

Table 8-16: Traffic survey results for station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side  
Date: 30 January, 1997

TIME	FROM MWENGE TO BAGAMOYO			FROM BAGAMOYO TO MWENGE			TOTAL					
	SV	LV	MC	TOTAL	SV	LV	MC	TOTAL	SV	LV	MC	TOTAL
6.00 - 7.00	4	1	0	5	7	2	0	9	11	3	0	14
7.00 - 8.00	34	5	1	40	50	5	0	55	84	10	1	95
8.00 - 9.00	13	6	1	20	13	3	2	18	26	9	3	38
9.00 - 10.00	78	26	4	108	67	20	2	89	145	46	6	197
10.00 - 11.00	19	6	0	25	24	4	2	30	43	10	2	55
11.00 - 12.00	77	38	2	117	82	28	3	113	159	66	5	230
12.00 - 13.00	17	9	0	26	14	2	2	18	31	11	2	44
13.00 - 14.00	83	57	2	142	96	47	2	145	179	104	4	287
14.00 - 15.00	11	10	1	22	10	2	0	12	21	12	1	34
15.00 - 16.00	67	24	1	92	71	35	3	109	138	59	4	201
16.00 - 17.00	8	5	1	14	17	6	1	24	25	11	2	38
17.00 - 18.00	64	45	2	111	89	41	3	133	153	86	5	244
18.00 - 19.00	18	7	0	25	17	15	0	32	35	22	0	57
19.00 - 20.00	58	41	1	100	64	42	0	106	122	83	1	206
20.00 - 21.00	9	8	0	17	15	8	0	23	24	16	0	40
21.00 - 22.00	46	37	3	86	52	38	1	91	98	75	4	177
22.00 - 23.00	13	7	0	20	16	9	1	26	29	16	1	46
23.00 - 24.00	59	28	0	87	67	50	2	119	126	78	2	206
24.00 - 25.00	15	7	0	22	9	4	0	13	24	11	0	35
25.00 - 26.00	45	34	0	79	70	45	3	118	115	79	3	197
26.00 - 27.00	10	4	0	14	4	3	0	7	14	7	0	21
27.00 - 28.00	48	26	2	76	80	30	2	112	128	56	4	188
28.00 - 29.00	6	3	0	9	15	5	0	20	21	8	0	29
29.00 - 30.00	73	14	3	90	76	29	1	106	149	43	4	196
30.00 - 31.00	19	3	2	24	18	10	0	28	37	13	2	52
31.00 - 32.00	62	12	1	75	65	20	3	88	127	32	4	163

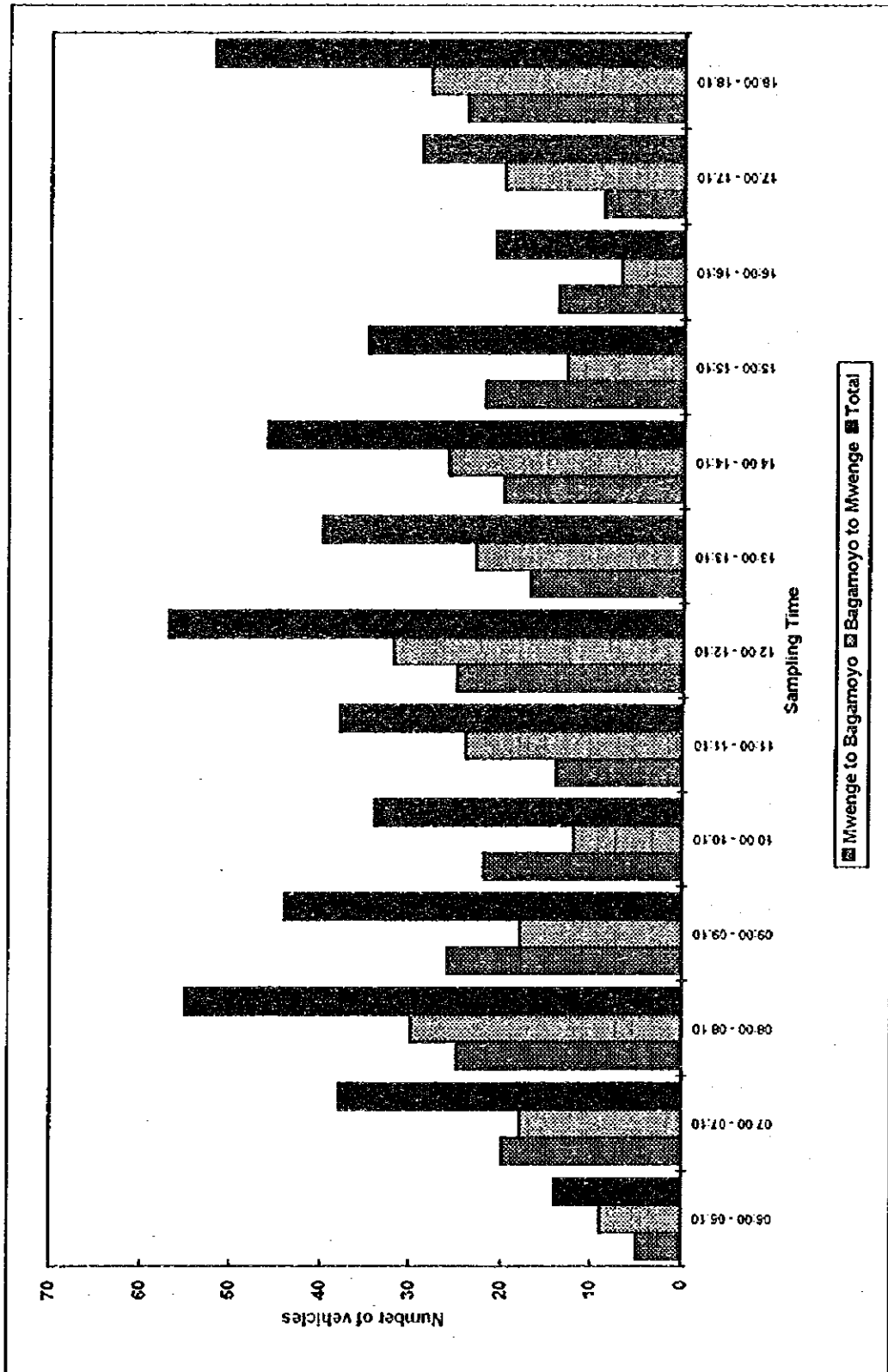


Figure 8-12: Traffic survey results for station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 30 January, 1997

Table 8-17: Traffic survey results for station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side

Date: 30 January, 1997

TIME	FROM MWENGE TO BAGAMOYO	FROM BAGAMOYO TO MWENGE	TOTAL
6.00 - 7.00	45	64	109
7.00 - 8.00	128	107	235
8.00 - 9.00	142	143	285
9.00 - 10.00	168	163	331
10.00 - 11.00	114	121	235
11.00 - 12.00	125	157	282
12.00 - 13.00	125	138	263
13.00 - 14.00	103	114	217
14.00 - 15.00	107	145	252
15.00 - 16.00	101	131	232
16.00 - 17.00	90	119	209
17.00 - 18.00	99	126	225
18.00 - 19.00	99	116	215

Table 8-18: Traffic survey results for station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side

Date: 30 January, 1997

TIME	FROM MWENGE TO BAGAMOYO			FROM BAGAMOYO TO MWENGE			TOTAL				
	SV	LV	MC	SV	LV	MC	SV	LV	MC	TOTAL	
6.00 - 7.00	38	6	1	45	57	7	64	95	13	1	109
7.00 - 8.00	91	32	5	128	80	23	107	171	55	9	235
8.00 - 9.00	96	44	2	142	106	32	143	202	76	7	285
9.00 - 10.00	100	66	2	168	110	49	163	210	115	6	331
10.00 - 11.00	78	34	2	114	81	37	121	159	71	5	235
11.00 - 12.00	72	50	3	125	106	47	157	178	97	7	282
12.00 - 13.00	76	48	1	125	81	57	138	157	105	1	263
13.00 - 14.00	55	45	3	103	67	46	114	122	91	4	217
14.00 - 15.00	72	35	0	107	73	59	145	155	94	3	252
15.00 - 16.00	60	41	0	101	79	49	131	139	90	3	232
16.00 - 17.00	58	30	2	90	84	33	119	142	63	4	209
17.00 - 18.00	79	17	3	99	91	34	126	170	51	4	225
18.00 - 19.00	81	15	3	99	83	30	116	164	45	6	215

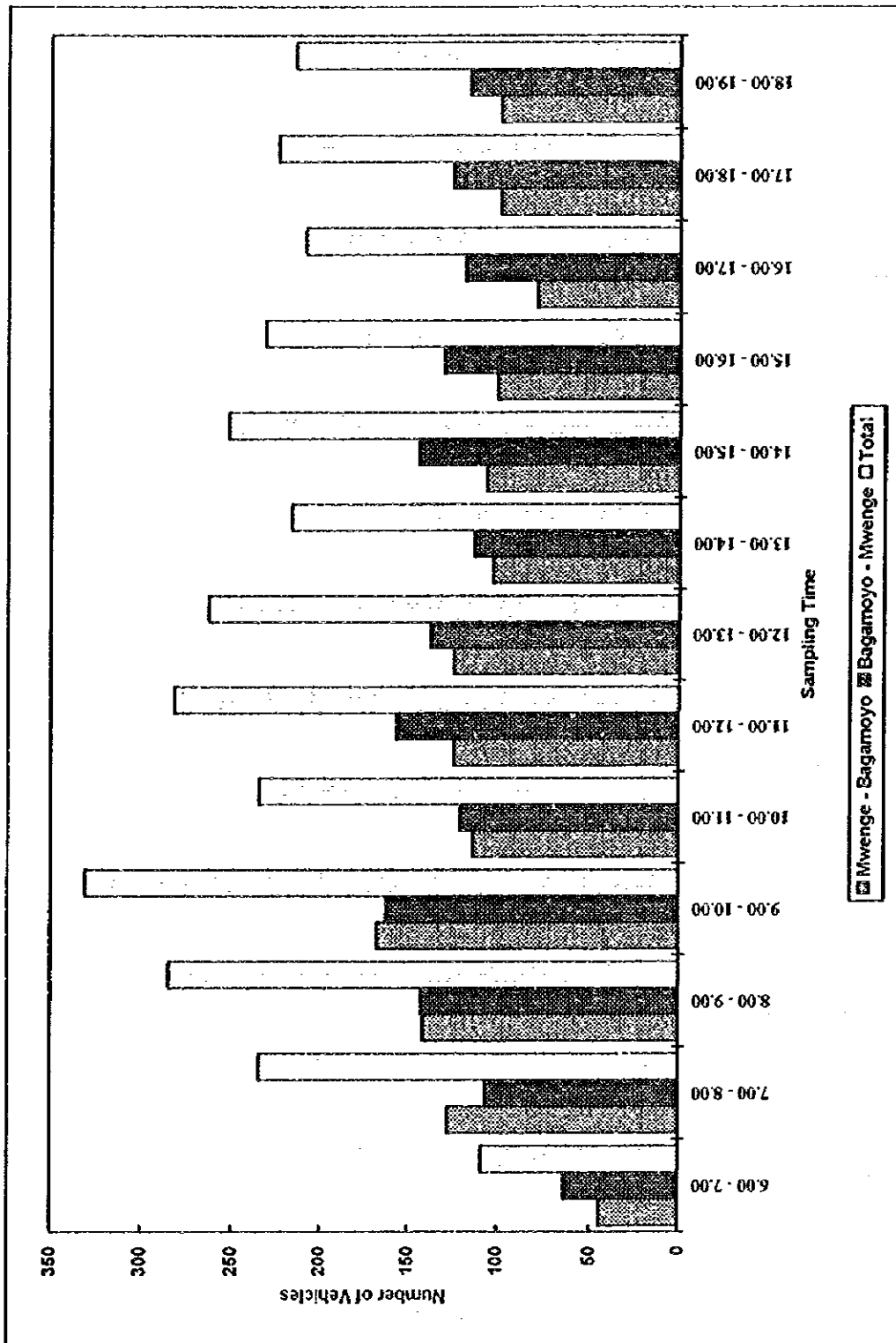


Figure 8-13: Traffic survey results for station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 30 January, 1997

## **9 Noise Level Survey**

### **9.1 Introduction**

This survey was conducted at the same two stations (A1 and A2) and at the same time as for the traffic volume, vibration and roadside air quality surveys, in accordance with the Terms of Reference. The aim of this survey was to assess the noise level generated by road traffic under normal road conditions on a normal working day. Only the data collected during this survey is presented in this section. Detailed data analysis is presented in the final report.

### **9.2 Land Use in Vicinity of Survey Stations**

Survey station A1 was along New Bagamoyo Road about 150 m north of the intersection with Sam Nujoma Road. On the western side of the road, the main land uses are high density unplanned residential and commercial while on the eastern side, the main land use is industrial. The nearest buildings are 10 - 15 m from the edge of the road, excluding temporary structures like kiosks and containers. Almost all permanent buildings near the survey station are single storey houses.

Survey station A2 was along New Bagamoyo Road, south-east of the proposed disposal site near the intersection of Bahari Beach Road with New Bagamoyo Road. On the western side of the road, the main land use is agricultural with patches of shrubs. On the eastern side, the main land uses are commercial and light industrial. There is also a dispensary and residential buildings. On the western side, there are two temporary structures, a stall and make-shift restaurant within 10 m of the edge of the road. On the eastern side, the nearest buildings are 5 m from the edge of the road.

### **9.3 Methodology**

At each survey station, measurements of noise levels were made 13 times during a normal working day for three consecutive days between 0600 and 1900 hours. The measurements were made using an Integrating Sound Level Meter (NL - 04 RION). This meter was placed at a height of 1.2 m above the ground on the walkway, 7.4 m from the edge of the road as shown in Figure 9-1 and Figure 9-2.

The measurement period was the first ten minutes of each hour, during which time all-noise levels were stored at one second intervals by the noise level meter. At the end of this period, the average L<sub>5</sub>, L<sub>50</sub> and L<sub>95</sub> readings were retrieved via the meter's digital display and manually recorded.

### **9.4 Survey Results**

Results of the noise level survey are presented in the tables and figures which follow in this section.

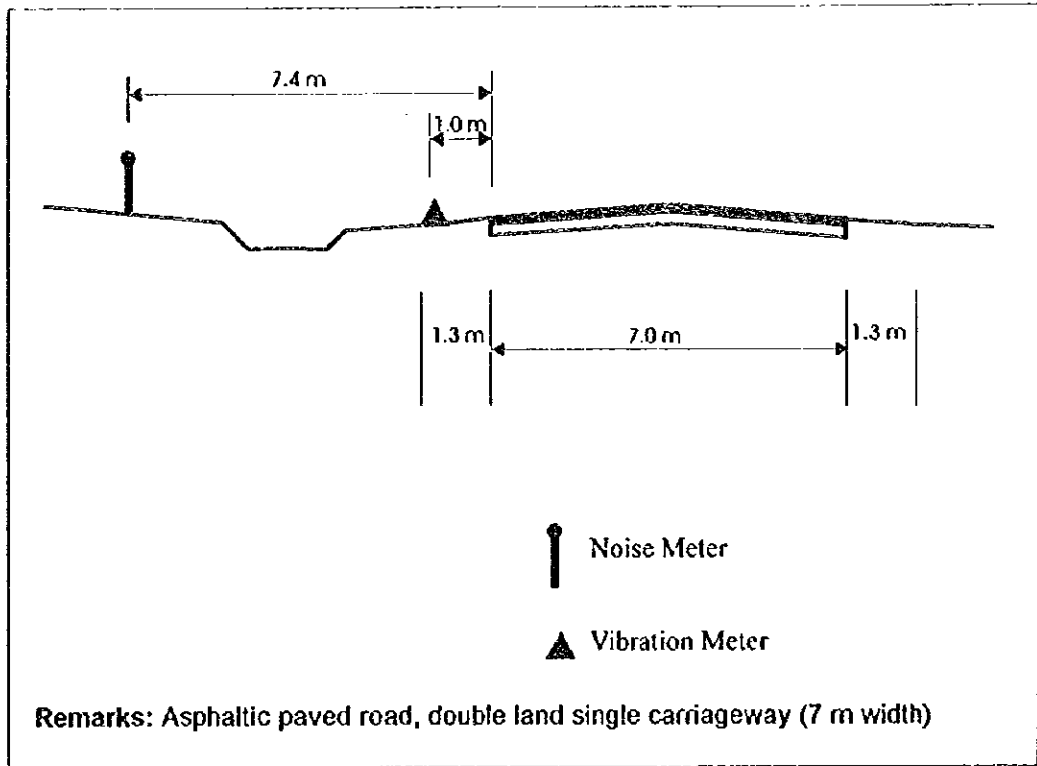


Figure 9-1: Road profile at station A1 along New Bagamoyo Road about 150 m north of the intersection with Sam Nujoma Road

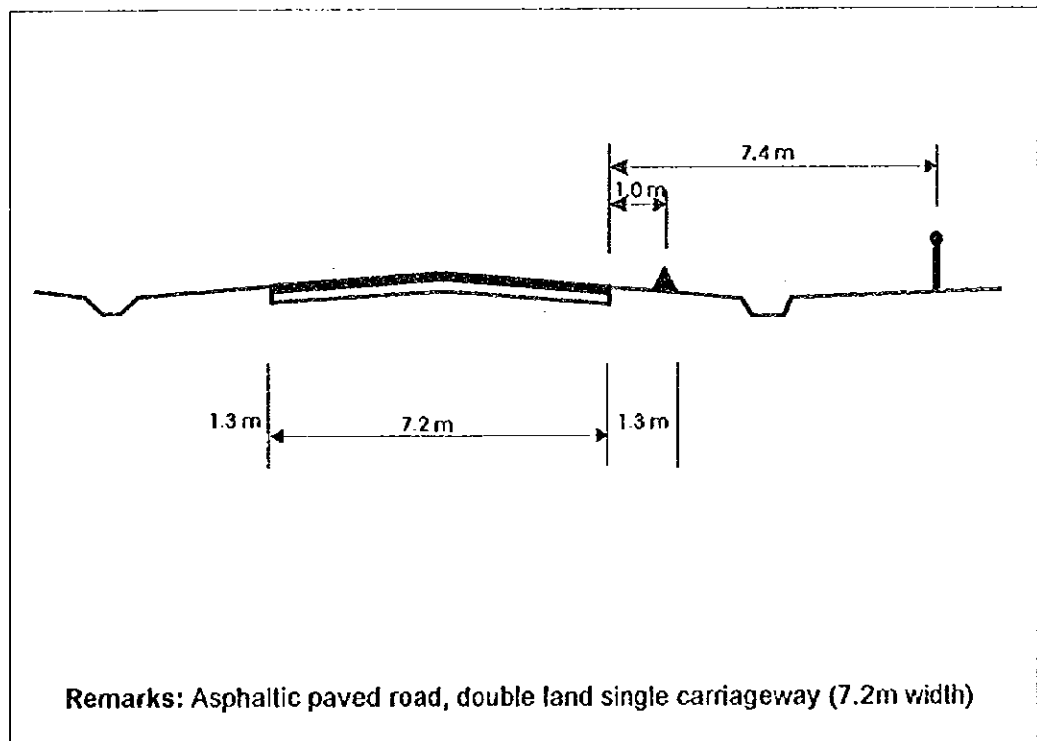


Figure 9-2: Road profile at station A2 along New Bagamoyo Road about 300 m south-east of the proposed disposal site

Table 9-1: Noise level survey results at station: A1: New Bagamoyo Road, 150 m north of the intersection with Sam Nujoma Road: 21 January 1997

<b>Date: 21 January 1997</b>			
<b>TIME</b>	<b>NOISE LEVEL (dB)</b>		
	<b>L95</b>	<b>L50</b>	<b>L5</b>
06:00 - 06:10	47.4	58.5	74.9
07:00 - 07:10	57.0	68.1	81.6
08:00 - 08:10	55.3	68.4	80.7
09:00 - 09:10	54.4	66.8	78.4
10:00 - 10:10	54.3	64.5	77.7
11:00 - 11:10	56.3	65.2	75.1
12:00 - 12:10	53.5	64.2	74.9
13:00 - 13:10	53.4	63.2	77.0
14:00 - 14:10	53.6	64.5	75.9
15:00 - 15:10	56.3	63.9	76.0
16:00 - 16:10	56.2	64.7	76.0
17:00 - 17:10	58.5	66.6	75.6
18:00 - 18:10	55.8	64.2	74.6
<b>Average</b>	<b>54.8</b>	<b>64.8</b>	<b>76.8</b>

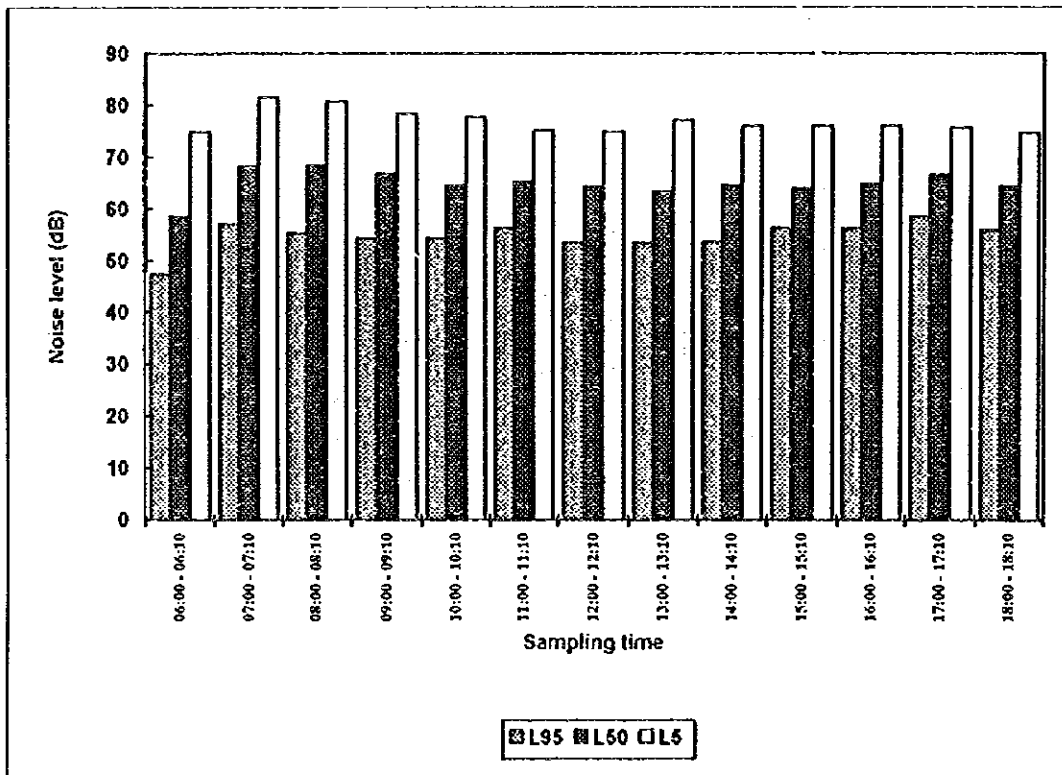


Figure 9-3: Noise level survey results at station A1: New Bagamoyo Road, 150 m north of the intersection with Sam Nujoma Road: 21 January 1997

Table 9-2: Noise level survey results at station A1: New Bagamoyo Road, 150 m north of the intersection with Sam Nujoma Road: 22 January 1997

Date: 22 January 1997			
TIME	NOISE LEVEL (dB)		
	L <sub>95</sub>	L <sub>50</sub>	L <sub>5</sub>
06:00 - 06:10	48.2	56.6	71.5
07:00 - 07:10	54.2	63.3	74.5
08:00 - 08:10	56.6	64.7	75.5
09:00 - 09:10	56.3	65.5	76.1
10:00 - 10:10	54.9	62.7	72.8
11:00 - 11:10	55.2	64.0	73.6
12:00 - 12:10	52.7	62.2	74.2
13:00 - 13:10	54.9	64.0	77.1
14:00 - 14:10	53.6	63.1	75.3
15:00 - 15:10	52.8	64.2	75.1
16:00 - 16:10	56.5	65.7	76.2
17:00 - 17:10	57.9	65.7	74.8
18:00 - 18:10	58.1	65.2	75.8
<b>Average</b>	<b>54.8</b>	<b>63.6</b>	<b>74.8</b>

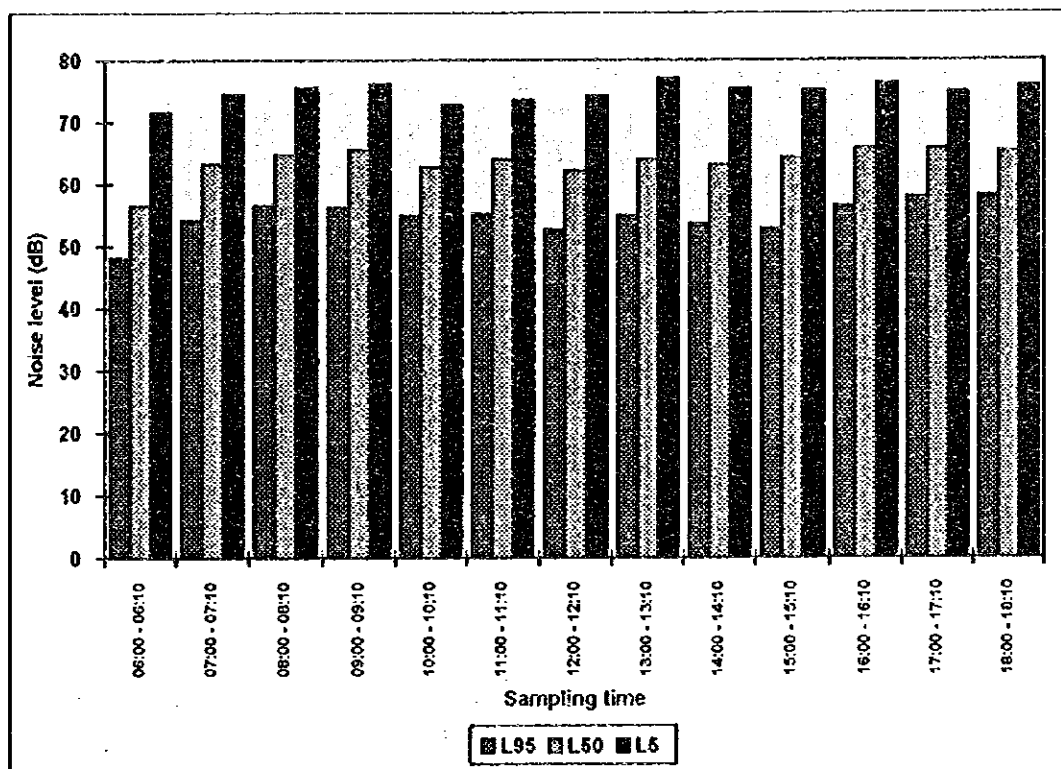


Figure 9-4: Noise level survey results at station A1: New Bagamoyo Road, 150 m north of the intersection with Sam Nujoma Road: 22 January 1997



Table 9-3: Noise level survey results at station A1: New Bagamoyo Road, 150 m north of the intersection with Sam Nujoma Road: 23 January 1997

Date: 23 January 1997			
TIME	NOISE LEVEL (dB)		
	L95	L50	L5
06:00 - 06:10	49.3	58.3	70.6
07:00 - 07:10	55.4	64.8	75.3
08:00 - 08:10	58.4	66.7	77.4
09:00 - 09:10	55.2	64.1	73.9
10:00 - 10:10	55.7	63.3	74.5
11:00 - 11:10	56.5	64.6	74.9
12:00 - 12:10	57.1	65.7	75.3
13:00 - 13:10	57.4	65.3	77.0
14:00 - 14:10	55.9	65.1	78.4
15:00 - 15:10	56.3	64.5	74.5
16:00 - 16:10	57.6	65.2	74.3
17:00 - 17:10	57.1	63.3	77.0
18:00 - 18:10	55.3	65.1	73.9
<b>Average</b>	<b>55.9</b>	<b>64.3</b>	<b>75.2</b>

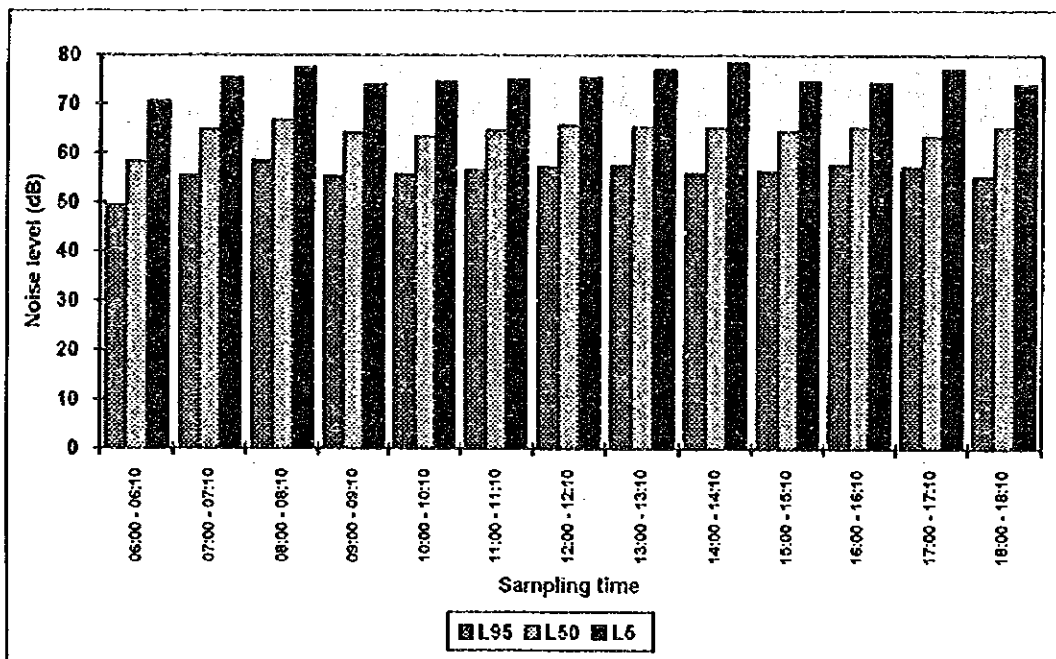


Figure 9-5: Noise level survey results at station A1: New Bagamoyo Road, 150 m north of the intersection with Sam Nujoma Road: 23 January 1997

Table 9-4: Noise level survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 28 January 1997

Date: 28 January 1997			
TIME	NOISE LEVEL (dB)		
	L95	L50	L5
06:00 - 06:10	38.5	46.2	60.9
07:00 - 07:10	48.6	56.5	70.4
08:00 - 08:10	51.3	60.1	73.5
09:00 - 09:10	52.1	59.4	74.0
10:00 - 10:10	51.2	58.8	73.1
11:00 - 11:10	49.3	56.1	73.9
12:00 - 12:10	49.1	57.8	72.2
13:00 - 13:10	53.4	59.3	74.7
14:00 - 14:10	51.4	59.7	75.2
15:00 - 15:10	49.5	57.4	71.5
16:00 - 16:10	51.6	58.7	73.8
17:00 - 17:10	49.2	58.8	74.0
18:00 - 18:10	51.1	60.2	73.3
<b>Average</b>	<b>49.7</b>	<b>57.6</b>	<b>72.3</b>

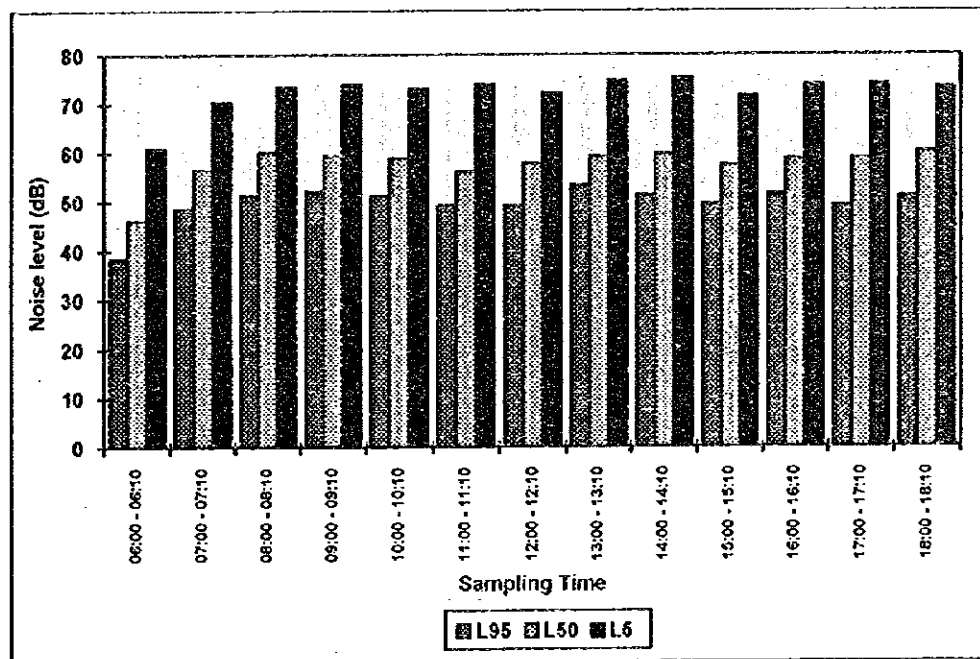


Figure 9-6: Noise level survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 28 January 1997

Table 9-5: Noise level survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 29 January 1997

Date: 29 January 1997			
TIME	NOISE LEVEL (dB)		
	L95	L50	L5
06:00 - 06:10	36.0	47.1	67.1
07:00 - 07:10	45.6	54.6	71.3
08:00 - 08:10	50.5	59.7	73.5
09:00 - 09:10	51.5	61.8	75.9
10:00 - 10:10	50.4	59.8	73.7
11:00 - 11:10	53.9	61.8	75.6
12:00 - 12:10	50.7	58.1	74.8
13:00 - 13:10	51.2	62.0	75.8
14:00 - 14:10	52.6	62.5	74.4
15:00 - 15:10	49.5	60.4	76.6
16:00 - 16:10	50.5	60.4	77.5
17:00 - 17:10	50.2	57.9	72.0
18:00 - 18:10	49.4	59.1	73.5
<b>Average</b>	<b>49.4</b>	<b>58.9</b>	<b>74.0</b>

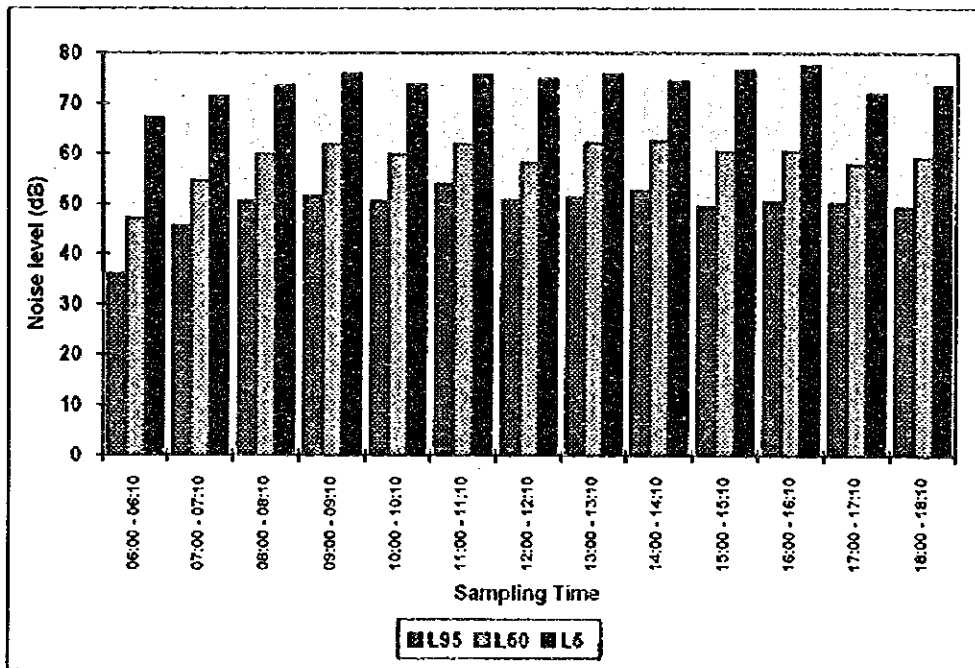


Figure 9-7: Noise level survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 29 January 1997

Table 9-6: Noise level survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 30 January 1997

Date:		30 January 1997		
TIME	NOISE LEVEL (dB)			
	L <sub>95</sub>	L <sub>50</sub>	L <sub>5</sub>	
06:00 - 06:10	40.7	51.5	68.5	
07:00 - 07:10	49.6	58.1	73.3	
08:00 - 08:10	52.4	60.1	72.1	
09:00 - 09:10	53.0	60.9	73.1	
10:00 - 10:10	50.4	59.6	74.9	
11:00 - 11:10	53.5	60.8	75.7	
12:00 - 12:10	51.8	63.6	76.1	
13:00 - 13:10	55.0	62.8	74.0	
14:00 - 14:10	52.0	61.7	75.6	
15:00 - 15:10	48.2	58.0	73.3	
16:00 - 16:10	50.6	60.4	76.3	
17:00 - 17:10	50.9	61.7	78.2	
18:00 - 18:10	51.9	59.3	73.2	
<b>Average</b>	<b>50.8</b>	<b>59.9</b>	<b>74.2</b>	

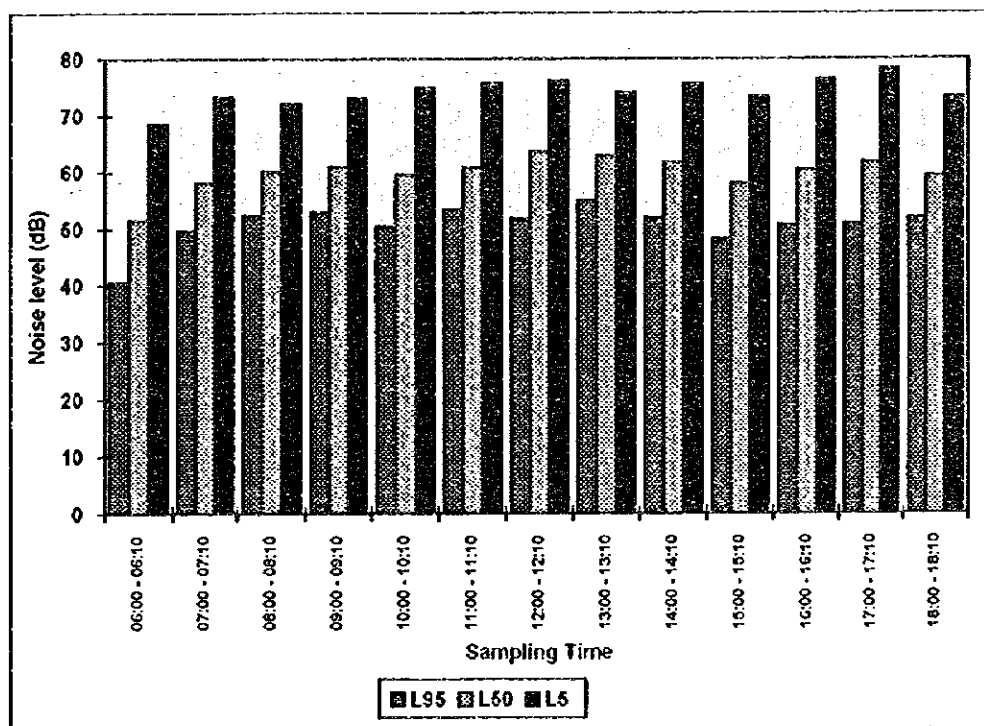


Figure 9-8: Noise level survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 30 January 1997

## **10 Vibration Level Survey**

### **10.1 Introduction**

This survey was conducted at the same two stations (A1 and A2) and at the same time as for the traffic volume, noise and roadside air quality surveys, in accordance with the Terms of Reference.

The aim of this survey was to assess the vibration level generated by road traffic under normal road conditions on a normal working day.

Only the data collected during this survey is presented in this section. Detailed data analysis is presented in the final report.

### **10.2 Methodology**

At each survey station, measurements of vibration levels were made 13 times during a normal working day for three consecutive days between 0600 and 1900 hours. The measurements were made using a vibration level meter (RION VM-52). The meter was placed at a distance of one metre from the road as shown in Figure 9-1 and Figure 9-2.

The measurement periods was the first ten minutes of each hour, during which time the vibration levels were stored at one second intervals in the vibration level meter. At the end of this period, the average L<sub>50</sub> and L<sub>10</sub> readings were retrieved via the meter's digital display and manually recorded.

### **10.3 Survey Results**

Results of the vibration level survey are presented in the figures and tables which follow in this section.

Table 10-1: Vibration level survey results at station A1: New Bagamoyo Road, 150 m north of the intersection with Sam Nujoma Road: 21 January, 1997

TIME	VIBRATION LEVEL (dB)	
	L50	L10
06:00 - 06:10	26.6	35.4
07:00 - 07:10	25.0	35.3
08:00 - 08:10	27.9	36.6
09:00 - 09:10	24.7	35.0
10:00 - 10:10	23.2	35.5
11:00 - 11:10	26.6	37.5
12:00 - 12:10	27.6	37.8
13:00 - 13:10	25.8	36.8
14:00 - 14:10	26.6	37.6
15:00 - 15:10	26.2	37.3
16:00 - 16:10	26.8	38.6
17:00 - 17:10	27.6	36.3
18:00 - 18:10	24.7	35.5
<b>Average</b>	<b>26.1</b>	<b>36.6</b>

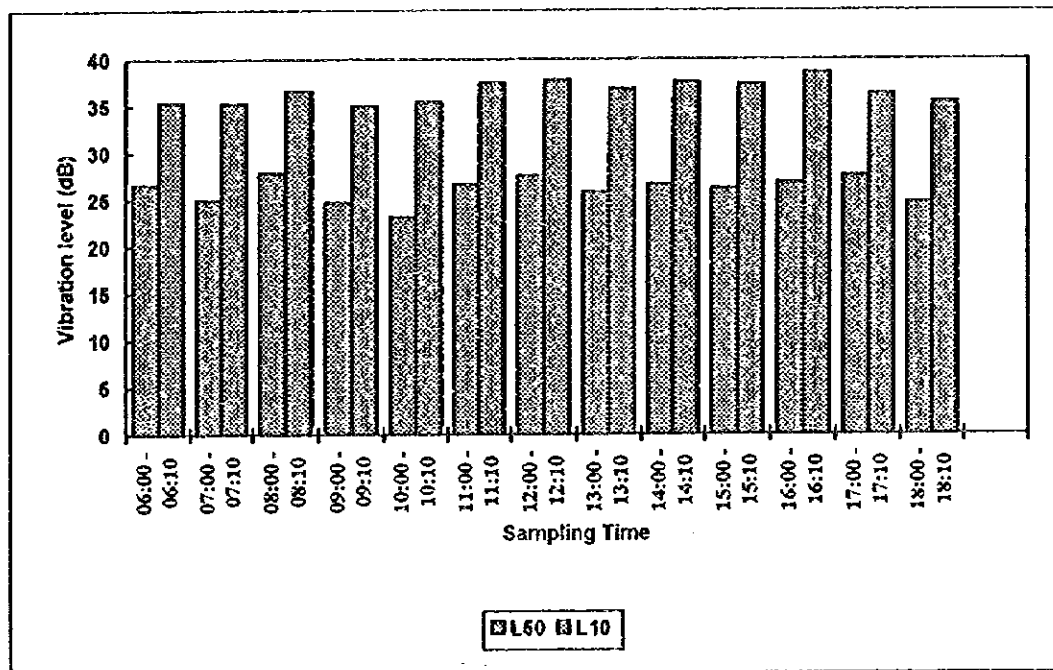


Figure 10-1: Vibration level survey results at station A1: New Bagamoyo Road, 150 m north of the intersection with Sam Nujoma Road: 21 January, 1997

Table 10-2: Vibration level survey results at station A1: New Bagamoyo Road, 150 m north of the intersection with Sam Nujoma Road: 22 January, 1997

TIME	VIBRATION LEVEL (dB)	
	L50	L10
06:00 - 06:10	25.0	32.2
07:00 - 07:10	25.0	35.9
08:00 - 08:10	26.2	36.1
09:00 - 09:10	25.9	37.1
10:00 - 10:10	25.9	36.9
11:00 - 11:10	26.4	37.1
12:00 - 12:10	25.2	36.8
13:00 - 13:10	25.7	38.2
14:00 - 14:10	25.0	36.2
15:00 - 15:10	25.9	38.4
16:00 - 16:10	28.2	39.0
17:00 - 17:10	25.0	36.0
18:00 - 18:10	27.0	36.6
<b>Average</b>	<b>25.9</b>	<b>36.7</b>

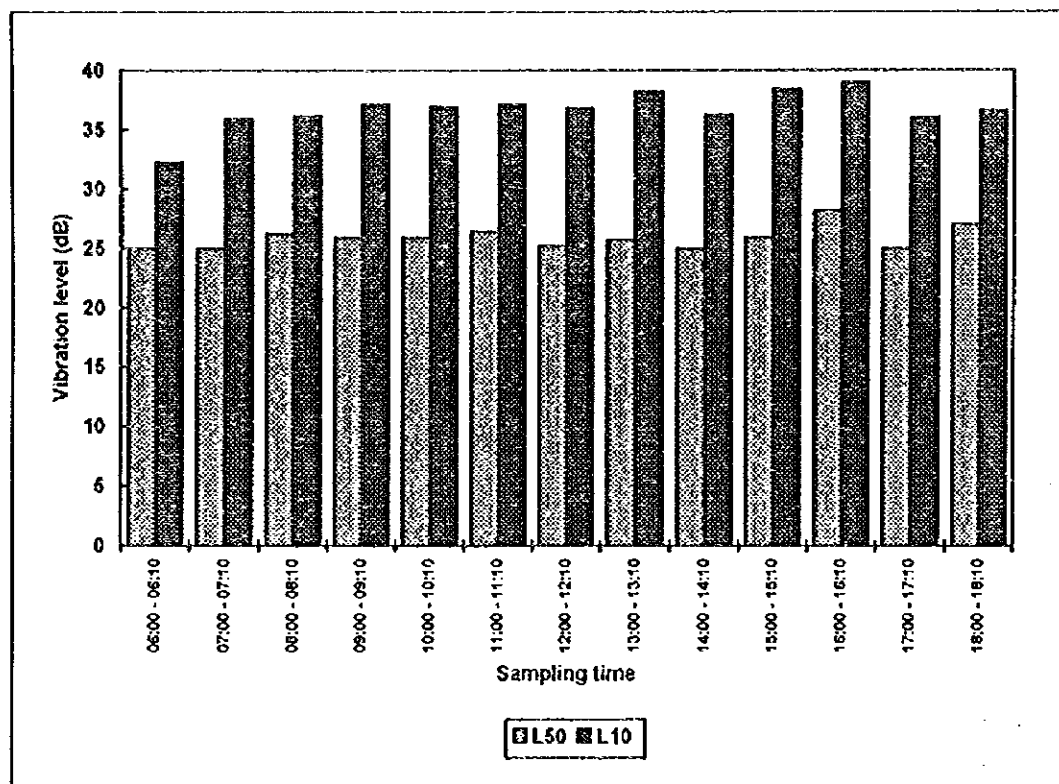


Figure 10-2: Vibration level survey results at station A1: New Bagamoyo Road, 150 m north of the intersection with Sam Nujoma Road: 22 January 1997

Table 10-3: Vibration level survey results at station A1: New Bagamoyo Road, 150 m north of the intersection with Sam Nujoma Road: 23 January, 1997

TIME	VIBRATION LEVEL (dB)	
	L50	L10
06:00 - 06:10	25.0	32.0
07:00 - 07:10	26.0	36.3
08:00 - 08:10	29.5	39.2
09:00 - 09:10	25.9	36.9
10:00 - 10:10	24.4	35.2
11:00 - 11:10	25.4	37.0
12:00 - 12:10	27.0	37.0
13:00 - 13:10	26.5	36.6
14:00 - 14:10	26.3	37.6
15:00 - 15:10	24.0	36.6
16:00 - 16:10	27.0	36.5
17:00 - 17:10	27.4	37.5
18:00 - 18:10	26.1	36.4
<b>Average</b>	<b>26.2</b>	<b>36.5</b>

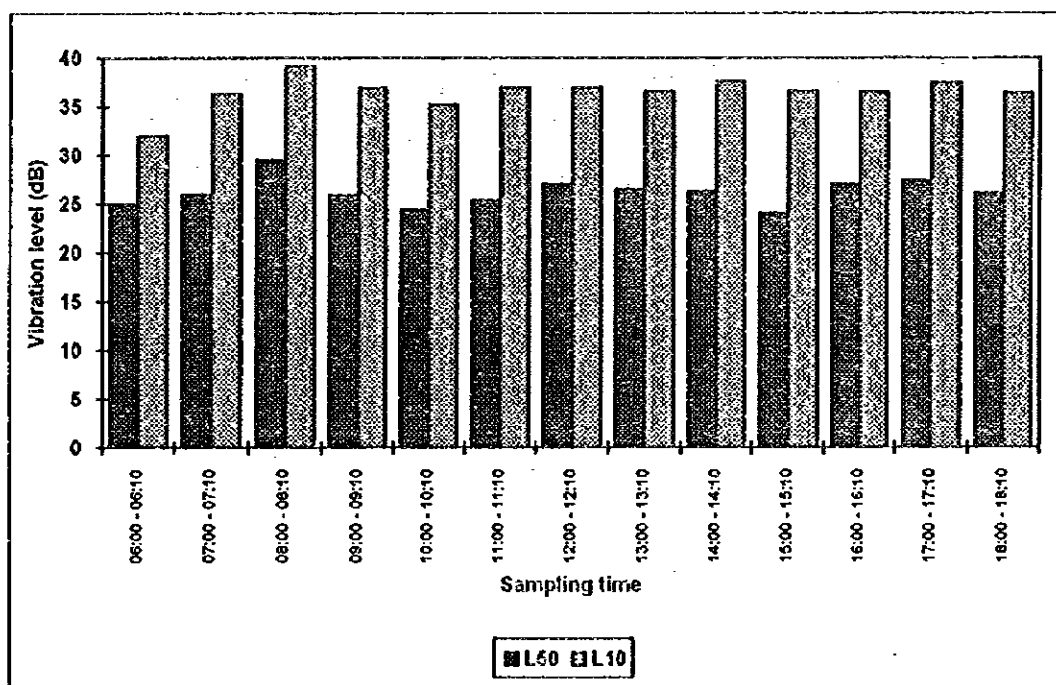


Figure 10-3: Vibration level survey results at station A1: New Bagamoyo Road, 150 m north of the intersection with Sam Nujoma Road: 23 January 1997



Table 10-4: Vibration survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 28 January, 1997

TIME	VIBRATION LEVEL (dB)	
	L-50	L-10
06:00 - 06:10	15.0	19.8
07:00 - 07:10	15.7	26.7
08:00 - 08:10	19.9	31.2
09:00 - 09:10	18.8	30.4
10:00 - 10:10	21.1	31.3
11:00 - 11:10	25.0	31.4
12:00 - 12:10	22.0	31.0
13:00 - 13:10	23.5	31.6
14:00 - 14:10	22.1	33.0
15:00 - 15:10	20.4	29.1
16:00 - 16:10	21.9	31.2
17:00 - 17:10	20.5	31.9
18:00 - 18:10	19.1	31.5
<b>Average</b>	<b>20.4</b>	<b>30.0</b>

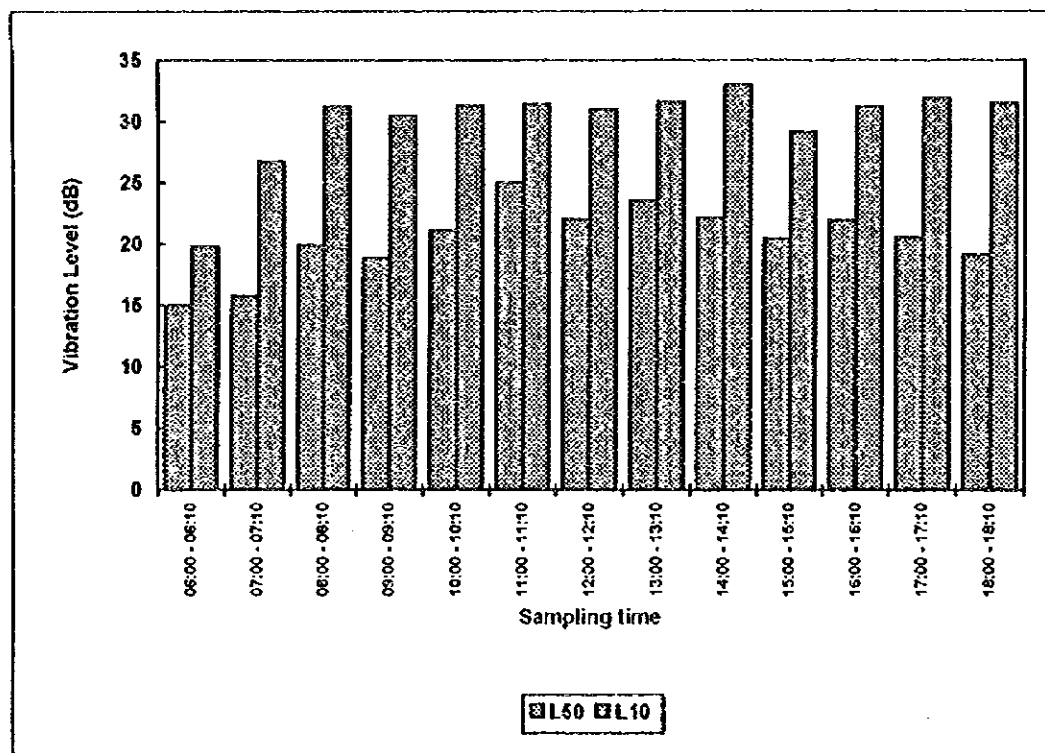


Figure 10-4: Vibration level survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 28 January 1997

Table 10-5: Vibration survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 29 January, 1997

TIME	VIBRATION LEVEL (dB)	
	L50	L10
06:00 - 06:10	20.3	21.1
07:00 - 07:10	16.6	28.6
08:00 - 08:10	23.7	24.7
09:00 - 09:10	22.1	31.8
10:00 - 10:10	20.8	32.2
11:00 - 11:10	21.6	33.1
12:00 - 12:10	21.2	33.9
13:00 - 13:10	23.8	31.8
14:00 - 14:10	22.1	33.9
15:00 - 15:10	21.2	34.9
16:00 - 16:10	21.9	34.5
17:00 - 17:10	18.9	31.1
18:00 - 18:10	16.5	30.1
<b>Average</b>	<b>20.8</b>	<b>30.9</b>

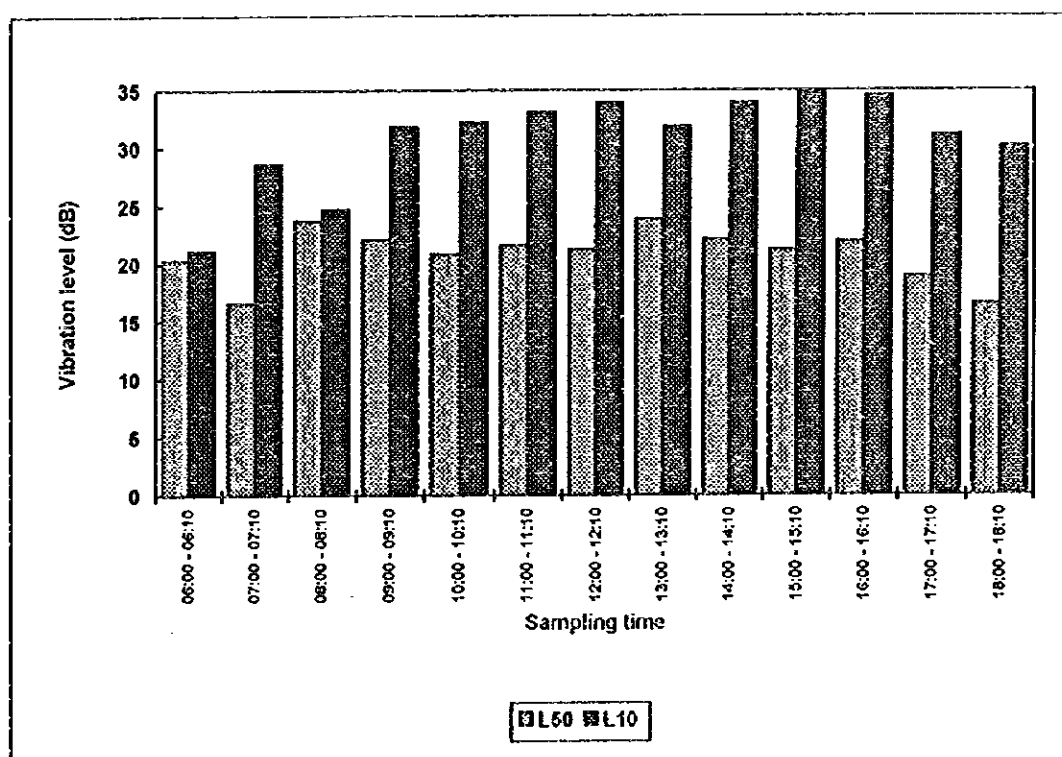


Figure 10-5: Vibration level survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 29 January, 1997

Table 10-6: Vibration survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 30 January, 1997

TIME	VIBRATION LEVEL (dB)	
	L50	L10
06:00 - 06:10	15.0	23.1
07:00 - 07:10	17.3	30.0
08:00 - 08:10	21.4	30.6
09:00 - 09:10	23.0	31.9
10:00 - 10:10	20.9	32.0
11:00 - 11:10	23.7	33.0
12:00 - 12:10	23.3	33.4
13:00 - 13:10	23.2	32.0
14:00 - 14:10	22.2	32.3
15:00 - 15:10	19.2	29.5
16:00 - 16:10	20.7	31.3
17:00 - 17:10	20.3	33.2
18:00 - 18:10	21.1	31.3
<b>Average</b>	<b>20.9</b>	<b>31.0</b>

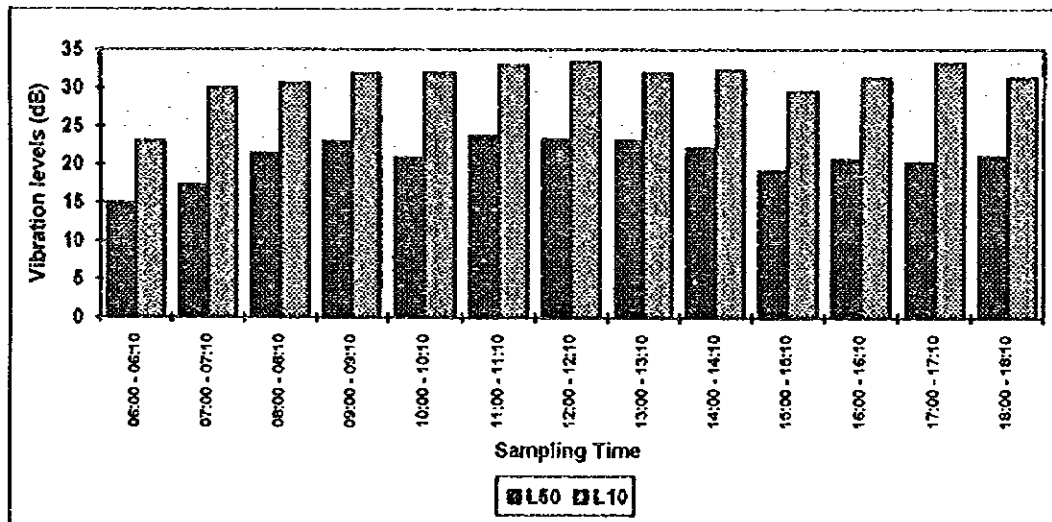


Figure 10-6: Vibration level survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 30 January, 1997

## **11 Air Quality Survey**

### **11.1 Roadside Air Quality Survey**

#### **11.1.1 Introduction**

This survey was conducted at the same two stations (A1 and A2) and at the same time as for the traffic volume, noise and vibration surveys, in accordance with the Terms of Reference.

The aim of this survey was to measure roadside air concentrations for nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), sulphur dioxide (SO<sub>2</sub>) and ammonia (NH<sub>3</sub>) originating from automobile exhaust and other sources.

Only the data collected during this survey is presented in this section. Detailed data analysis is presented in the final report.

#### **11.1.2 Methodology**

Measurements for all parameters were taken on the side of the road at both stations for the first ten minutes of each hour from 0600 - 1900. The measurements were made using gas detector tubes. This method utilises the Gastec Model 800 pump and provides a rapid and fully quantitative analysis of the concentration of the measured gases in the air with minimum accuracy of  $\pm 25\%$ .

Temperature, humidity, wind direction and speed were measured simultaneously at the same stations as the air quality measurements. Temperature and humidity were measured with the use of a Thermo-hygrograph (Ota Keiki Type MN-5), wind direction using a wind vane (Porton Wind Vane Type W 200) and wind speed with the use of an anemometer (Porton Anemometer Type A 100).

#### **11.1.3 Survey results**

The results of the air quality survey including weather condition measurements are presented in the tables and figures which follow in this section.

Table 11-1: Ambient air survey results at station A1: New Bagamoyo Road, 150 m north of the intersection with Sam Nujoma Road: 21 January, 1997

Time	Temp °C	Humidity (%)	Wind Direction	Wind Speed (m/s)	NH <sub>3</sub> (ppm)	CO (ppm)	SO <sub>2</sub> (ppm)	NO <sub>x</sub> (ppm)
06:00 - 06:10	26	75	NE	0.3	0	2.5	0.00	0.02
07:00 - 07:10	28	68	NW	2.0	0	5.0	0.02	0.04
08:00 - 08:10	30	40	NW	2.0	0	4.0	0.01	0.04
09:00 - 09:10	32	50	NW	1.2	0	5.0	0.00	0.02
10:00 - 10:10	32	55	NW	1.6	0	4.5	0.00	0.06
11:00 - 11:10	32	51	NE	1.3	0	4.0	0.00	0.04
12:00 - 12:10	34	46	NE	1.1	0	2.0	0.00	0.02
13:00 - 13:10	34	50	NE	0.6	0	2.0	0.00	0.04
14:00 - 14:10	34	52	SE	1.3	0	3.0	0.00	0.04
15:00 - 15:10	34	52	SE	1.1	0	4.0	0.00	0.02
16:00 - 16:10	34	50	SE	1.8	0	4.0	0.00	0.04
17:00 - 17:10	31	58	SE	2.1	0	5.0	0.00	0.04
18:00 - 18:10	28	61	SE	1.7	0	5.0	0.00	0.02

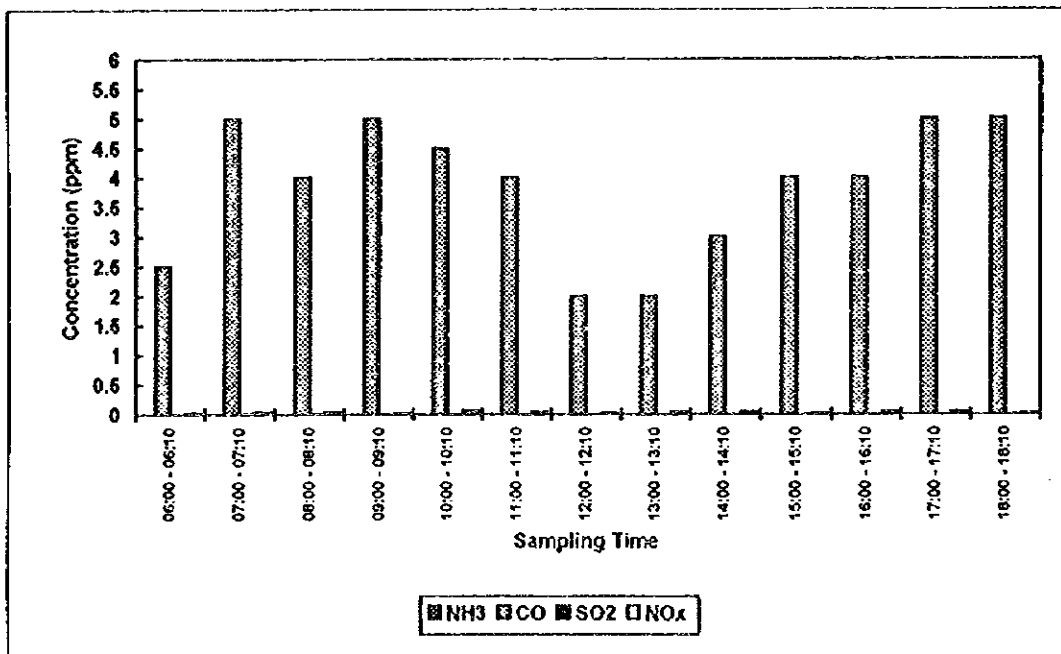


Figure 11-1: Ambient air survey results at station A1: New Bagamoyo Road, 150 m north of the intersection with Sam Nujoma Road: 21 January, 1997

Table 11-2: Ambient air survey results at station A1: New Bagamoyo Road, 150 m north of the intersection with Sam Nujoma Road: 22 January 1997

Time	Temp °C	Humidity (%)	Wind Direction	Wind Speed (m/s)	NH <sub>3</sub> (ppm)	CO (ppm)	SO <sub>2</sub> (ppm)	NO <sub>x</sub> (ppm)
06:00 - 06:10	25	68	NE	0.8	0.0	2.0	0.10	0.02
07:00 - 07:10	28	70	NE	0.8	0.0	3.0	0.13	0.04
08:00 - 08:10	29	68	NE	0.6	0.0	3.0	0.13	0.05
09:00 - 09:10	30	64	NW	1.4	0.0	4.0	0.14	0.04
10:00 - 10:10	32	55	NW	1.9	0.0	4.0	0.12	0.04
11:00 - 11:10	34	50	NW	1.2	0.0	2.0	0.00	0.04
12:00 - 12:10	34	48	NE	1.4	0.0	2.0	0.10	0.06
13:00 - 13:10	34	48	SE	0.7	0.0	3.0	0.11	0.08
14:00 - 14:10	34	50	SE	1.7	0.0	3.0	0.00	0.04
15:00 - 15:10	34	50	SE	1.6	0.0	3.0	0.00	0.08
16:00 - 16:10	33	58	SE	3.2	0.0	3.0	0.10	0.04
17:00 - 17:10	30	62	SE	2.9	0.0	4.0	0.12	0.04
18:00 - 18:10	30	58	SE	2.8	0.0	3.0	0.16	0.02

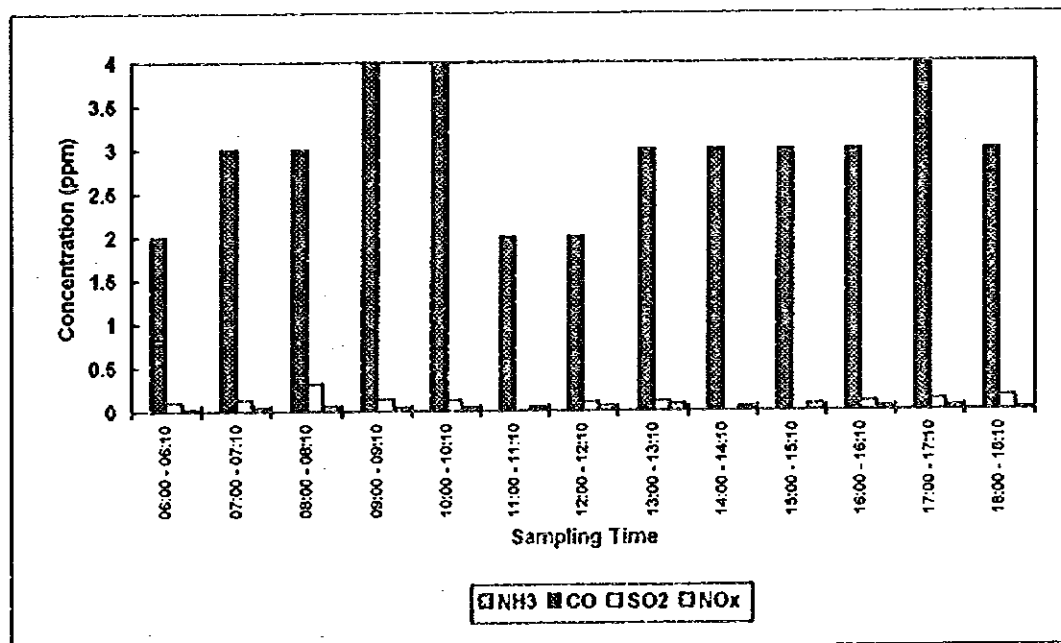


Figure 11-2: Ambient air survey results at station A1: New Bagamoyo Road, 150 m north of the intersection with Sam Nujoma Road: 22 January, 1997

Table 11-3: Ambient air survey results at station A1: New Bagamoyo Road,  
150 m north of the intersection with Sam Nujoma Road: 23 January, 1997

Time	Temp °C	Humidity (%)	Wind Direction	Wind Speed (m/s)	NH <sub>3</sub> (ppm)	CO (ppm)	SO <sub>2</sub> (ppm)	NO <sub>x</sub> (ppm)
06:00 - 06:10	26	78	SE	0.7	0	2.0	0.11	0.02
07:00 - 07:10	27	74	SE	1.6	0	3.0	0.13	0.04
08:00 - 08:10	30	62	NE	1.9	0	3.0	0.14	0.06
09:00 - 09:10	32	55	NE	1.2	0	3.0	0.09	0.04
10:00 - 10:10	34	50	NE	2.2	0	3.0	0.05	0.04
11:00 - 11:10	34	48	NE	1.8	0	4.0	0.10	0.04
12:00 - 12:10	34	48	NE	1.5	0	3.0	0.03	0.06
13:00 - 13:10	34	52	NE	1.8	0	3.0	0.01	0.06
14:00 - 14:10	34	60	NE	1.4	0	4.0	0.01	0.08
15:00 - 15:10	34	55	SE	2.6	0	4.0	0.12	0.04
16:00 - 16:10	32	60	SE	2.4	0	4.0	0.07	0.04
17:00 - 17:10	30	65	SE	2.0	0	3.0	0.12	0.04
18:00 - 18:10	29	70	SE	1.8	0	2.0	0.15	0.02

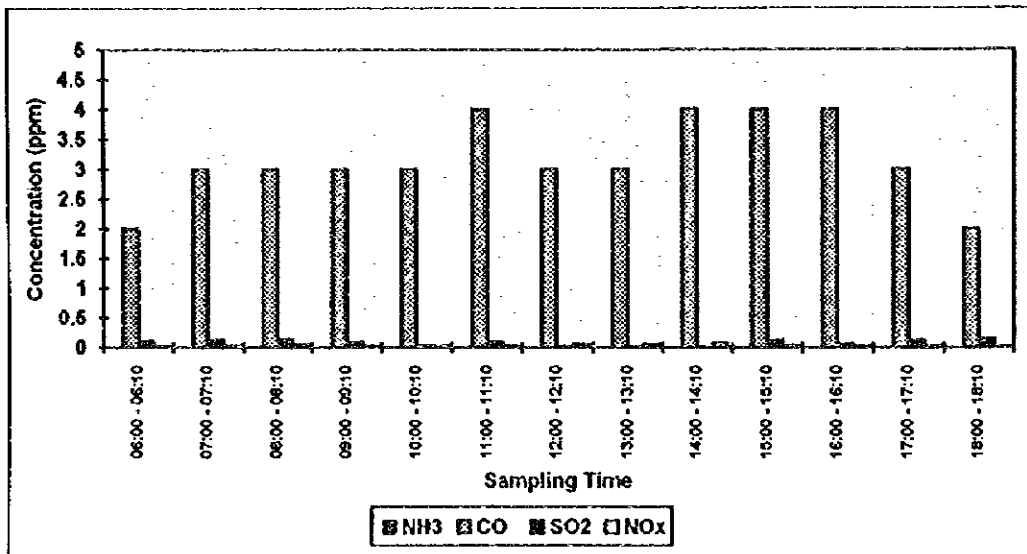


Figure 11-3: Ambient air survey results at station A1: New Bagamoyo Road,  
150 m north of the intersection with Sam Nujoma Road: 23 January, 1997

Table 11-4: Ambient air survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 28 January, 1997

Time	Temp °C	Humidity (%)	Wind Direction	Wind Speed (m/s)	NH <sub>3</sub> (ppm)	CO (ppm)	SO <sub>2</sub> (ppm)	NO <sub>x</sub> (ppm)
06:00 - 06:10	26	70	N	3.0	0.0	1.0	0.10	0.00
07:00 - 07:10	28	72	N	2.2	0.0	2.0	0.05	0.00
08:00 - 08:10	30	60	NW	2.8	0.0	2.0	0.00	0.00
09:00 - 09:10	31	55	NW	2.6	0.0	2.0	0.00	0.02
10:00 - 10:10	34	55	NW	2.6	0.0	3.0	0.01	0.00
11:00 - 11:10	34	42	N	3.0	0.0	2.0	0.00	0.00
12:00 - 12:10	34	40	NW	3.6	0.0	1.0	0.12	0.02
13:00 - 13:10	36	35	NE	2.0	0.0	1.0	0.00	0.02
14:00 - 14:10	35	50	NE	2.4	0.0	1.0	0.13	0.02
15:00 - 15:10	34	48	NE	1.8	0.0	2.0	0.00	0.02
16:00 - 16:10	34	48	NE	1.6	0.0	2.0	0.00	0.02
17:00 - 17:10	32	55	NE	2.2	0.0	2.0	0.11	0.02
18:00 - 18:10	30	60	NE	3.4	0.0	1.0	0.04	0.00

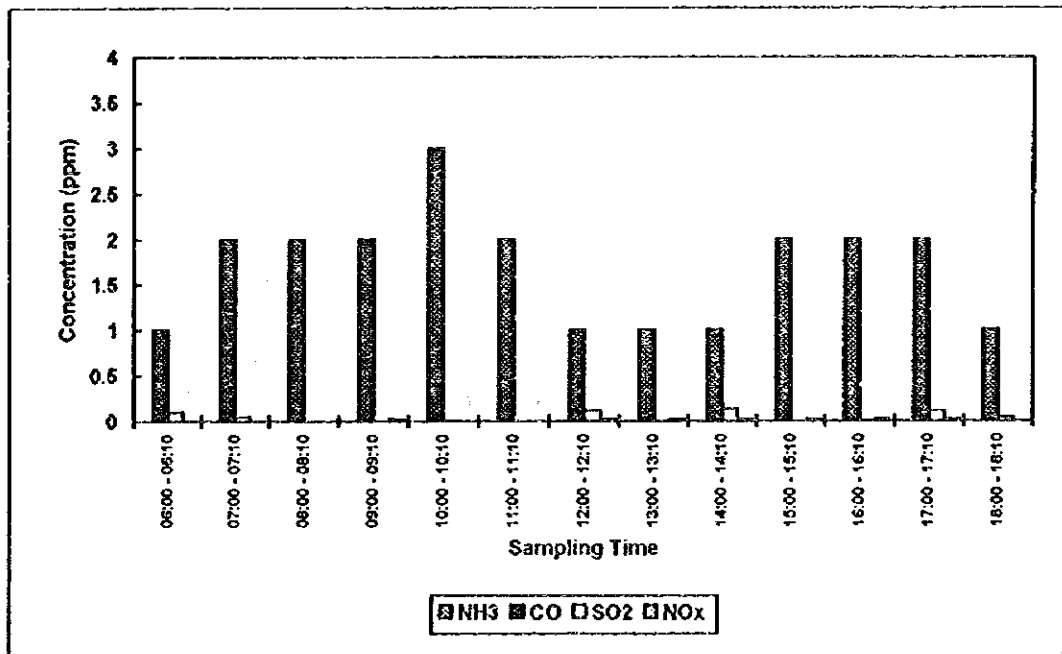


Figure 11-4: Ambient air survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 28 January, 1997



Table 11-5: Ambient air survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 29 January, 1997

Time	Temp °C	Humidity (%)	Wind Direction	Wind Speed (m/s)	NH <sub>3</sub> (ppm)	CO (ppm)	SO <sub>2</sub> (ppm)	NO <sub>x</sub> (ppm)
06:00 - 06:10	26	75	NW	2.6	0	2.0	0.05	0.00
07:00 - 07:10	27	65	NW	2.8	0	4.0	0.11	0.00
08:00 - 08:10	31	60	NW	2.4	0	2.0	0.00	0.02
09:00 - 09:10	32	60	NW	1.8	0	2.0	0.01	0.02
10:00 - 10:10	32	59	NW	3.0	0	2.0	0.00	0.04
11:00 - 11:10	34	50	NW	3.0	0	3.0	0.00	0.02
12:00 - 12:10	34	50	NW	2.5	0	1.0	0.00	0.00
13:00 - 13:10	34	48	NE	2.8	0	3.0	0.00	0.02
14:00 - 14:10	34	50	NE	2.0	0	1.0	0.11	0.00
15:00 - 15:10	33	53	NE	1.9	0	2.0	0.10	0.00
16:00 - 16:10	32	55	NE	1.8	0	1.0	0.02	0.02
17:00 - 17:10	32	57	NE	1.8	0	2.0	0.12	0.02
18:00 - 18:10	28	70	NE	2.2	0	2.0	0.12	0.00

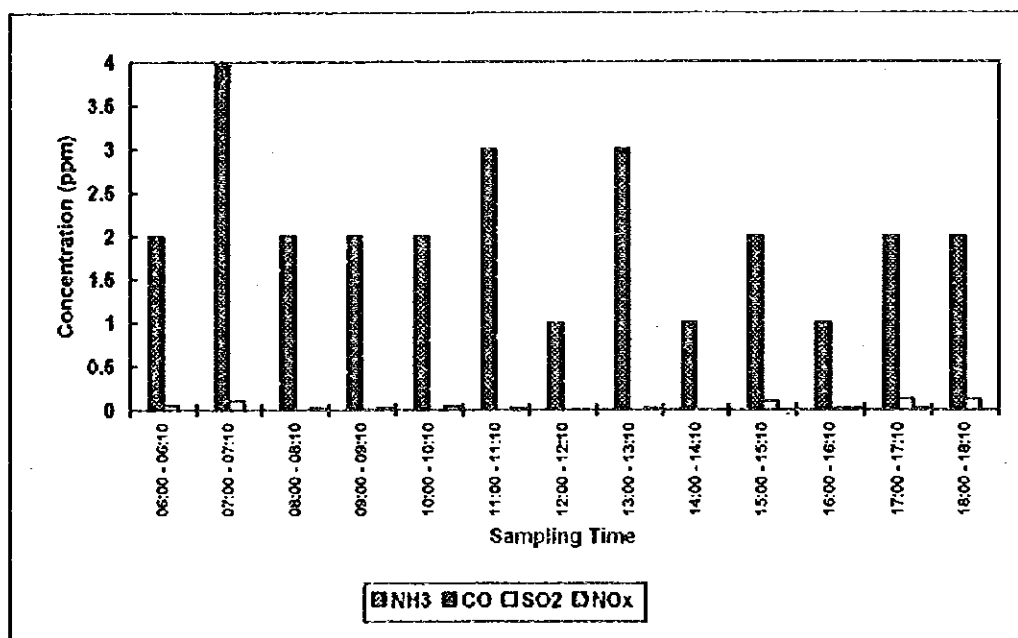


Figure 11-5: Ambient air survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 29 January, 1997

Table 11-6: Ambient air survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 30 January, 1997

Time	Temp °C	Humidity (%)	Wind Direction	Wind Speed (m/s)	NH <sub>3</sub> (ppm)	CO (ppm)	SO <sub>2</sub> (ppm)	NO <sub>x</sub> (ppm)
06:00 - 06:10	26	85	N	0.8	0.0	1.0	0.13	0.00
07:00 - 07:10	26	70	N	0.4	0.0	2.0	0.10	0.00
08:00 - 08:10	30	60	NW	1.8	0.0	1.0	0.07	0.02
09:00 - 09:10	32	55	NW	1.9	0.0	3.0	0.06	0.04
10:00 - 10:10	34	55	NW	2.8	0.0	2.0	0.12	0.04
11:00 - 11:10	34	53	NW	1.6	0.0	2.0	0.00	0.02
12:00 - 12:10	34	45	NW	2.4	0.0	2.0	0.00	0.04
13:00 - 13:10	35	45	W	2.6	0.0	1.0	0.00	0.00
14:00 - 14:10	35	45	W	2.8	0.0	3.0	0.01	0.00
15:00 - 15:10	34	48	N	1.6	0.0	2.0	0.02	0.04
16:00 - 16:10	32	52	NE	1.0	0.0	2.0	0.25	0.06
17:00 - 17:10	32	55	NE	1.2	0.0	1.0	0.30	0.02
18:00 - 18:10	29	62	NE	2.5	0.0	2.0	0.31	0.00

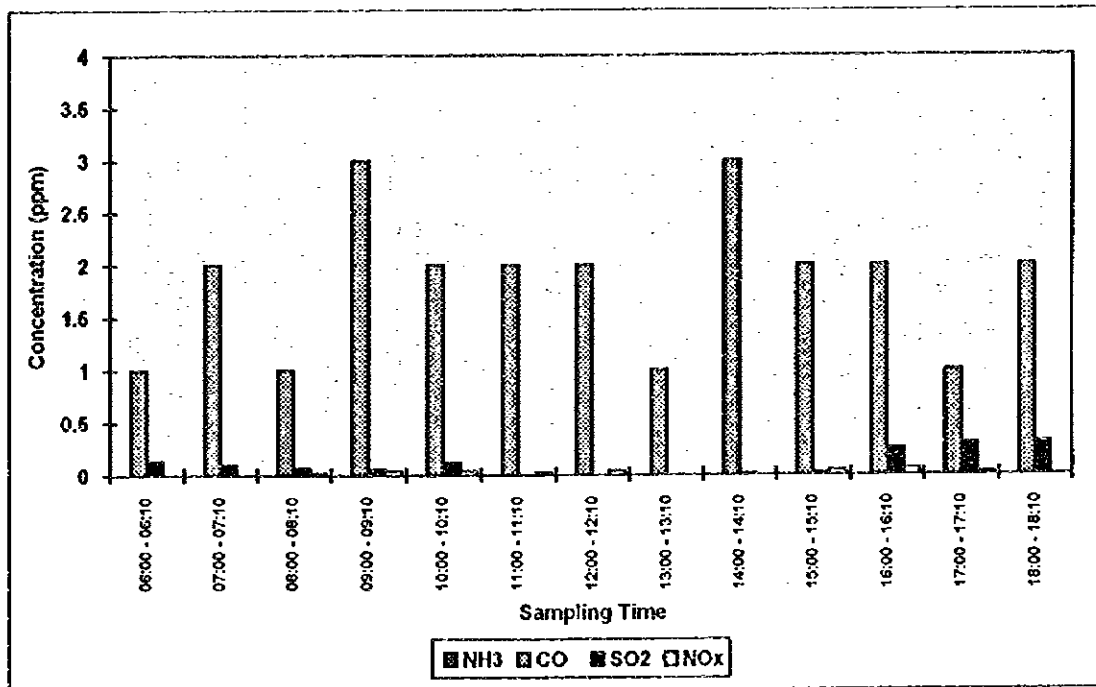


Figure 11-6: Ambient air survey results at station A2: New Bagamoyo Road, near to the proposed disposal site on the south-east side: 30 January, 1997

## **11.2 Air Quality Survey at the proposed disposal site**

### **11.2.1 Introduction**

An air quality survey was also conducted at the proposed disposal site using two sampling points, on opposite sides of the main cavity, near its edge. In addition to the other parameters previously measured in the roadside air survey, the rate of dust fall-out was also measured here.

The objective of this survey was to determine the baseline levels of these gases and dust at the proposed disposal site.

### **11.2.2 Methodology**

The air quality survey involved measurement of nitrogen oxides ( $\text{NO}_x$ ), ammonia ( $\text{NH}_3$ ), sulphur dioxide ( $\text{SO}_2$ ) and carbon monoxide ( $\text{CO}$ ) by using the detector tube method as per the roadside air quality survey. Samples were taken from the two points at approximately monthly intervals, three times over a three month period.

Dust fall-out was measured at the two sampling points over a seven day continuous period once during the three month period. The procedure used is set out below:

A cotton (mosquito) net with fine mesh was folded twice and placed on a 1.5 x 1.5m horizontal wooden tray. This net was used to trap dust falling on the horizontal surface. The net was kept constantly wet by adding water regularly to facilitate effective trapping of dust. The wooden tray was placed at a height of 1.5 m above the ground surface to minimise interference from anthropogenic activities and surface wind turbulence which could affect the results. Dust fall-out per unit area of the exposed surface was determined by finding the difference in weight of the net before and after being exposed to dust after drying and dividing the weight of trapped dust by the area of the exposed surface.

### **11.2.3 Results**

None of the gases being monitored were detected during all the measurements. The average ambient temperature was  $27^\circ\text{C}$ , average humidity was 70% and the weather conditions were calm.

The dust measurement was made in late February/early March, before the rainy season started. A very small amount of dust was observed but was too small to be quantified.

## **12 Land Use Survey**

The Land use survey covered an area within approximately a 1 km radius of the centre of the proposed disposal site and investigated both present and future land use.

### **12.1 Existing Land Use**

Present land use is described in the following sections and illustrated in Figure 12-2 and Figure 12-3.

#### **12.1.1 Mining Rights and Quarrying: western side of New Bagamoyo Road**

The land allocated to mining activities on the western side of New Bagamoyo Road is owned by the Government and is under the control of the Ministry of Energy and Minerals, who has leased mining rights to various parties as shown in Figure 12-1.

The landfill sites comprises an area of 30 ha. Most of the mining rights for this area have been leased to Mwananchi Engineering Construction Company (MECCO) while some rights have also been leased to the National Service, MALI Ltd. and Tanzania Sand and Stone Quarries (TSSQ). The area leased to MECCO is known as the New MECCO quarry. MECCO continues to operate a crushing plant on site even though a significant proportion of the New MECCO quarry has already been exhausted.

Other mining rights have been granted to Konoike, TANGEM, Daffi Castro, and A. PEA for areas in the immediate vicinity of the site.

The main land uses within these areas is the excavation and crushing of aggregates. Other land use activities include associated offices and open workshops for heavy machinery. Some independent small scale miners and food vendors also operate within these areas, including at the New MECCO quarry.

#### **12.1.2 Residential/Farm Areas**

The new landfill site is surrounded by subsistence farms and large residential properties to the north, west and the south. These areas are characterised by mixed farming. The main crops include bananas, palms, oranges, papaw, water melon and green vegetables. Poultry and livestock farming are also commonly practised in these areas.

#### **12.1.3 Residential**

The major residential areas are found to the east and north-east of the proposed landfill site. These are built-up areas composed of both permanent and non-permanent structures. Kunduchi Mtongani village, which is largely an unplanned area, is the most prominent residential area close to the site.

#### **12.1.4 Other Quarries: eastern side of New Bagamoyo Road**

On the eastern side of New Bagamoyo road is the Old MECCO quarry site which is no longer operational as well as some other privately owned quarries, most of which are still working. These quarries cover a very large area. Some residential houses are already being built in the old quarries especially close to New Bagamoyo Road.

### **12.1.5 Commercial**

Commercial activities are found at the junction of New Bagamoyo Road and Kunduchi Road. These include a petrol station, hotel and other small-scale activities.

### **12.1.6 Salt pans and water logged area**

In the far eastern part of the study area, about 2.5 km from the site and near sea level, lies a water logged (swampy) area where salt pans are found. The salt pans are in operation and produce salt. Some saline water springs are also located in this area as described further in the sections on the Hydrological and Water use surveys.

### **12.1.7 Scrubs and Bushes**

Scrub and bushes do exist in the study area, especially west of the proposed site. However, these are only found in small patches.

## **12.2 Infrastructure**

The New Bagamoyo Road runs parallel to the north-eastern border of the site. This is the main road link between the site and other parts of DSM city and it also links DSM city with Bagamoyo town. To the north of the site, there is an earth track that links the northern part of Salasala, a settlement on the western side of the site, to New Bagamoyo Road. An important but ill-defined earth standard access road passes across the southern end of the site, in between quarry pits. This goes to another part of Salasala settlement, and is the only means of access to Salasala quarries which are an important source of building materials for the city.

Along New Bagamoyo Road, to the northeast of the site, there is a power supply line of 11 kV which is not easily discernible. To the southwest, there is a radio transmitter belonging to Radio Tanzania Dar es Salaam (RTD) and a telephone transmitter belonging to the Tanzania Telephone Company Ltd (TTCL).

## **12.3 Significant Sites**

Within and around the site, there are no protected areas, no places of historical or cultural significance nor any areas used for recreational purposes. The site also has no religious significance although there is an Anglican church, located along New Bagamoyo Road to the southeast of the landfill site.

## **12.4 Future Land Use**

There are three main future land uses proposed for the study area as shown in Figure 12-3 and summarised below:

1. Quarrying use: all areas presently used for quarrying activities are still allocated for quarrying use.
2. Residential use: all areas east of the landfill site, starting with Mtongani village and including the police quarters and water logged areas are zoned as residential areas.

Similarly, all areas west and north-west of the site (i.e. all areas between the valley and New Bagamoyo Road) are earmarked for residential use.

3. Industrial use: all areas south of the landfill site, beginning from the transmitter location are zoned for industrial use.

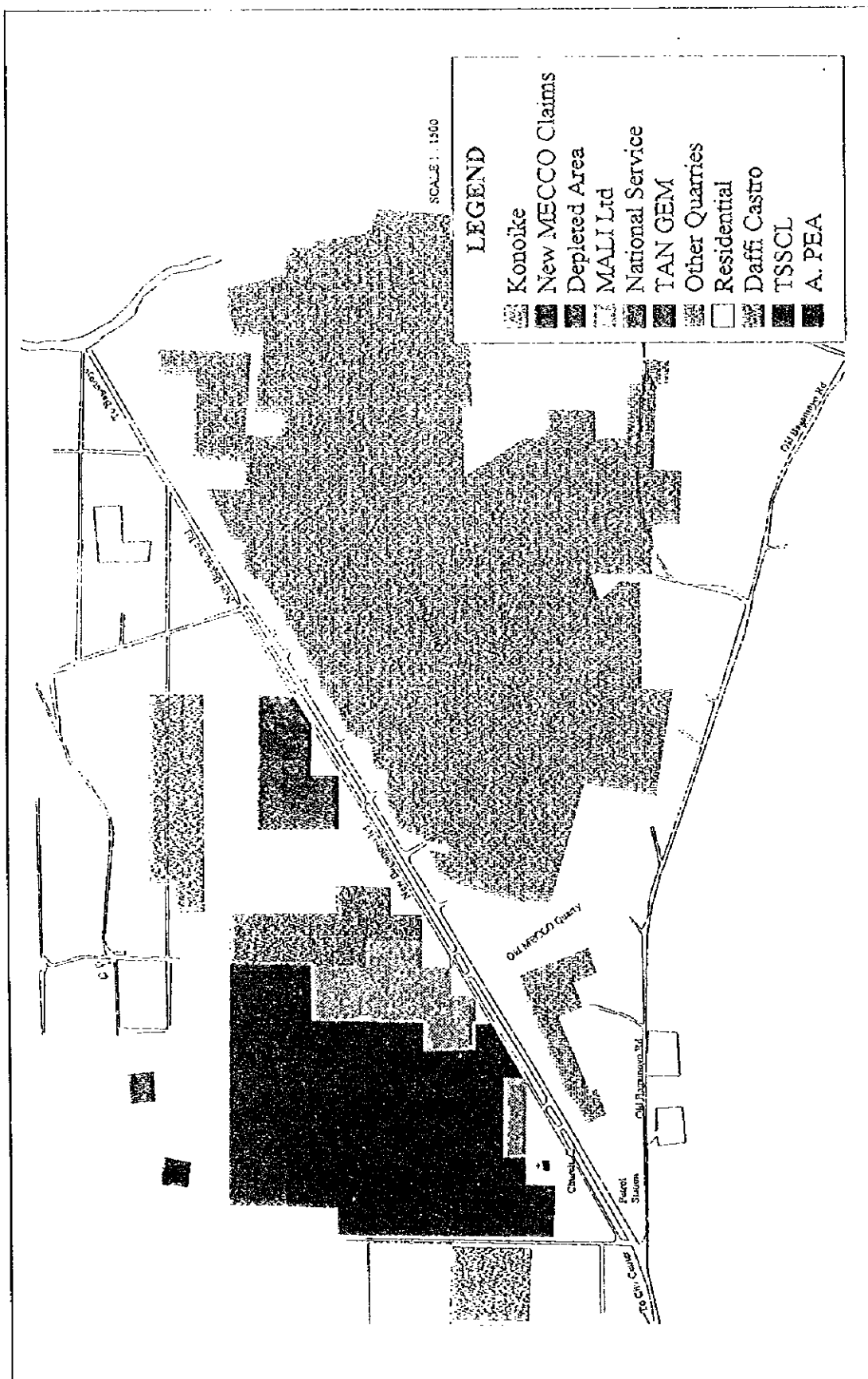


Figure 12-1: Distribution of Mining Rights

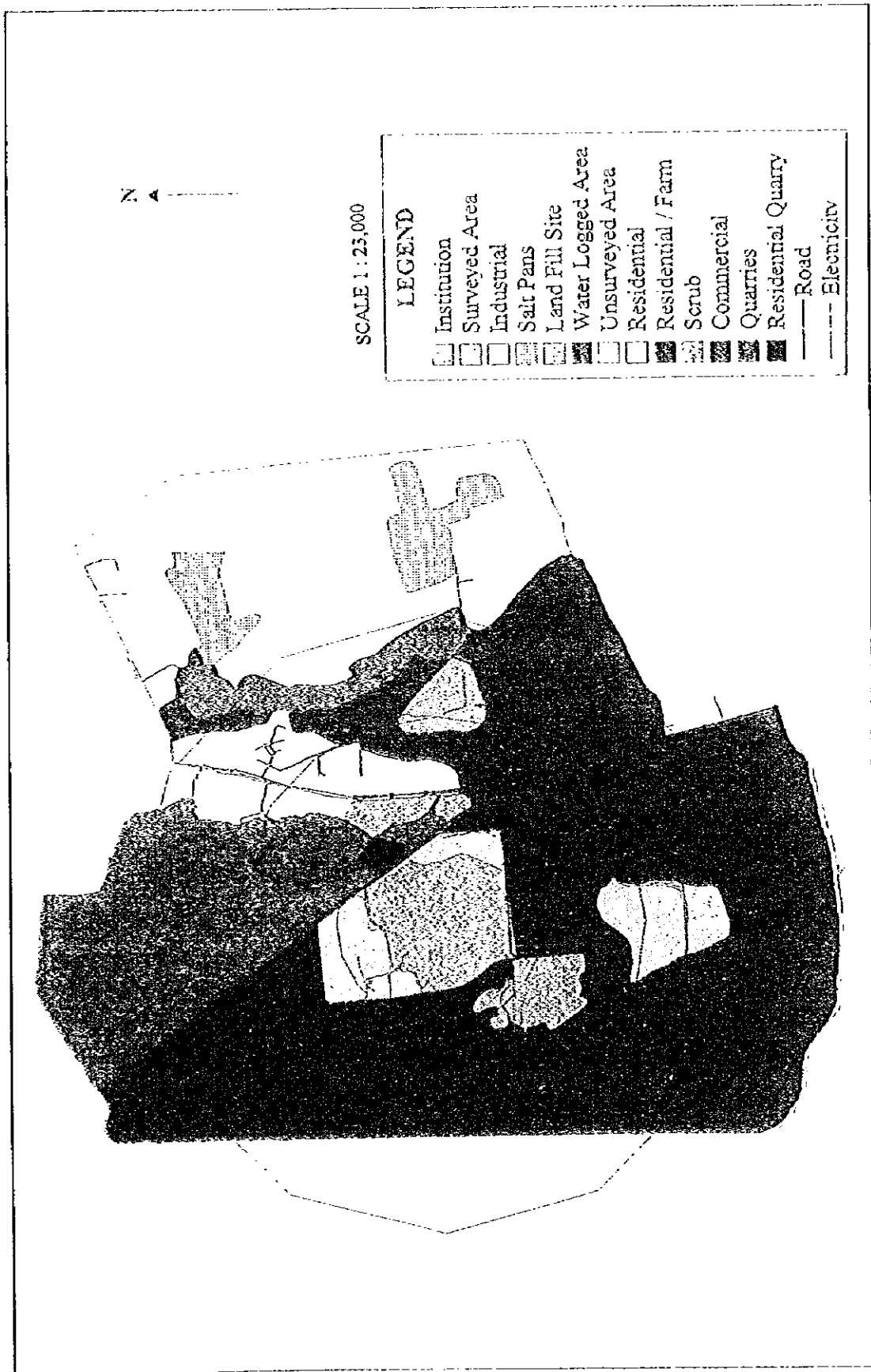


Figure 12-2: Existing Landuse within the Study Area



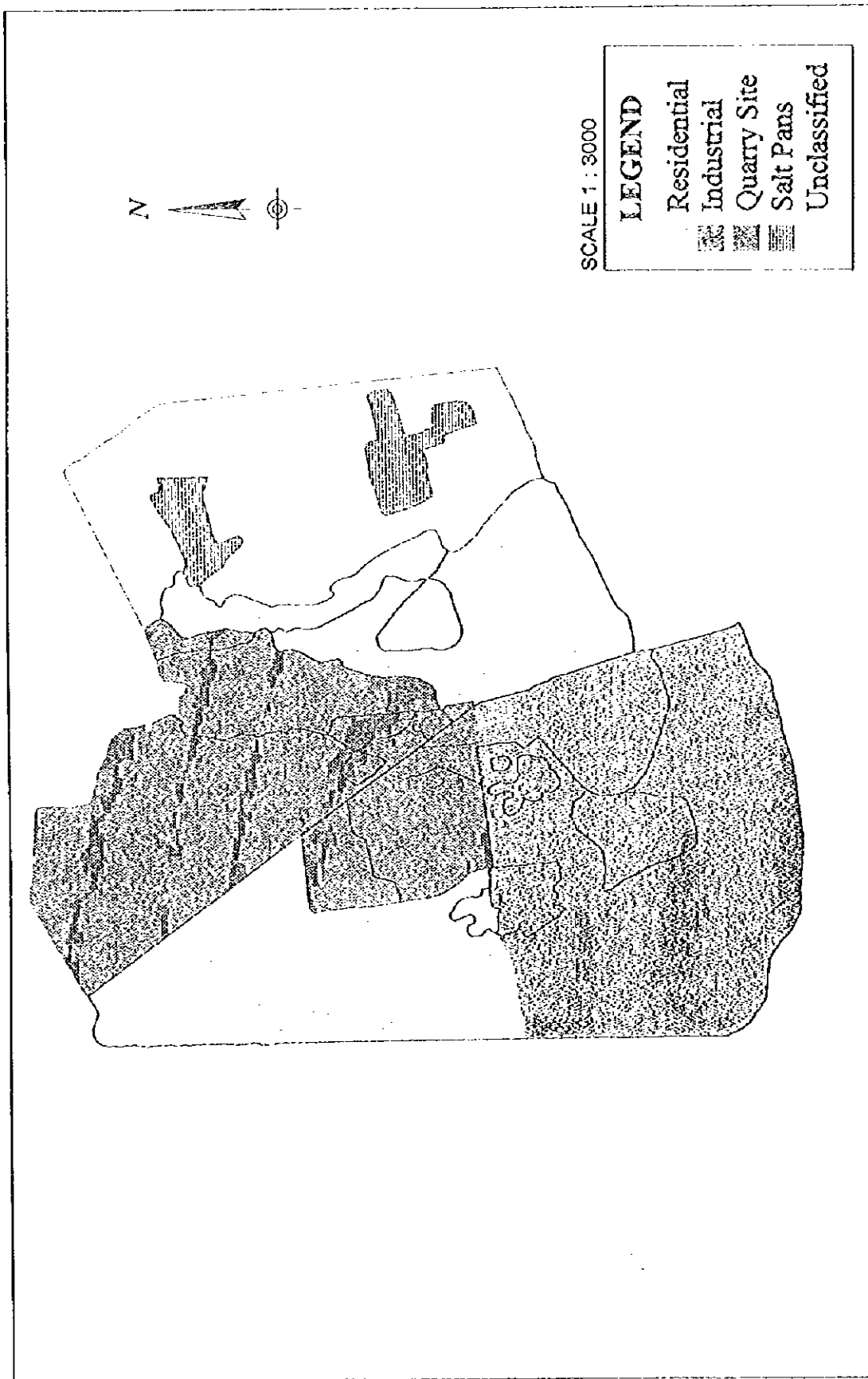


Figure 12-3: Proposed Future Landuse within the Study Area

## 13 Flora and Fauna

The Flora and fauna survey covered an area within approximately a 1 km radius of the centre of the proposed disposal site. It also involved the identification and discussion of material relevant to this study from any existing national, bilateral and/or multinational conventions on flora and fauna that Tanzania is party to. The former results are presented here while the latter material is presented in the final report.

### 13.1 Flora

A quantitative method of flora determination was not used as it would not bring any meaningful results in the final analysis because the vegetation within the study area has been completely modified by man. Instead, plant species were collected and identified from selected study habitats with different conditions and locations. Photographs of the different sites were taken and are shown as plates in the report. A plant check list was prepared from the plants collected from the survey area, and literature references have been consulted on the status of each species. The results of this work are presented below.

#### 13.1.1 Vegetation

The original vegetation of the study area has been profoundly and totally destroyed, being represented only by relics of fragmented pockets of scrubs and bushes or thickets - e.g. bush near MECCO office (Plate No. 1). The natural vegetation was what White (1983) calls Zanzibar-Inhambane scrubby woodland whose conspicuous emergent tree is *Adansonia digitata* (Plate No. 2). This was eliminated when all the land from the Kunduchi quarries westward was turned into a sisal estate. After land use alienation in the Kunduchi area the vegetation distribution is as shown in Figure 13-1 and the main vegetation units identified are described below.

##### a. Scrubland and Thickets

Scrubland and thickets are represented by fragmented bushes and scrubs with emergent isolated stands of *Adansonia digitata* (Plates No. 3). *Adansonia* trees are sometimes left over as relics. Evergreen thickets abound on anthills. Birch (1963) asserts that these thickets represent the climax on shallow soils overlying coral limestone where rainfall is between 950 and 1200 mm in parts of coastal Kenya. The vegetation type which covers most of the hill and hill slopes on either side of the road, highest point being at the church, is composed of the key or characteristic species which include *Carpodiptera africana*, *Dichrostachys cinerea*, *Adansonia digitata*, *Harrisonia abyssinica*, *Commiphora africana*, *Maclura africana*, *Sterculia africana*, *Lamprothamnus zanzebaricus*, *Xylothea tettensis*, *Lamnea schweinfurthii*, *Sclerocarya birrea*, *Deinbollia borbonica*, *Flueggea vilosa*, *Annona senegalensis*, *Dalbergia melanoxylon*, *Dalbergia vacciniifolia*, *Markhamia acuminata*, *Phyllanthus reticulatus*, *Combretum pentagonum*, *Suregada zanzibarensis* and *Cassia abbreviata*. Others are *Uvaria acuminata* and *Uvaria kirkii* which have been tested to contain compounds with anti-malarial activities. There is also a mosaic of *Cocos nucifera*, *Anacardium occidentale*, *Mangifera indica*, *Melia azaderach* and *Senna siamea* (Plate No. 4). *Dalbergia melanoxylon* is an endangered species because it is highly valued for its use in carvings. Recovering scrubland vegetation is typified by *Dichrostachys* scrubs. The Kunduchi church is built here and its environments are decorated with ornamental trees and rounded cement blocks (Plate No. 5).

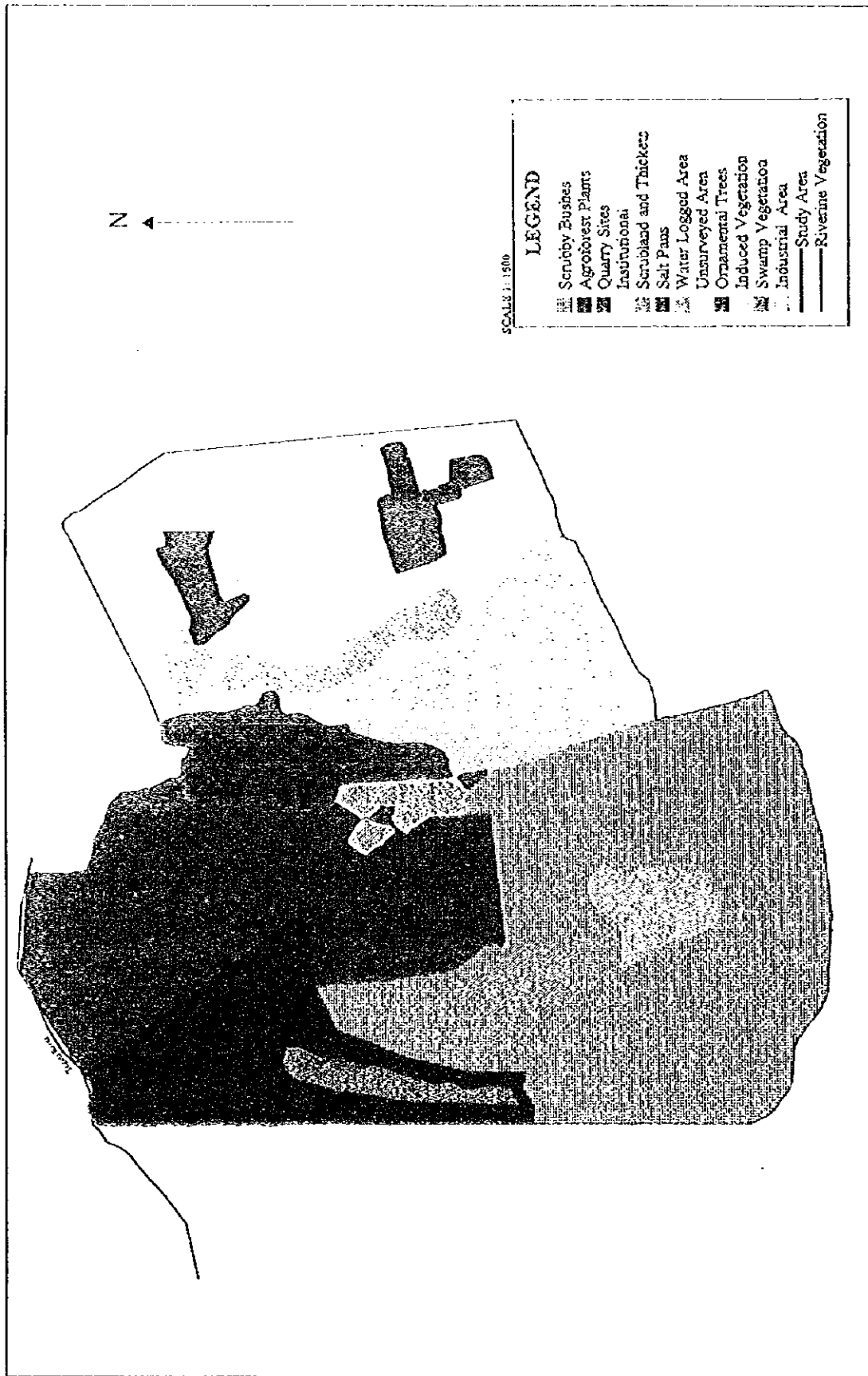


Figure 13-1: Distribution of Vegetation within the Study Area

#### b. Riverine Vegetation

This occurs along the Tegeta river. Where the vegetation is intact, it is bushland which remains evergreen due to moist conditions. The characteristic species are *Phragmites mauritianum*, *Mimosa pudica*, *Aeschynomene indica* and *Ludwigia jussiaeoides*. *Mimosa pudica* was being infested by an insect group of aphids which suck sap from stems, causing death to a large population of the *Mimosa*. *Pennisetum purpureum*, an introduced elephant grass, has now escaped into this riverine bushland.

This information was collected in Tegeta valley east of the bridge. This area was once used for collecting white sand and where the pits have disintegrated, they have now been invaded by *Pluchea dioscoridis* (Plate No.6). In other places, the riverine valley is planted with *Saccharum officinarum* (Plate no. 7).

#### c. Swamp Vegetation

There are several swamps in the valley to the west of the Kunduchi hill. This valley has many spring wells and a high water table. These swamps may represent entrenched water pools along previous stream courses into the Tegeta main river (Pers. obs.). The following swamp indicator species were identified: *Typha domingensis*, *Aeschynomene indica*, *Fimbristylis littoralis*, *Nymphaea* sp., *Ceratopteris thalictroides*, *Cyperus prolifer*, *Fuirena ciliaris* (Plate No. 8). Other swamps develop where large artificial ponds accumulate litter and depositional silt brought down by rain water. There is one such swamp near the proposed landfill site which was dry during the time of this study. It is represented by a large sedge of *Cyperus exaltatus*. (Plate No. 9).

#### d. Induced Vegetation

Following extensive land use development the area in the western valley of the Tegeta River system is now characterised by a landscape which is a mosaic of agricultural crops, agroforestry plants and orchards of *Cocos*, *Mangifera* and *Anacardium* species. *Anacardium* was introduced by the Portuguese in the 14th Century, *Mangifera* came from India while *Cocos* was first introduced in Dar es Salaam at Gerezani by Seyyid Majid in the 1880s.

A dense forest of large mango trees (*Mangifera indica*) exists in the western valley of the Tegeta River system, suggesting that the area has been settled for a very long period (Plate No. 10). Sometimes these are associated with *Psidium guajava*, the latter also suggesting old settlement and cultivation. Agroforestry is being practised as an integral part of development of the area. Many exotic trees are now grown as ornamentals, to enhance shade in crop plots, and some are useful medicinal and fuelwood or building pole species. The following are commonly planted in the area: *Casuarina equisetifolia*, *Eucalyptus* spp., *Tamarindus indica*, *Senna siamea*, *Melia azaderach*, *Moringa oleifera*, *Delonix regia* (Flamboyant) (Plate No. 11) and *Leucaena glauca*. Fruit and tuber food plant species include *Citrus sinensis* (oranges), *Mangifera indica* (mango), *Papaya carica* (papaw), *Musa* sp. (Bananas), *Colocasia esculenta*, *Ananas comosus*, *Psidium guajava* and *Cocos nucifera* (Plate No. 12).

Vegetable plants include *Abelmoschus esculentus* (okra), *Lycopersicon esculentum* (tomato), *Vigna unguiculata* and *Amaranthus hybridus*. These are grown in small plots around homesteads. Certain trees and shrubs are used as boundary markers e.g. *Senna*

*siamea*, *Melia azadirach* and *Eucalyptus* species (Plate No. 13). Fencing may also be achieved by planting *Euphorbia cuneata* sp. *cuneata* (Plate No. 14).

### 13.1.2 Weeds from Induced Vegetation

#### a. Common Weeds in Crop Plots

Plant weed literature for coastal areas is scanty. The knowledge of weed plants is necessary, especially for the particularly troublesome ones, in order to know which hormone weed-killers to apply to farm crops. This is because weed-killers are selective in action. The weeds considered here are those found on arable land or near human habitations on flat coastal lands with sand-bound clay soils.

Because weeds grow in farm crops selected sites were located where fauna traps were established. One of these fauna traps was located at Kifongawima, Mtongani village about 100 m south of the Police Quarters. This area on the east side of the road was formerly part of the sisal plantation of the Mbezi Sisal Estate. It is now under housing development, each housing plot being surrounded by a garden of annual crops like *Carica papaya* (pawpaw), *Abelmoschus esculentus* (okra), *Lycopersicon esculentum* (tomato), *Musa* sp. (banana) and *Cocos* (coconut).

The following weeds were observed: *Boerhaavia erecta* (hogweed), *Commelina bengalensis*, *Euphorbia hyssopifolia*, *Euphorbia hirta*, *Psilotrichum boivinianum*, *Lactuca cornuta*, *Eleusine indica*, *Leptochloa panicea*, *Cynodon dactylon*, *Vernonia cinerea*, *Tephrosia vilosa*, *Phyllanthus amarus*, *Eragrostis ciliaris*, *Echinochloa colona* and *Cyperus rotundus*. As these farm plots are mowed and kept clean and since it was a dry spell when this information was collected there are probably many more weeds which have been missed out.

Mechanical cultivation kill weeds and give good tilth. In fallow land, the common weeds include *Solanum incanum*, *Cynodon dactylon*, *Dactyloctenium aegyptium*, *Crotalaria retusa*, *Rhynchosia minima*, *Clerodendrum rotundifolia*, *Vernonia cinerea*, *Panicum maximum*, *Sclerocarya birrea*, *Emilia coccinea*, *Ruellia patula* and saplings of *Grewia microcarpa*, *Crotalaria laburnoides*, *Cassia abbreviata* and *Adansonia digitata*. Some of these weeds are originally from other parts of the tropics and workers from elsewhere have already done research on some weed species.

#### b. Common Weeds in Old Abandoned Quarry Sites

After quarries in the Kunduchi area are abandoned (partially or completely), they start being colonised by fast growing pioneer weed species. The most dominant species is *Pluchea dioscoridis* which is extensively distributed, forming pure homogenous bushes. Other weeds include *Achyranthes aspera*, *Aeschynomene indica* (water loving), *Dactyloctenium aegyptium*, *Calotropis procera*, *Abutilon mauritianum*, *Opuntia vulgaris* (which can become a troublesome weed to eradicate), *Dichanthium annulatum* and *Hyparrhenia rufa* (Plate No. 15).

#### c. Common Weeds on Hill Tops on Quarry Verges

The disturbed hill tops with red capped soils which were formerly under sisal estates are covered with scrubby bushes of *Dichrostachys cinerea* (Plate No. 16). Where this scrubby bush is cleared but not tilled fast growing weeds appear. These include *Heliotropium steudneri*, *Indigofera tinctoria*, *Alternanthera pungens*, *Malvastrum*

*coromandelianum*, *Vernonia cinerea*, *Waltheria indica* and *Corbichonia decumbens*. Wild (1955) also includes *Dichrostachys cinerea* in this habitat, and this was confirmed here in this kind of situation at Kunduchi.

### **13.1.3 Kunduchi mangroves**

The mangroves of Kunduchi creek are located to the east of the proposed disposal site. The main species in these mangroves are *Avicennia marina* and *Ceriops tagal*. *A. marina* has narrow, pointed, peg-like aerial roots, while *C. taga* has knee-roots, which form arches arising from the mud to the lower part of the trunk forming a pyramidal buttressed base.

### **13.1.4 Plates depicting Site Observations**

All of the plates referred to in the preceding sections follow here.



Plate No. 1: Bush of *Dichrostachys cinerea* and *Dalbergia vacciniifolia* left over after the original vegetation has been destroyed. This photograph was taken close to the MECCO Office.

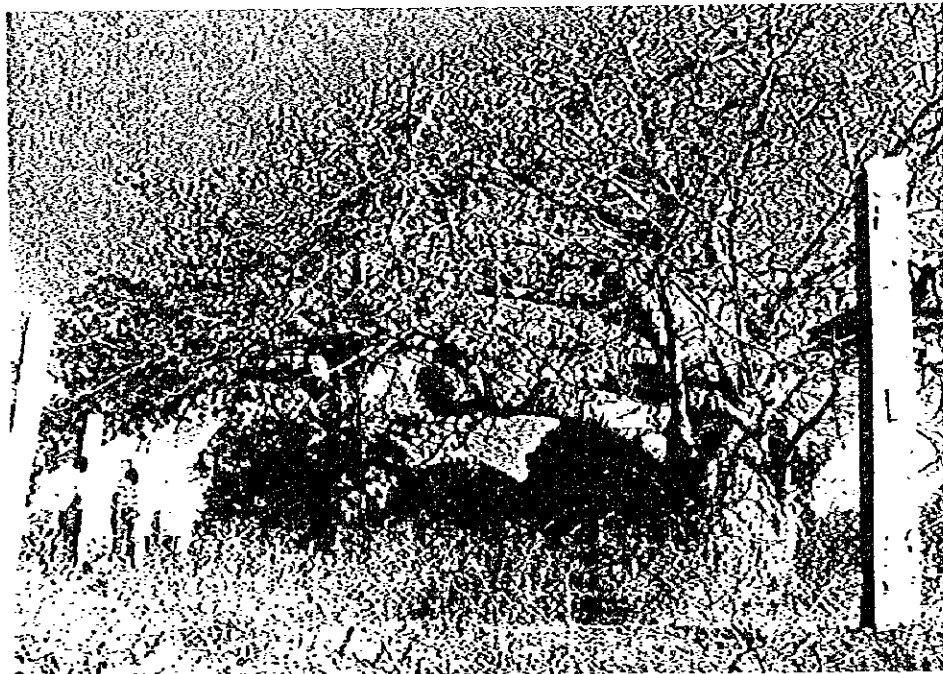


Plate No.2: *Adansonia digitata* trees and *Mangifera indica* to the north east of New Bagamoyo Road facing Tegeta Valley.



Plate No. 3: Scrubby bushes dominated by *Carpodiptera africana*, *Machura africana*, *Dichrostachys cinerea*, *Suregada zanzibarensis*, *Dalbergia vacciniifolia*, *Commiphora africana*, and *Uvaria acuminata*.

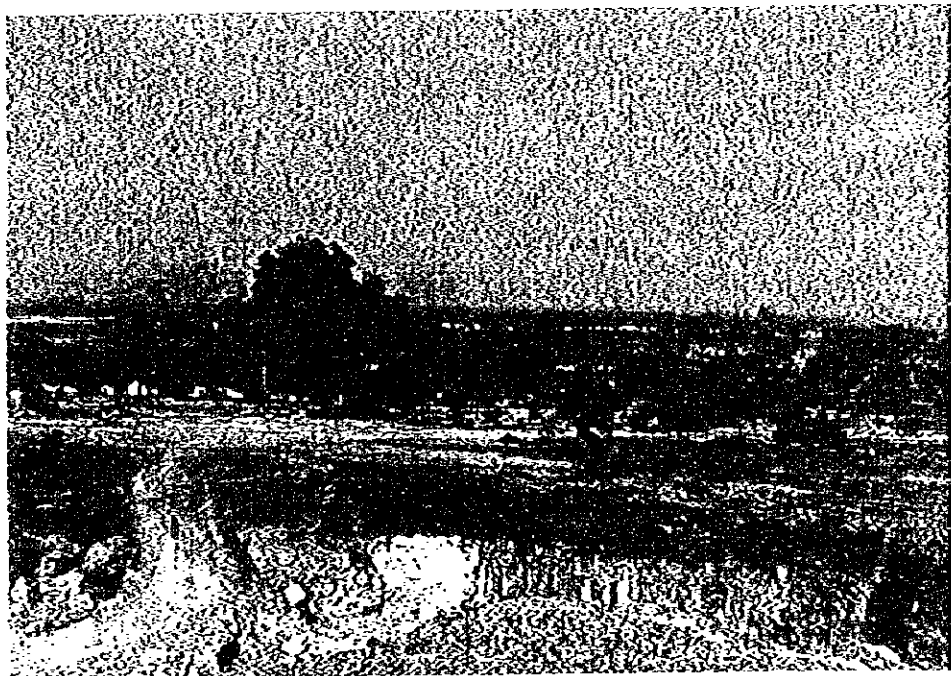


Plate No. 4: A view of the Indian Ocean. This photograph was taken at the hill top opposite the Kunduchi church. The quarry is on the eastern side of the road. The red-flowered trees of *Delonix regia* run along the road to Mtongani village beside a white wall. Trees and shrubs to the right of the quarry include *Mangifera indica*, *Anacardium occidentale* (cashew tree) and *Carpodiptera africana*.



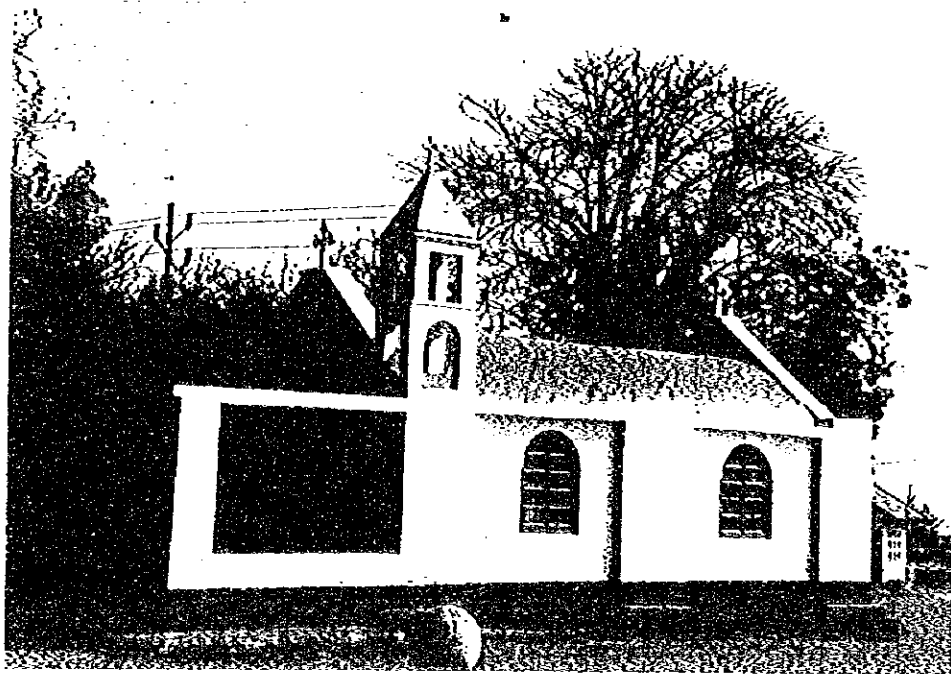


Plate No. 5: The environments of the church are kept clean with added decorations of ornamental rounded cement blocks and trees of *Mangifera indica* (mango), *Ceiba pentandra* and *Pithecelobium dulce* (Madras tree), the latter usually being used for fencing.



Plate No. 6: On the hill slopes overlooking the Tegeta valley at the small mammal trap site. This is riverine vegetation with *Phragmites mauritianum*. The area was once used for collecting white sand. The disintegrated sand pits have now been invaded by *Pluchea dioscoridis*.



Plate No.7: *Saacharum officinarum*, planted for chewing in the riverine vegetation to the west of Kunduchi quarry.



Plate 8: Swamp vegetation. *Typha domingensis* is the most dominant species. *Musa paradisiaca* (banana plantains) has escaped into the swamp. These swamps are scattered throughout the valley, west of Tegeta river.

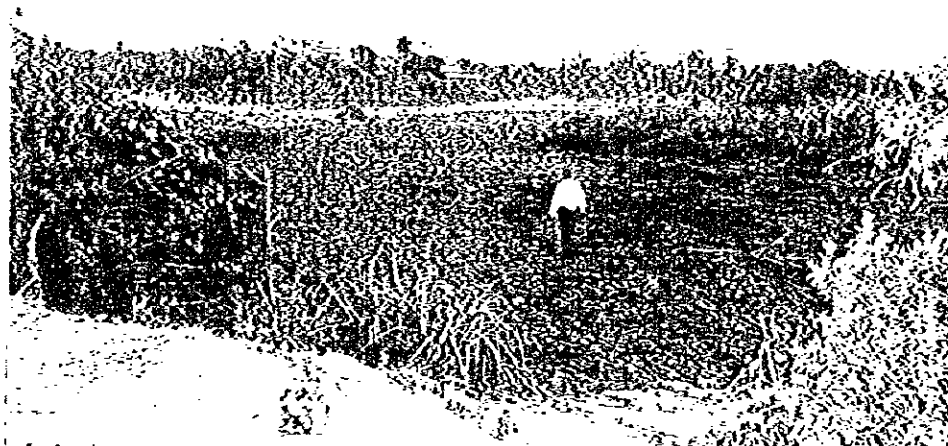


Plate No. 9: Dried up pond excavated on the hill which contains water almost all year round. However, it has dried out completely this year. The relic bush is *Cyperus exaltatus*.



Plate No. 10: A dense vegetation cover of *Mangifera indica* in the west Tegeta valley is a relic marking early settlements in the area. Other plants include *Cocos nucifera*, *Manihot esculenta* (cassava) and *Melia ozaderach*.



Plate No. 11: Agroforestry being practised in the western valley, Tegeta river. Common trees include *Delonix regia*, *Eucalyptus* spp., *Senna siamea*, *Melia azadirach*, *Anacardium occidentale* and *Cocos nucifera*.



Plate No. 12: Banana plantains are commonly planted in the western valley, Tegeta river and elsewhere. They thrive best in the west valley along with *Colocasia esculenta* and *Carica papaya*.



Plate No. 13: Trees which are used to mark boundaries and for avenues include *Semia siamea* and *Eucalyptus* spp.



Plate No. 14: Plot fencing may be achieved by planting *Euphorbia cuneata* sp. *cuneata*.

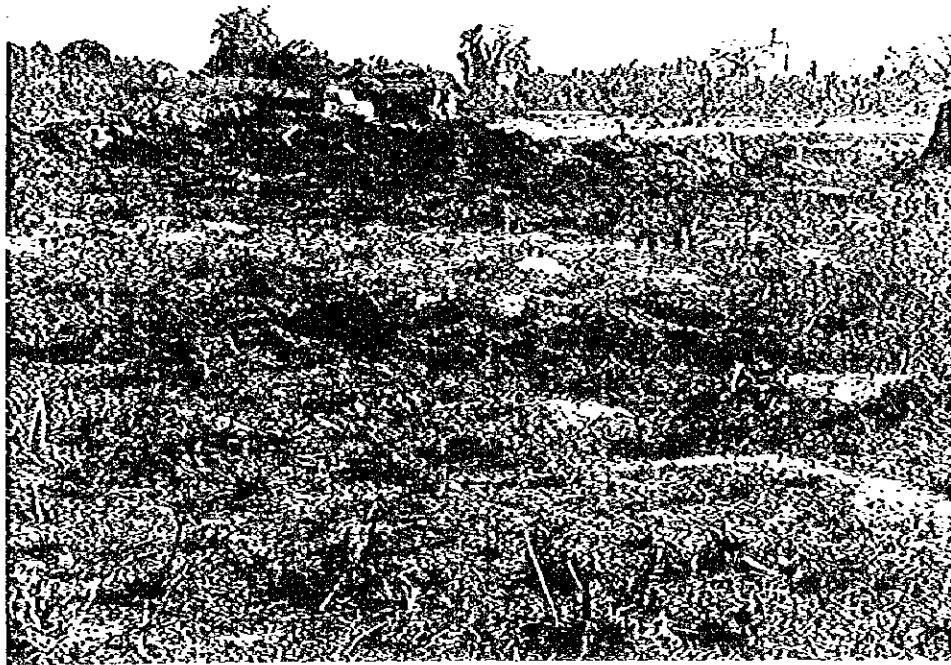


Plate No. 15: Common weeds in old pits of the Kunduchi quarries. *Pluchea dioscoridis* is the most successful pioneer weed invading and colonising the Kunduchi quarries. A less dense but widely spread pioneer weed is *Calotropis procera*.



Plate No. 16: *Dichrostachys* scrubland with *Phyllanthus reticulata*, *Flueggea virosa*, *Harrisonia abyssinica*, *Capparis fascicularis*, *Ehretia amoena*, *Grewia microcarpa*, *Lannea schweinfurthii*, *Xylotheca tettensis*, *Catunaregan spinosa*, *Dalbergia vacciniifolia*, *Deinbollia borbonica*, 50 m adjacent to the church.

