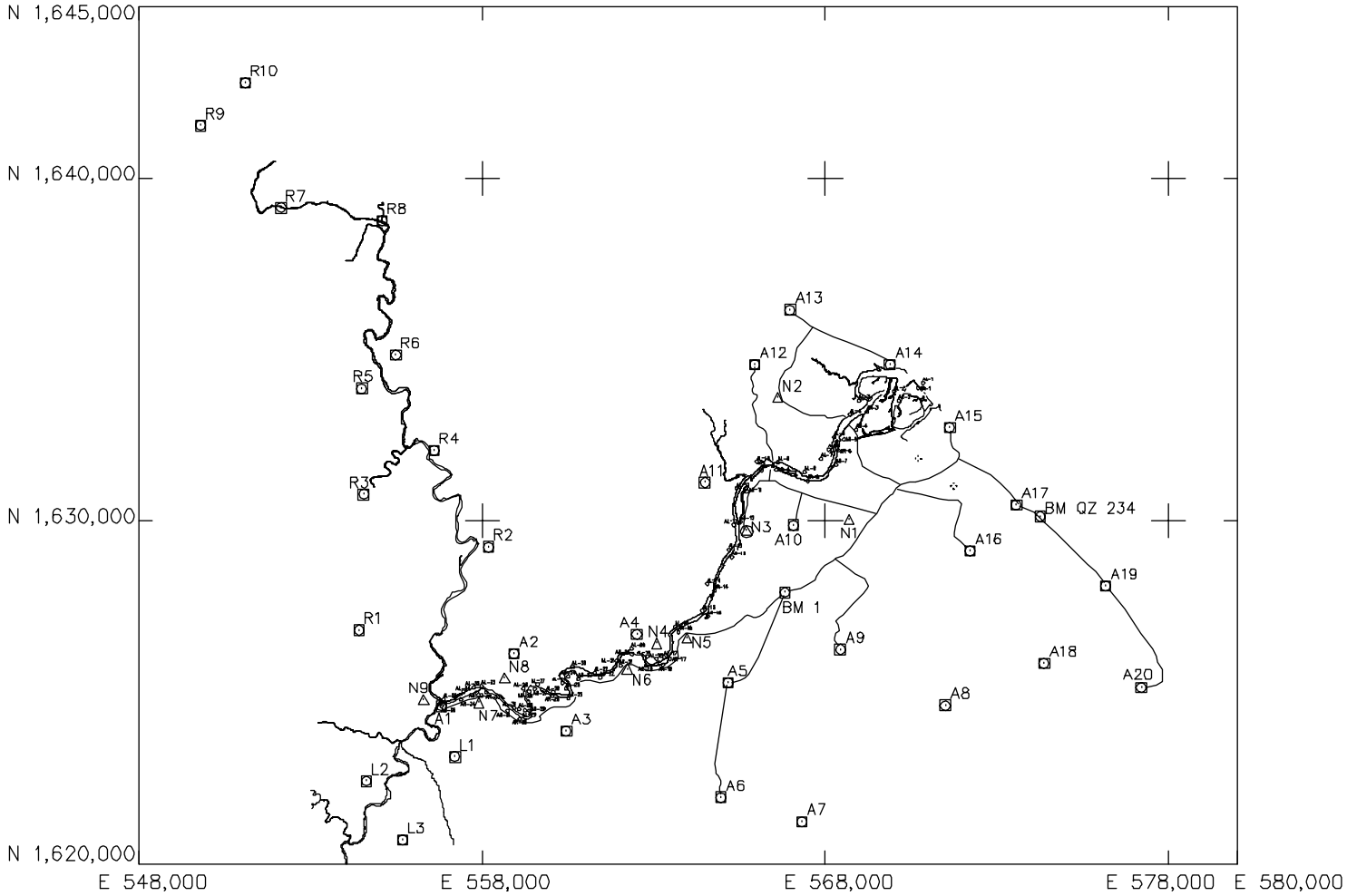

Figure A3.1 Distribution of New Benchmark, Control Points and Leveling Route (2/2)