

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

**NAIROBI CITY COUNCIL
MINISTRY OF LOCAL AUTHORITIES
THE REPUBLIC OF KENYA**

**THE STUDY ON
SOLID WASTE MANAGEMENT
IN NAIROBI CITY
IN THE REPUBLIC OF KENYA**

FINAL REPORT

VOLUME 6

DATA BOOK (2)

AUGUST 1998

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**CTI ENGINEERING CO., LTD.
ENVIRONMENTAL TECHNOLOGY CONSULTANTS CO., LTD.**

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All the Kenyan shilling amounts including the project costs shown in this report are indicated in 1997 price unless otherwise indicated. Those amount are estimated partly based on the foreign prices by applying mean 1997 currency exchange rates; namely, US\$1 = Kshs. 58.8 = 121.76 Japanese Yen.

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- 5. Collection and Transportation Study*
- 5.2.3 Records of the Time and Motion Study for Each Collection Vehicle (First Survey)
- 5.2.4 Records of the Time and Motion Study for Each Collection Vehicle (Second Survey)

* Other sections except Subsections 5.2.3 and 5.2.4 (pages from 5-89 to 5-1172) are shown in Data Book (1).

DATA BOOK 5
COLLECTION AND
TRANSPORTATION STUDY

**5.2.3 Daily Records of the Time and Motion
Study for Each Collection Vehicle
(First Survey)**

NAIROBI CITY COUNCIL

Time & Motion Study

Organization: N.C.C

Trip-1 Date: 16th May 1997

Vehicle No. KAB 292Q

Loading Capacity:

Researcher's name: D. Akinyi

No. of Crew: 8

Estimated Volume: 5.9 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	74,866		10 : 35			
Loading-1	in	74,867	1,000	:			Jamia Lane
	out		0	:		0	Left N.C.C Katoloni Depot at 8:05
Loading-2	in						to the servicing Station 2km away
	out						Left Servicing Station at 10:04 for
Loading-3	in						Central Depot which was 6km away
	out						Left Central Depot at 10:35
Dumping site	in	74,878	11,000	12 : 10	95		
Start dumping				:			
Finish dumping				:		0	Dumping site
Dumping site	out	74,893	15,000	12 : 15	5		
Reach to workshop	in			:			
Total			27,008		250	0	Total min.:250 min.
Collection			0		0	0	
Transportation			12,008		245	0	
Inside the dumping site			15,000		5	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip-2 Date: 16th May 1997

Vehicle No. KAB 292Q

Loading Capacity:

Researcher's name: D. Akinyi

No. of Crew: 8

Estimated Volume: 7.9 tons

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	74,894		12 : 15			
Loading-1	74,908	14,000	13 : 8	53		City - Central car Parking
		0	13 : 50		42	Area
Loading-2	74,909	1,000	13 : 56	6		
		0	14 : 18		22	I.C.E.A. Building
Loading-3	74,912	3,000	14 : 31	13		
		0	15 : 15		44	Aga khan Flats
Dumping site	74,926	14,000	15 : 52	37		
Start dumping			:			
Finish dumping			:		0	
Dumping site			16 : 0	8		
Reach to workshop			16 : 30	30		
Total		32,000		147	108	Total min.:255min.
Collection		4,000		19	108	
Transportation		28,000		120	0	
Inside the dumping site		0		8	0	Dumping time
Idling time					0	

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 16th May 1997

Vehicle No. KAB 388Q

Loading Capacity: 6.950

Researcher's name: S. Kimotho

No. of Crew:

Estimated Volume: 12m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	11,351		8 : 20			The vehicle from workshop to
Loading-1	in	11,383	32,000	9 : 56	96		Mbotela to pick workers and drop
	out	11,383	0	9 : 59		3	them at Mmbasa road to Town.
							On the way form the workshop the
							vehicle have stop for Idoling time
							from 8:30 to 8.45
							From they to Loading point at
							City center and to dumping site at
							Dandora
Dumping site	in	11,394	11,000	10 : 30	31		
Start dumping				10 : 35	5		
Finish dumping				10 : 36		1	
Dumping site	out	11,398	4,000	10 : 40	4		
Reach to workshop	in			:			
				:			
Total			47,000		136	4	Total min.: 140min.
Collection			0		0	3	
Transportation			43,000		112		
Inside the dumping site			4,000		9	1	Dumping time
Idling time					15		

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 16th May 1997

Vehicle No. KAB 388Q

Loading Capacity: 6.950

Researcher's name: S. Kinoto

No. of Crew: 1

Estimated Volume: 12m³

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	11,398		10 : 40			
Loading-1	11,410	12,000	11 : 9	29		Town to Dandora
	11,410	0	11 : 20		11	
Dumping site	11,422	12,000	11 : 45	25		
Start dumping			:			
Finish dumping			:		0	
Dumping site	11,426	4,000	11 : 54	9		
Reach to workshop			:			
Total		28,000		63	11	Total min.: 74min.
Collection		0		0	11	
Transportation		24,000		54		
Inside the dumping site		4,000		9	0	Dumping time
Idling time						

Time & Motion Study

Organization:N.C.C

Trip- 3 Date:16th May 1997

Vehicle No. KAB 388Q

Loading Capacity:6.950

Researcher's name: S. Kimotho

No. of Crew: 1

Estimated Volume:12m³

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	11,426		11 : 54			
Loading-1	11,437	11,000	12 : 17	23		City Center to Dumping site
	11,437	0	12 : 22		5	
Dumping site	11,449	12,000	12 : 47	25		
Start dumping			:			
Finish dumping			:		0	
Dumping site	11,453	4,000	13 : 1	14		
Reach to workshop			:			
Total		27,000		62	5	Total min.:67min.
Collection		0		0	5	
Transportation		23,000		48		
Inside the dumping site		4,000		14	0	Dumping time
Idling time						

Time & Motion Study

Organization: N.C.C

Trip- 4 Date: 16th May 1997

Vehicle No. KAB 388Q

Loading Capacity: 6.950

Researcher's name: S. Kimotho

No. of Crew:

Estimated Volume: 12m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	11,453		13 : 1			
Loading-1	in	11,465	12,000	13 : 20	19		City Center to Dumping site
	out	11,465	0	13 : 28		8	
Loading-2	in			:			
	out			:		0	
Dumping site	in	11,477	12,000	13 : 54	26		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	11,481	4,000	14 : 5	11		
Reach to workshop	in			:			
Total			28,000		56	8	Total min.: 64min.
Collection			0		0	8	
Transportation			24,000		45		
Inside the dumping site			4,000		11	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 5 Date: 16th May 1997

Vehicle No. KAB 388Q

Loading Capacity: 6.950

Researcher's name: S. Kimotho

No. of Crew: 1

Estimated Volume: 12m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	11,481		14 : 5			Break for lunch: 2:11 to 2:25
Loading-1	in	11,496	15,000	14 : 57	52		No the way Dumping site
	out	11,496	0	15 : 4		7	the Vehicle went to Depoet
				:			for fuel from ther to dumping
				:		0	site Dandora. The vehicle
Dumping site	in	11,513	17,000	15 : 56	52		stop for idoling time for
Start dumping				:			lunch for 10 minutes
Finish dumping				:		0	
Dumping site	out	11,515	2,000	16 : 10	14		
Reach to workshop	in	11,526	11,000	16 : 30	20		
				:			
Total			45,000	:	138	7	Total min.: 145min.
Collection			0		0	7	
Transportation			43,000		100		
Inside the dumping site			2,000		14	0	Dumping time
Idling time					24		Idling time: 3:15 to 3:25

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 16th May 1997

Vehicle No. KAB 389Q

Loading Capacity: 7 TON

Researcher's name: H. Githua N.

No. of Crew: 1

Estimated Volume: 12 m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	8,617		8 : 12			From Workshop it went for
Loading-1	in	8,621	4,000	9 : 41	89		fueling repair
	out			9 : 43		2	Kaloleni - Town
							Heading to Dandora for
							Disposal
Dumping site	in	8,634	13,000	10 : 18	35		Town-Dandora
Start dumping		8,635	1,000	10 : 24	6		
Finish dumping				:			
Dumping site	out	8,636	1,000	10 : 26	2		
Reach to workshop	in			:			
Total			19,000		132	2	Total min : 134min.
Collection			0		0	2	
Transportation			17,000		124	0	
Inside the dumping site			2,000		8	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 16th May 1997

Vehicle No. KAB 389Q

Loading Capacity: 7 TON

Researcher's name: H. Githua N.

No. of Crew: 1

Estimated Volume: 12 m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	8,636		10 : 26			
Loading-1	in	8,643	7,000	10 : 48	22		Fox -Drive Inn via Thika rd. to
	out			11 : 1		13	Town(O.T.C) then back agein
Loading-2	in	8,649	6,000	11 : 18	17		to Town
	out			11 : 24		6	
Dumping site	in	8,662	13,000	11 : 55	31		Town- Dandora via thika road
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	8,666	4,000	12 : 8	13		
Reach to workshop	in			:			
Total			30,000		83	19	Total min.: 102min.
Collection			6,000		17	19	
Transportation			20,000		53	0	
Inside the dumping site			4,000		13	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 3 Date: 16th May 1997

Vehicle No. KAB 389Q

Loading Capacity: 7 TON

Researcher's name: H. Githua N.

No. of Crew: 1

Estimated Volume: 12 m³

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site out	8,666		12 : 8			Dumping site-Dandora
Loading-1 in	8,676	10,000	12 : 35	27		From OTC to Dandora via
out		0	12 : 37		2	Thika road
			:			
			:			
Dumping site in	8,689	13,000	13 : 9	32		
Start dumping			13 : 13	4		
Finish dumping			:			
Dumping site out	8,692	3,000	13 : 16	3		
Reach to workshop in			:			
Total		26,000		66	2	Total min.:68min.
Collection		0		0	2	
Transportation		23,000		59	0	
Inside the dumping site		3,000		7	0	Dumping time
Idling time						

Time & Motion Study

Organization: N.C.C

Trip- 4 Date: 16th May 1997

Vehicle No. KAB 389Q

Loading Capacity: 7 TON

Researcher's name: H. Githua N.

No. of Crew: 1

Estimated Volume: 12 m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	8,692		13 : 16			
Loading-1	in	8,704	12,000	13 : 41	25		Collection was done at race
	out			13 : 42			1 course rd. then we headed to
				:			Dandora for disposal. Then we
				:			0 came back again at Town
Dumping site	in	8,718	14,000	14 : 11	29		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	8,720	2,000	14 : 16	5		
Reach to workshop	in			:			
Total			28,000		59	1	Total min.: 60min.
Collection			0		0	1	
Transportation			26,000		54	0	
Inside the dumping site			2,000		5	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 5 Date: 16th May 1997

Vehicle No. KAB 389Q

Loading Capacity: 7 TON

Researcher's name: H. Githua N.

No. of Crew: 1

Estimated Volume: 12 m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	8,720		14 : 16			Dandora dumping site
Loading-1	in	8,733	13,000	15 : 4	48		Collection was done at race
	out			15 : 9		5	course via Thika rd. to Dandora
Dumping site	in	8,746	13,000	15 : 37	28		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	8,749	3,000	15 : 47	10		
Reach to workshop	in	8,760	11,000	16 : 29	42		
				:			
Total			40,000		128	5	Total min.: 133min.
Collection			0		0	5	
Transportation			37,000		118	0	
Inside the dumping site			3,000		10	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 16th May 1997

Vehicle No. KAB 390Q

Loading Capacity: 6.950

Researcher's name: M. Adhiambo

No. of Crew: 5

Estimated Volume:

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	8,039	0	8 : 25			Katoleni
Loading-1	in	8,042	3,000	8 : 40	15		Munyual road
	out			10 : 3		83	
Dumping site	in	8,065	16,000	10 : 45	42		Dandora
Start dumping				10 : 45	0		
Finish dumping				10 : 55		10	
Dumping site	out			10 : 55	0		
Reach to workshop	in			:			
Total			19,000		57	93	Total min.: 150min.
Collection			0		0	83	
Transportation			19,000		57	0	
Inside the dumping site			0		0	10	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 16th May 1997

Vehicle No. KAB 390Q

Loading Capacity: 6.950

Researcher's name: M. Adhiambo

No. of Crew: 5

Estimated Volume:

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site			10 : 55			
Loading-1	8,078		11 : 20	25		O.T.C Station
			11 : 25		5	
Dumping site	8,093	15,000	12 : 0	40		Dandora
Start dumping			:			
Finish dumping						
Dumping site			12 : 10	10		
Reach to workshop			:	0		
Total		15,000		75	5	Total min.: 80 min.
Collection		0		0	5	
Transportation		15,000		65	0	
Inside the dumping site		0		10	0	Dumping time
Idling time						

Time & Motion Study

Organization: N.C.C

Trip- 3 Date: 16th May 1997

Vehicle No. KAB 390Q

Loading Capacity: 6.950

Researcher's name: M. Adhiambo

No. of Crew: 5

Estimated Volume:

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site						OTC station
Loading-1	8,107		12 : 35			
			12 : 40		5	
Dumping site	8,122	15,000	13 : 12	32		Dandora
Start dumping			13 : 14	2		
Finish dumping			13 : 15		1	
Dumping site			13 : 15	0		
Reach to workshop			:			
Total		15,000		34	6	Total min.: 40 min.
Collection		0		0	5	
Transportation		15,000		32	0	
Inside the dumping site		0		2	1	Dumping time
Idling time						

Time & Motion Study

Organization: N.C.C

Trip- 4 Date: 16th May 1997

Vehicle No. KAB 390Q

Loading Capacity: 6.950

Researcher's name: M. Adhiambo

No. of Crew: 5

Estimated Volume:

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out			13 : 15			Salvation Army
Loading-1	in	8,134		13 : 45	30		
	out			13 : 50		5	
Dumping site	in	8,149	15,000	14 : 20	30		Dandora
Start dumping				14 : 22	2		
Finish dumping				14 : 23		1	
Dumping site	out			14 : 23	0		
Reach to workshop	in	8,167	18,000	15 : 15	52		
Total			33,000		114	6	Total min.: 120min.
Collection			0		0	5	
Transportation			33,000		112	0	
Inside the dumping site			0		2	1	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 16th May 1997

Vehicle No. KUL 991

Loading Capacity: 7 TON

Researcher's name: A Gaititi

No. of Crew: 8

Estimated Volume: 5m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	155,104.0	0	8 : 25			Jogoo road-Town- Ngara
Loading-1	in	155,113.0	9,000	9 : 2	37		Pumwani Maternity
	out	155,113.0	0	9 : 12		10	
Loading-2	in	155,114.0	1,000	9 : 18	6		
	out	155,114.0	0	9 : 19		1	
Loading-3	in	155,115.7	1,700	9 : 23	4		Madina Nursing home
	out		0	9 : 33		10	EAS-SEC II
Loading-4	in	155,115.9	200	9 : 39	6		Mecca Medical Clinic
	out		0	9 : 43		4	EST-SEC II
Loading-5	in	155,116.6	700	9 : 48	5		Marie stopes Nursing home
	out		0	9 : 58		10	EST-SEC II
Loading-6	in	155,117.0	400	10 : 2	4		Radiant health Clinic-Pangani
	out		0	10 : 5		3	Pangani-Kariokor-Kamukunji-
Loading-7	in	155,126.0	9,000	10 : 28	23		Police S.-Jogoo road
	out		0	10 : 40		12	Kariobangi South
Loading-8	in	155,135.1	9,100	11 : 4	24		Mowrem to Dumping site
	out			11 : 16		12	
Dumping site	in	155,142.6	7,500	11 : 24	8		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	155,144.0	1,400	12 : 5	41		
Reach to workshop	in			:			
				:			
Total			40,000	:	158	62	Total min.:220min.
Collection			22,100		72	62	
Transportation			16,500		45	0	
Inside the dumping site			1,400		41	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 16th May 1997

Vehicle No. KUL 991

Loading Capacity: 7 TON

Researcher's name: A Gaititi

No. of Crew: 8

Estimated Volume: 4m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	155,144.0		12 : 5			For Dumping site to Haruma Nursing
Loading-1	in	155,148.4	4400	12 : 15	10		Home- Outer ring road- Thika road-
	out		0	12 : 23		8	St. John Health Clinic- Githurai
Loading-2	in	155,158.0	9,600	12 : 36	13		From Githurai- Thika road- Muranga
	out		0	12 : 36		0	road- Ring road- Kariakor-
Loading-3	in	155,160.5	2,500	12 : 57	21		Kamukunji Police Station- Jogoo
	out		0	13 : 17		20	road- Lusaka road- Enterprise Road-
Loading-4	in	155,185.9	25,400	14 : 47	90		Dar- es- salaam road- Garage road to
	out		0	14 : 52		5	N.C.C for Petroleum Time in: 1:52
Loading-5	in			:			Time out: 2:31 Mileage 155180.1
	out			:		0	From N.C.C to Jogoo road- Town
Loading-6	in			:			Ngara- Guruwanak Hospital to
	out			:		0	From Guruwanak Hospital to
							Juja road
Dumping site	in	155,195.8	9,900	15 : 24	32		Lunch Time Break 3:05 to 3:15
Start dumping				:			
Finish dumping				:		0	
Dumping site	out			15 : 31	7		
Reach to workshop	in	155,212.1	16,300	16 : 17	46		
Total			68,100		219	33	Total min.: 252min.
Collection			37,500		85	33	
Transportation			30,600		78	0	
Inside the dumping site			0		7	0	Dumping time
Idling time					49		

Time & Motion Study

Organization: N.C.C

Trip- 1 16th May 1997

Vehicle No. KUL 993

Loading Capacity: 7 TON

Researcher's name: D. A. Masaba

No. of Crew: 11

Estimated Volume: 3.5

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	177,389.0		7 : 55			Left to transport workers at
Loading-1	in	177,420.0	31,000	10 : 30	155		Dagoreti or Ngong rd. through
	out		0	10 : 31			1 Valley rd.-Nyerere to State House
Loading-2	in	177,421.0	1,000	10 : 35	4		rd. through Muthangari rd. to
	out		0	10 : 38			3 Ngumo rd.
Loading-3	in	177,424.0	3,000	10 : 45	7		
	out		0	10 : 46			1
Loading-4	in	177,424.3	300	10 : 47	1		Olengurone Avenue
	out		0	10 : 56			9
Loading-5	in	177,424.7	400	10 : 57	1		
	out		0	10 : 59			2
Loading-6	in	177,425.0	300	11 : 0	1		
	out		0	11 : 1			1
Loading-7	in	177,426.8	1,800	11 : 3	2		
	out		0	11 : 10			7
Loading-8	in	177,430.0	3,200	11 : 15	5		Msaduku lane
	out		0	11 : 17			2 back to Ngong rd.
Loading-9	in	177,433.5	3,500	11 : 25	8		
	out		0	11 : 35			10
Loading-10	in	177,434.2	700	11 : 36	1		Menelick road
	out		0	11 : 37			1
Loading-11	in	177,435.0	800	11 : 38	1		Chania Avenue
	out		0	11 : 45			7
Loading-12	in	177,436.0	1,000	11 : 49	4		back to Ngong rd.
	out		0	11 : 50			1
Loading-13	in	177,436.7	700	11 : 50	0		
	out		0	11 : 55			5
Loading-14	in	177,439.0	2,300	12 : 0	5		Kemri HQS
	out		0	12 : 0			0
Loading-15	in	177,439.4	400	12 : 1	1		
	out		0	12 : 10			9
Loading-16	in	177,441.0	1,600	12 : 11	1		High View estate
	out		0	12 : 20			9
Loading-17	in	177,442.0	1,000	12 : 22	2		Ngumo phase II
	out		0	12 : 51			29
Loading-18	in	177,444.0	2,000	12 : 55	4		Ngumo phase I
	out		0	13 : 38			43 Back to Dagoreti to report before
Loading-19	in	177,451.0	7,000	13 : 50	12		dumping at the Ngong rd. depot
	out		0	13 : 50			0 Stopped at Masaba Hsp.
Loading-20	in	177,454.0	3,000	14 : 0	10		
	out		0	14 : 5			5 Through Galana rd. Denis Pritt rd.
				:			State house rd. through
							University way Uhuru highway
							Museum rd. -Thika & Outer ring rd.
							through Komarock to dumping site

Time & Motion Study

Organization: N.C.C

Trip- 1 16th May 1997

Vehicle No. KUL 993

Loading Capacity: 7 TON

Researcher's name: D. A. Masaba

No. of Crew: 11

Estimated Volume: 3.5

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Dumping site in	177,476.0	22,000	14 : 55	50		
Start dumping			15 : 0	5		
Finish dumping			15 : 2		2	
Dumping site out	177,478.0	2,000	15 : 5	3		
Reach to workshop in	177,490.0	12,000	15 : 25	20		
Total		101,000		303	147	Total min.: 450min.
Collection		34,000		70	145	
Transportation		65,000		225	0	
Inside the dumping site		2,000		8	2	Dumping time
Idling time						

Time & Motion Study

Organization:N.C.C

Trip- 1 Date:16th May 1997

Vehicle KUL 994

Loading Capacity:7.88 TON

Researcher's name: Martin Sitati

No. of Crew:8

Estimated Volume:3m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	163,887.7		8 : 15			Workshop to Dumping site via
Loading-1	in			:			
	out			:			Komarock Dandora
				:			From dumping site
				:			Back to workshop for fueling
Dumping site	in	163,902.0	14,300	8 : 47	32		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	163,902.4	400	:			
Reach to workshop	in	163,916.7	14,300	9 23	36		
Total			29,000		68	0	Total min.:68min.
Collection			0		0	0	
Transportation			28,600		68	0	
Inside the dumping site			400		0	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 16th May 1997

Vehicle KUL 994

Loading Capacity: 7.88 TON

Researcher's name: Martin Sitati

No. of Crew: 8

Estimated Volume: 3.37ton

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	163,916.7	0	9 : 35			From Workshop to Punwani via
Loading-1	in	163,921.1	4,400	10 : 11	36		Ladhies rd and through Suakali
	out			10 : 40		29	section
Loading-2	in	163,921.2	100	10 : 42	2		
	out			10 : 47		5	Changed station to Makadara via
Loading-3	in	163,930.1	8,900	11 : 30	43		Jogoo rd. and rd.
	out	163,930.1		11 : 41		11	
Loading-4	in	163,930.3	200	11 : 46	5		Worked around
	out	163,930.9	600	11 : 57		11	BuruBuru Phase 4
Loading-5	in	163,931.5	600	12 : 0	3		
	out	163,931.8	300	12 : 9		9	Used jogoo road and through
Loading-6	in	163,932.0	200	12 : 10	1		Outer ring rd. -Komarock rd.
	out	163,932.7	700	12 : 20		10	to Dumping site
Dumping site	in	163,943.0	10,300	13 : 1	41		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	163,947.0	4,000	13 : 16	15		
Reach to workshop	in			:			
Total			30,300		146	75	Total min.:221min.
Collection			11,600		54	75	
Transportation			14,700		77	0	
Inside the dumping site			4,000		15	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 3 Date: 16th May 1997

Vehicle KUL 994

Loading Capacity: 7.88 TON

Researcher's name: Martin Sitati

No. of Crew: 8

Estimated Volume: 3.4 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	163,947.0		13 : 16			
Loading-1	in	163,953.6	6,600	13 : 30	14		BuruBuru Phase 5 via Muntias
	out	163,953.6	0	13 : 34		4	south road off outer ring road
Loading-2	in	163,953.9	300	13 : 36	2		
	out	163,953.9	0	13 : 42		6	Jogoo road-Outer ring road
Loading-3	in	163,954.4	500	13 : 46	4		Komarock rd. to Dandora
	out	163,954.4	0	13 : 52		6	dumping site
Loading-4	in	163,954.5	100	13 : 53	1		
	out	163,954.7	200	13 : 57		4	
Loading-5	in	163,954.9	200	13 : 59	2		From Dumping site via
	out	163,954.9	0	14 : 2		3	Komarock rd. -Outer ring rd.-Jogoo
Loading-6	in	163,955.1	200	14 : 4	2		rd. - Hamza rd. to Makadara Office.
	out	163,955.4	300	14 : 12		8	Then to workshop via Jogoo rd.
Loading-7	in	163,955.4		14 : 13	1		
	out	163,955.4	0	14 : 15		2	
Loading-8	in	163,955.5	100	14 : 17	2		
	out	163,955.5	0	14 : 19		2	
Loading-9	in	163,955.8	300	14 : 20	1		
	out	163,955.8	0	14 : 24		4	
Loading-10	in	163,955.9	100	14 : 25	1		
	out	163,956.1	200	14 : 27		2	
Loading-11	in	163,956.7	600	14 : 30	3		
	out	163,956.7	0	14 : 35		5	
Loading-12	in	163,956.9	200	14 : 37	2		
	out	163,956.9	0	14 : 40		3	
Loading-13	in	163,957.0	100	14 : 42	2		
	out	163,957.0	0	14 : 46		4	Went around dumping site
Loading-14	in	163,957.3	300	14 : 48	2		looking for a crew who had been
	out	163,957.3	0	14 : 51			chased by street boys
Dumping site	in	163,963.0	5,700	15 : 16	28		
Start dumping				:			8min. idling at Police Station
Finish dumping				:		0	after interruption by street boys
Dumping site	out	163,966.7	3,700	15 : 42	26		
Reach to workshop	in	163,997.0	30,300	16 : 26	44		
Total			50,000		137	53	Total min.: 190min.
Collection			3,700		33	53	
Transportation			42,600		78	0	
Inside the dumping site			3,700		26	0	Dumping time
Idling time					8		

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 16th May 1997

Vehicle No. KWE 081

Loading Capacity: 9 TON

Researcher's name: P. Kiama

No. of Crew: 11

Estimated Volume: 8m³

Location		Mileage (m)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	185,552		8 : 13			Garage to Uhuru Highway
Loading-1	in	185,554	2,000	8 : 30	17		Ufuku Highway & Presidential Rou.
	out			8 : 37		7	
Loading-2	in	185,555	1,200	8 : 39	2		Ufuku Highway & Presidential Rou.
	out			8 : 45		6	
Loading-3	in	185,556	800	8 : 47	2		Presidential route
	out			8 : 55		8	
Loading-4	in	185,565	9,000	9 : 8	13		Mombasa road
	out			9 : 10		2	
Loading-5	in	185,570	5,000	9 : 21	11		Mombasa road
	out			9 : 24		3	
Loading-6	in	185,575	5,000	9 : 30	6		Mombasa road
	out			9 : 36		6	
Loading-7	in	185,579	4,000	10 : 40	4		Mombasa road
	out			10 : 0		20	
Loading-8	in	185,584	5,000	10 : 11	11		Kenya pipeline Estate
	out			10 : 17		6	
Loading-9	in	185,591	7,000	10 : 28	11		
	out			11 : 46		78	
Dumping site	in	185,601	10,000	12 : 10	24		Dandora
Start dumping							
Finish dumping						0	
Dumping site	out	185,603	2,000	12 : 46	36		
Reach to workshop	in						
Total			51,000		137	136	Total min.: 273 min.
Collection			37,000		60	136	
Transportation			12,000		41		
Inside the dumping site			2,000		36	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 16th May 1997

Vehicle No. KWE 081

Loading Capacity: 9 TON

Researcher's name: P. Kiama

No. of Crew: 11

Estimated Volume: 8m³

Location		Mileage (m)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	185,603		12 : 46			Garagae to Uhuru Highway
Loading-1	in	185,613	10,000	13 : 10	24		Ufulu Highway & Presidential Ro
	out			14 : 37		67	
Dumping site	in	185,650	37,000	16 : 15	118		Dandora
Start dumping							
Finish dumping						0	
Dumping site	out			16 : 50	35		
Reach to workshop	in						
Total			47,000		240	67	Total min.: 307 min.
Collection			0		0	67	
Transportation			47,000		205		
Inside the dumping site			0		35	0	Dumping time
Idling time							

Time & Motion Study

Organization: NCC

Trip- 1 Date: 16th May 1997

Vehicle No. KWE 245

Loading Capacity: 7 TON

Researcher's name: Eliud Mbugua Kariuki

No. of Crew: 6

Estimated Volume: 2 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	161193		8 : 15			Karoleni Depot
	in	161202	9,000	11 : 15	180		Depot - Ncc workshop
	out						for fueling 5min.
Loading-1	in	161211	9,000	11 : 26	11		Loading points between
	out			11 : 28		2	highridge and Muthaiga
Loading-2	in	161211.5	500	11 : 30	2		
	out			11 : 31		1	
Loading-3	in	161211.7	200	11 : 32	1		Route to Dandora :
	out			11 : 39		7	:- Muthaiga lane -
Loading-4	in	161212.2	500	11 : 42	3		Thika road - Outering road
	out	161212.5		12 : 13		31	Komorock to Dandora
Loading-5	in	161212.6	400	12 : 14	1		
	out			12 : 19		5	
Loading-6	in	161212.8	200	12 : 20	1		
	out			12 : 22		2	
Loading-7	in	161212.9	100	12 : 23	1		
	out			12 : 27		4	
Loading-8	in	161213.1	200	12 : 28	1		
	out			12 : 36		8	
Loading-9	in	161213.9	800	12 : 40	4		
	out			12 : 49		9	
Loading-10	in	161216.7	2,800	12 : 53	4		
	out			13 : 7		14	
Loading-11	in	161220	3,300	13 : 10	3		
	out					0	
Dumping site	in	161227	7,000	13 : 15	5		
Start dumping		161230	3,000	13 : 23	8		
Finish dumping				13 : 27		4	
Dumping site	out	161233	3,000	13 : 30	3		
Reach to workshop	in				0		
Total			40,000		228	87	Total min.: 315 min.
Collection			9,000		21	83	
Transportation			25,000		191		
Inside the dumping site			6,000		11	4	Dumping time
Idling time					5		Fueling

Time & Motion Study

Organization: N.C.C.

Trip- 2 Date: 16th May 1997

Vehicle No. KWE 245

Loading Capacity: 7 TON

Researcher's name: Eliud M. Kariuki

No. of Crew: 6

Estimated Volume: 3.5 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	161233.4		13 : 37			Dandora Depot
Loading-1	in	161241	7600	13 : 53	16		
	out	161241		13 : 57		4	
Loading-2	in	161241.3	300	14 : 1	4		Loading points are
	out	161242	700	14 : 2		1	
Loading-3	in	161242		14 : 4	2		Muthaiga- Highridge area
	out	161242.5	500	14 : 10		6	
Loading-4	in	161243.2	700	14 : 12	2		
	out	161243.7	500	14 : 13		1	Route taken as for trip one
Loading-5	in	161244	300	14 : 14	1		
	out	161244		14 : 15		1	
Loading-6	in	161244.5	500	14 : 16	1		
	out	161245.4	900	14 : 22		6	
Loading-7	in	161245.4		14 : 23	1		Route to workshop:
	out	161245.5	100	14 : 26		3	
Loading-8	in	161245.6	100	14 : 27	1		Dandora - Komorock
	out	161245.6		14 : 30		3	- outering -
Loading-9	in	161248.6	3000	14 : 37	7		Jogoo road - Depot
	out	161248.6		15 : 3		26	
Loading-10	in	161249.8	1200	15 : 6	3		
	out	161249.8		15 : 8		2	
Loading-11	in	161249.9	100	15 : 9	1		
	out	161250.2	300	15 : 13		4	
Loading-12	in	161251.4	1200	15 : 15	2		
	out	161251.4		15 : 20		5	
Loading-13	in	161257.4	6000	15 : 30	10		
	out	161257.4		15 : 36		6	
				:			
				:			
				:			
				:			
				:			
				:			
Dumping site	in	161268.7	11300	16 : 6	30		
Start dumping				16 : 7	1		
Finish dumping				16 : 14		7	
Dumping site	out	161270.1	1400	16 : 19	5		
Reach to workshop	in	161280.7	10600	17 : 50	91		
Total			47300		178	75	Total min.: 253 min.
Collection			16400		35	68	
Transportation			29500		137		
Inside the dumping site			1400		6	7	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 17th May 1997

Vehicle No. KAB 292Q

Loading Capacity: 7 TON

Researcher's name: Eliud M. Kariuki

No. of Crew:

Estimated Volume:

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop out	74953		9 : 9			Kaloleni Depot
						From workshop to
						damping site
						for offloading
						the already loaded
						vehicle
						Route taken
						; - Jogoo road - Outering
						Komorock - Dandora
Dumping site in	74966	13,000	9 : 41	32		
Start dumping	74967	1,000	9 : 47	6		
Finish dumping	74967	0	9 : 49		2	
Dumping site out	74968	1,000	9 : 53	4		
Reach to workshop in						
Total		15,000		42	2	Total min.: 44 min.
Collection		0		0	0	
Transportation		13,000		32		
Inside the dumping site		2,000		10	2	Dumping time
Idling time						

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 17th May 1997

Vehicle No. KAB 292Q

Loading Capacity: 7 TON

Researcher's name: Eliud M. Kariuki

No. of Crew: 6

Estimated Volume: 0.7 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	74968	0	9 : 53			Dandora dumping site
Loading-1	in	74984	16,000	10 : 51	58		
	out			12 : 30		99	
Loading-2	in			:			Vehicle got a puncture at
	out			:		0	
Loading-3	in			:	0		loading point 1. Decision to
	out			:		0	
Loading-4	in			:	0		offload and vehicle taken
	out			:		0	
Loading-5	in			:	0		for repair was made
	out			:		0	
Loading-6	in			:	0		
	out			:		0	Route taken; Dandora
Loading-7	in			:	0		
	out			:		0	Dandora dumping site-Juja
Loading-8	in			:	0		rd.-Muranga rd.-Moi ave.-
	out			:		0	Harambee ave.-1st Haile
							Selasie Ave.
							We followed two above route
							to Dandora
							Where we emptied the truck
							and headed for Kaloleni Depot
							via Komo rock rd.-Juja rd-
							Jogoo rd.-Kaloleni depot
Dumping site	in	75001	17,000	14 : 12	102		
Start dumping		75002	1,000	14 : 15	3		
Finish dumping		75002	0	14 : 17		2	
Dumping site	out	75004	2,000	14 : 21	4		
Reach to workshop	in	75014	10,000	15 : 5	44		
Total			46,000		211	101	Total min.: 312 min.
Collection			0		0	99	
Transportation			43,000		204		
Inside the dumping site			3,000		7	2	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- I Date: 17th May 1997

Vehicle No. KAB 388Q

Loading Capacity: 6.95

Researcher's name: D. Akinyi

No. of Crew: 2

Estimated Volume: 4.5 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	11,533		8 : 40			
Loading-1	in	11,536	3,000	9 : 5	25		Lagos
	out			9 : 17		12	
Dumping site	in	11,546	10,000	9 : 46	29		
Start dumping		11,550	4,000	9 : 50	4		
Finish dumping				9 : 51		1	
Dumping site	out			9 : 55	4		
Reach to workshop	in			:			
				:			
Total			17,000		62	13	Total min.:75min.
Collection			0		0	12	
Transportation			13,000		54	0	
Inside the dumping site			4,000		8	1	Dumping time
Idling time							

Time & Motion Study

Organization:N.C.C

Trip- 2 Date:17th May 1997

Vehicle No.KAB 388 Q

Loading Capacity:6.95

Researcher's name: D. Akinyi

No. of Crew: 2

Estimated Volume:4.5tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	11,550		:			
Loading-1	in	11,564	14,000	10 : 30			KBS Bus park
	out			:			
Dumping site	in	11,577	13,000	11 : 2	32		
Start dumping		11,578	1,000	:			
Finish dumping				:		0	
Dumping site	out			11 : 5	3		
Reach to workshop	in			:			
Total			28,000		35	0	Total min.:35min.
Collection			0		0	0	
Transportation			27,000		32	0	
Inside the dumping site			1,000		3	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 3 Date: 17th May 1997

Vehicle No. KAB 388 Q

Loading Capacity: 6.95

Researcher's name: D. Akinyi

No. of Crew: 2

Estimated Volume:

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	11,578		11 : 5			
Loading-1	in	11,592	14,000	11 : 55	50		KBS Bus park
	out			:			
Dumping site	in	11605	13,000	12 : 35	40		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	11,607	2,000	12 : 37	2		
Reach to workshop	in			:			
				:			
Total			29,000	:	92	0	Total min.: 92min.
Collection			0	:	0	0	
Transportation			27,000	:	90	0	
Inside the dumping site			2,000	:	2	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 4 Date: 17th May 1997

Vehicle No. KAB 388 Q

Loading Capacity: 6.95

Researcher's name: D. Akinyi

No. of Crew: 2

Estimated Volume: 4.5 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	11,609		12 : 37			
Loading-1	in	11,618	9,000	13 : 30	53		
	out			13 : 33		3	KBS Bus park
Dumping site	in	11,633	15,000	14 : 30	57		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	11,634	1,000	:	0		
Reach to workshop	in	11,645	11,000	15 : 0			
Total			36,000		110	3	Total min.: 113min.
Collection			0		0	3	
Transportation			35,000		110	0	
Inside the dumping site			1,000		0	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip-1 Date:17th May 1997

Vehicle No.KAB 389Q

Loading Capacity:7 TON

Researcher's name: D. A. Masaba

No. of Crew: 2

Estimated Volume:3.5tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	8,760		8 : 37			Enterprise rd.-Ladhies rd. to the
	in	8,765	5,000	8 : 50	13		City Center.
	out			9 : 7		17	Stopped to wait for loaders 9:07
Loading-1	in	8,766	1,000	9 : 14	7		moved to Race course waited to
	out			9 : 16		2	load 9:15
Loading-2	in	8,766	200	9 : 19	3		
	out			9 : 30		11	Waited to load at bus station
				:			Through Ring rd.-Ngara-Thika
				:			rd.-Outer ring rd.
Dumping site	in	8,777	10,800	10 : 0	30		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	8,781	4,000	10 : 7	7		
Reach to workshop	in			:			
				:			
Total			21,000	:	60	30	Total min.:90min.
Collection			200	:	3	13	
Transportation			16,800	:	50	0	
Inside the dumping site			4,000	:	7	0	Dumping time
Idling time						17	

Time & Motion Study

Organization: N.C.C

Trip-2 Date: 17th May 1997

Vehicle No. KAB 389Q

Loading Capacity: 7 TON

Researcher's name: D. A. Masaba

No. of Crew: 2

Estimated Volume: 3.5 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	8,781		10 : 7			
Loading-1	in	8,795	14,000	10 : 38	31		Bus station
	out			10 : 45		7	To dumping through Thika road
Loading-2	in			:			Outering road-Komarock road
	out			:		0	to dandora
Loading-3	in			:	0		
	out			:		0	
Dumping site	in	8,809	14,000	11 : 18	33		Vehicle stuck from 11:19 to 11:30
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	8,812	3,000	11 : 38	20		
Reach to workshop	in			:			
Total			31,000		84	7	Total min.:91 min.
Collection			0		0	7	
Transportation			28,000		64		
Inside the dumping site			3,000		9	0	Dumping time
Idling time					11		

Time & Motion Study

Organization: N.C.C

Trip-3

Date:17th May 1997

Vehicle No.KAB 389Q

Loading Capacity:7 TON

Researcher's name: D. Masaba

No. of Crew: 2

Estimated Volume:4.7

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	8,812		11 : 38			
Loading-1	8,824	12,000	12 : 5	27		Bus station
			12 : 10		5	To dumping site through Thika road-Outering road-Komarock road to Dandora
			:			
Dumping site	8,838	14,000	12 : 46	36		
Start dumping			:			
Finish dumping			:		0	
Dumping site	8,841	3,000	12 : 49	3		
Reach to workshop			:			
			:			
Total		29,000	:	66	5	Total min.:71min.
Collection		0	:	0	5	
Transportation		26,000	:	63	0	
Inside the dumping site		3,000	:	3	0	Dumping time
Idling time						

Time & Motion Study

Organization: N.C.C

Trip-4 Date: 17th May 1997

Vehicle No. KAB 389Q

Loading Capacity: 7 TON

Researcher's name: D. Masaba

No. of Crew: 2

Estimated Volume: 4 tons

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	8,841		12 : 49			Stopped for lunch
Loading-1	8,854	13,000	13 : 20	31		Bus station
			13 : 32		12	To dumping site through Thika road-Outering road-Komareock
			:		0	road to Dandora
Dumping site	8,867	13,000	14 : 9	37		
Start dumping			:			
Finish dumping			:		0	
Dumping site	8,870	3,000	14 : 21	12		
Reach to workshop			:			
Total		29,000		80	12	Total min.: 92min.
Collection		0		0	12	
Transportation		26,000		68	0	
Inside the dumping site		3,000		12	0	Dumping time
Idling time						

Time & Motion Study

Organization: N.C.C

Trip-5 Date: 17th May 1997

Vehicle No. KAB 389Q

Loading Capacity: 7 TON

Researcher's name: D. Masaba

No. of Crew: 2

Estimated Volume: 4.5 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	8,870.0		14 : 21			Stopped at the office at 14:22-
Loading-1	in	8,883.4	13,400	14 : 51	30		14:29 Bus station
	out			14 : 57		6	To Dumping site through Thika road-Outer road-
				:		0	Komarock road to Dandora
Dumping site	in	8,897.0	13,600	15 : 27	30		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	8,900.0	3,000	15 : 37	10		Stopped to register at 15:40-
Reach to workshop	in	8,910.0	10,000	16 : 2	25		15:41 passed through Buru buru-
							Kariobangi-Jogoo rd.
Total			40,000		95	6	Total min.:101 min.
Collection			0		0	6	
Transportation			37,000		77	0	
Inside the dumping site			3,000		10	0	Dumping time
Idling time					8		

Time & Motion Study

Organization: N.C.C

Trip- I Date:17th May 1997

Vehicle No. KAB 390Q

Loading Capacity:6.95

Researcher's name: M. Adhiambo

No. of Crew:

Estimated Volume:4

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	8,181		9 : 0			Kaloleni
Loading-1	in	8,184	3,000	9 : 20	20		Bus Station
	out			9 : 25		5	
Dumping site	in	8,200	16,000	10 : 5	40		Dandora
Start dumping				10 : 6	1		
Finish dumping				10 : 7		1	
Dumping site	out			10 : 7	0		
Reach to workshop	in			:			
				:			
Total			19,000		61	6	Total min.:67min.
Collection			0		0	5	
Transportation			19,000		60	0	
Inside the dumping site			0		1	1	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 2 Date:17th May 1997

Vehicle No. KAB 390Q

Loading Capacity:6.95

Researcher's name: M. Adhiambo

No. of Crew:

Estimated Volume:4

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out			10 : 7			
Loading-1	in	8,211	11,000	10 : 38	31		Bus station
	out			10 : 49		11	
Dumping site	in	8,227	16,000	11 : 20	31		Dandora
Start dumping				11 : 21	1		
Finish dumping				11 : 22		1	
Dumping site	out			11 : 22	0		
Reach to workshop	in			:			
Total			27,000		63	12	Total min.: 75min.
Collection			0		0	11	
Transportation			27,000		62	0	
Inside the dumping site			0		1	1	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 3 Date:17th May 1997

Vehicle No. KAB 390Q

Loading Capacity:6.95

Researcher's name: M. Adhiambo

No. of Crew:

Estimated Volume:4

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site			11 : 22			
Loading-1	8,242	15,000	12 : 0	38		Bus Station
			12 : 2		2	
Dumping site	8,258	16,000	12 : 45	43		Dandora
Start dumping			12 : 46	1		
Finish dumping			12 : 47		1	
Dumping site			12 : 47	0		
Reach to workshop			:			
Total		31,000		82	3	Total min.:85min.
Collection		0		0	2	
Transportation		31,000		81	0	
Inside the dumping site		0		1	1	Dumping time
Idling time						

Time & Motion Study

Organization: N.C.C

Trip- 4 Date:17th May 1997

Vehicle No. KAB 390Q

Loading Capacity:6.95

Researcher's name: M. Adhiambo

No. of Crew:

Estimated Volume:4

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site			12 : 47			
Loading-1	8,273	15,000	13 : 25	38		Bus station
			13 : 30		5	
Dumping site	8,287	14,000	14 : 13	43		Dandora
Start dumping			14 : 14	1		
Finish dumping			14 : 15		1	
Dumping site			14 : 15	0		
Reach to workshop			:			
Total		29,000		82	6	Total min.:88min.
Collection		0		0	5	
Transportation		29,000		81	0	
Inside the dumping site		0		1	1	Dumping time
Idling time						

Time & Motion Study

Organization: N.C.C

Trip- 5 Date: 17th May 1997

Vehicle No. KAB 390Q

Loading Capacity: 6.95

Researcher's name: M. Adhiambo

No. of Crew:

Estimated Volume: 4

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site			14 : 15			
Loading-1	8,298	11,000	14 : 40	25		
			14 : 45		5	
Dumping site	8,314	16,000	15 : 20	35		Dandora
Start dumping			15 : 21	1		
Finish dumping			15 : 22		1	They have an evening shift
Dumping site			15 : 22	0		which starts at 3:00 afternoon
Reach to workshop			:			
Total		27,000		61	6	Total min.: 67min.
Collection		0		0	5	
Transportation		27,000		60	0	
Inside the dumping site		0		1	1	Dumping time
Idling time						

Time & Motion Study

Organization: n.N.C.C.

Trip- 1 Date: 17th may 1997

Vehicle No. KUL 990

Loading Capacity: 7 TONS

Researcher's name: Arafa

No. of Crew: 6

Estimated Volume: 30m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	201968		8 : 20			
Loading-1	in	201973	5,000	8 : 50	30		Jogoo road
	out			8 : 55		5	
Loading-2	in		200	8 : 56	1		Muranga road
	out			9 : 0		4	
Loading-3	in		100	9 : 0	0		Limuru road
	out			9 : 5		5	
Loading-4	in	201974	700	9 : 10	5		Limuru - Makhana
	out			9 : 12		2	Kolbot - Kipbus roads
Loading-5	in	201977	3,000	9 : 20	8		Forest road
	out			9 : 25		5	
Loading-6	in		100	9 : 27	2		Forest road
	out			9 : 40		13	
Loading-7	in		500	9 : 41	1		Forest road
	out			9 : 50		9	
Loading-8	in	201978	400	9 : 51	1		Forest road
	out			10 : 5		14	
Loading-9	in	201979	1,000	10 : 10	5		Forest road
	out			10 : 15		5	
Loading-10	in	201986	7,000	10 : 35	20		Forest road - River road -
	out			10 : 45		10	
Loading-11	in		300	10 : 46	1		Forest road - Limuru road
	out			10 : 54		8	
Loading-12	in	201990	3600	11 : 12	18		Masary, Third P. Limuru
	out			12 : 40		88	
Loading-13	in	201992	2000	12 : 45	5		Muthaiga old road
	out			13 : 1		16	
Loading-14	in	201993	1000	13 : 5	4		Muthaiga old road
	out			13 : 25		20	
Loading-15	in	202001	8000	13 : 45	20		
	out			14 : 0		15	
Loading-16	in	202004	3000	14 : 20	20		Muthaiga to Agakhan
	out			14 : 40		20	
Dumping site	in	202020	16,000	15 : 40	60		Agakhan - Dandora
Start dumping				:			
Finish dumping				:		0	From Dandora
Dumping site	out	202033	13,000	16 : 37	57		
Reach to workshop	in	202045	12,000	17 : 45	68		
Total			76,900		326	239	Total min.: 565 min.
Collection			30,900		111	239	
Transportation			33,000		158		
Inside the dumping site			13,000		57	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 17th May 1997

Vehicle No. KUL 991

Loading Capacity: 7.88

Researcher's name: M. Sitati

No. of Crew: 5

Estimated Volume:

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	155,210.3		9 : 3			workshop to Kasarani via Ladhies
Loading-1	in	155,238.0	27,700	10 : 0	57		Racecourse-Park road-
	out		0	10 : 4		4	Thika road Back to city at NCC
Loading-2	in	155,239.0	1,000	10 : 13	9		office for allocation
	out		0	10 : 27		14	Moved around City because of
Loading-3	in	155,240.7	1,700	10 : 45	18		miss allocation of duty
	out		0	11 : 0		15	
Loading-4	in	155,246.1	5,400	11 : 40	40		From Central parking (city
	out		0	13 : 20		100	centre) to KBS station-Ngara
Loading-5	in	155,253.1	7,000	14 : 5	45		shopping Centre
	out		0	14 : 13		8	Juja road-Komarock road to
				:			Dumping site
				:			
							Back to workshop via
							Komarock rd.-Outer ring rd.-
							BuruBuru-Jogoo road-Kaloleni
Dumping site	in	155264	10,900	15 : 0	47		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	155265.8	1,800	15 : 25	25		
Reach to workshop	in	155276.4	10,600	15 : 50	25		
Total			66,100		266	141	Total min.:407min.
Collection			15,100		112	141	
Transportation			49,200		129	0	
Inside the dumping site			1,800		25	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 17th May 1997

Vehicle No. KUL 993

Loading Capacity: 7.98

Researcher's name: A. Gaititi

No. of Crew: 8

Estimated Volume : 0.3m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	177,527.0		8 : 17			Workshop to Industrial area-
Loading-1	in	177,543.7	16,700	8 : 58	41		Nyayo Estate-Ngong road to
	out		0	9 : 3		5	N.C.C depot
Loading-2	in	177,544.4	700	9 : 4	1		Time in 8:34 Time out 8:52
	out		0	9 : 5		1	Mileage 177540.2
Loading-3	in	177,544.8	350	9 : 6	1		Deport-Ngong road-Kiriswi road
	out		0	9 : 15		9	Chania Avenue-Argwings
Loading-4	in	177,549.1	4,350	9 : 25	10		Kodhek rd.-Ole odume rd.-
	out		0	9 : 26		1	Gitanga rd.-Riverside drive.-
Loading-5	in	177,550.0	900	9 : 28	2		Stae house rd.-Hotel salama
	out		0	9 : 29		1	(Anex)-Milimani rd.-Kenyatta
Loading-6	in	177,557.7	7,700	9 : 45	16		Avenue
	out		0	9 : 48		3	
Loading-7	in	177,559.1	1,400	9 : 54	6		
	out		0	10 : 3		9	
Loading-8	in	177,567.6	8,500	10 : 17	14		
	out		0	10 : 18		1	
Loading-9	in	177,568.2	600	10 : 19	1		
	out		0	10 : 22		3	
Loading-10	in	177,568.5	300	10 : 22	0		
	out		0	10 : 23		1	
Loading-11	in	177,568.6	50	10 : 23	0		
	out		0	10 : 24		1	
Loading-12	in	177,569.3	750	10 : 26	2		
	out		0	10 : 26		0	
Loading-13	in	177,569.5	200	10 : 28	2		
	out		0	10 : 29		1	
Loading-14	in	177,569.6	100	10 : 30	1		
	out		0	10 : 31		1	
Loading-15	in	177,569.7	80	10 : 32	1		
	out		0	10 : 32		0	
Loading-16	in	177,575.4	5,720	10 : 46	14		
	out			10 : 48		2	
Loading-17	in	177,575.4	20	10 : 48	0		Kenyatta Avenue-Nyerere road
	out		0	10 : 48		0	state house road-Ring road-River-
Loading-18	in	177,575.9	480	10 : 54	6		James gichuru road-Fred Ngumo
	out		0	10 : 57		3	resident-waiyaki way-Mvuli road
Loading-19	in	177,576.0	100	10 : 58	1		Rhapta road-Lantana road-Churex
	out		0	11 : 0		2	road-Manyani road east-
Loading-20	in	177,576.6	600	11 : 2	2		Olentimama resident-Manyani
	out		0	11 : 6		4	road-Swaziland High
Loading-21	in	177,576.6	10	11 : 6	0		Commissioner's resident-
	out		0	11 : 6		0	Kabarsiran road
Loading-22	in	177,576.9	290	11 : 7	1		
	out		0	11 : 8		1	
Loading-23	in	177,577.0	100	11 : 9	1		
	out		0	11 : 11		2	

Time & Motion Study

Organization: N.C.C

Trip- I Date: 17th May 1997

Vehicle No. KUL 993

Loading Capacity: N.C.C

Researcher's name: A. Gaititi

No. of Crew: 8

Estimated Volume : 0.3m³

Location		Mileage (m)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Loading-24	in	177,579.2	2,200	11 : 14	3		
	out		0	11 : 14		0	
Loading-25	in	177,579.3	100	11 : 15	1		
	out		0	11 : 16		1	
Loading-26	in	177,579.4	100	11 : 17	1		
	out		0	11 : 17		0	
Loading-27	in	177,579.6	200	11 : 18	1		
	out		0	11 : 19		1	
Loading-28	in	177,579.8	200	11 : 19	0		
	out		0	11 : 19		0	
Loading-29	in	177,580.0	200	11 : 20	1		
	out		0	11 : 21		1	
Loading-30	in	177,580.4	400	11 : 22	1		
	out		0	11 : 23		1	
Loading-31	in	177,581.0	600	11 : 25	2		
	out		0	11 : 26		1	
Loading-32	in	177,581.3	300	11 : 27	1		
	out		0	11 : 27		0	
Loading-33	in	177,581.5	200	11 : 29	2		Kianda school-Kangemi
	out		0	11 : 30		1	shopping center-Kabete
Loading-34	in	177,581.6	100	11 : 30	0		area-Precious blood Rinuta
	out		0	11 : 31		1	Kenya Science of Teachers college to Ngong depot
Loading-35	in	177,581.7	100	11 : 32	1		
	out		0	11 : 33		1	
Loading-36	in	177,582.3	600	11 : 35	2		
	out		0	11 : 36		1	
Loading-37	in	177,582.7	400	11 : 38	2		
	out		0	11 : 39		1	
Loading-38	in	177,582.9	200	11 : 40	1		
	out		0	11 : 40		0	
Loading-39	in	177,583.0	100	11 : 41	1		
	out		0	11 : 41		0	
Loading-40	in	177,583.6	600	11 : 45	4		
	out		0	11 : 46		1	
Loading-41	in	177,585.5	1,900	11 : 50	4		
	out		0	11 : 55		5	
Loading-42	in	177,585.7	200	11 : 58	3		
	out		0	11 : 59		1	
Loading-43	in	177,585.8	50	12 : 0	1		
	out		0	12 : 4		4	
Loading-44	in	177,585.8	50	12 : 5	1		
	out		0	12 : 6		1	
Loading-45	in	177,586.2	400	12 : 8	2		
	out		0	12 : 14		6	
Loading-46	in	177,587.4	1,200	12 : 18	4		
	out		0	12 : 21		3	

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 17th May 1997

Vehicle No. KUL 993

Loading Capacity: N.C.C

Researcher's name: A. Gaititi

No. of Crew: 8

Estimated Volume : 0.3m³

Location		Mileage (m)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Loading-47	in	177,589.5	2,100	12 : 28	7		
	out		0	12 : 29		1	
Loading-48	in	177,589.9	400	12 : 29	0		
	out		0	12 : 30		1	
Loading-49	in	177,590.0	100	12 : 31	1		From Ngong depot (N.C.C)
	out		0	12 : 31		0	to Ngong road-valley road-
Loading-50	in	177,590.4	400	12 : 32	1		Kenyatta ave.-Nyerere road-
	out		0	12 : 32		0	University way-Museum road-
Loading-51	in	177,590.8	400	12 : 33	1		forest road-Muranga road-thika
	out		0	12 : 33		0	road-Outer ring road-Komorock
Loading-52	in	177,591.1	300	12 : 35	2		road to Dumping site
	out		0	12 : 37		2	From dumping site to workshop
Loading-53	in	177,596.7	5,600	12 : 46	9		through Komorock road-outering
	out		0	12 : 48		2	road-Jogoo road to work shop
Loading-54	in	177,606.5	9,800	13 : 14	26		
	out		0	13 : 16		2	
Loading-55	in	177,606.6	100	13 : 17	1		
	out		0	13 : 20		3	
Loading-56	in	177,606.8	200	13 : 22	2		
	out		0	14 : 2		40	
Dumping site	in	177,629.8	23,000	14 : 44	42		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	177,633.0	3,200	14 : 55	11		
Reach to workshop	in	177,647.2	14,200	15 : 28	33		
				:			
Total			120,200	:	298	133	Total min.: 431 min.
Collection			63,100		189	133	
Transportation			53,900		98	0	
Inside the dumping site			3,200		11	0	Dumping time
Idoling time					18		

Time & Motion Study

Organization:N.C.C

Trip- 1 Date:17th May 1997

Vehicle No.KWE 063

Loading Capacity:7TON

Researcher's name: Antony Ngaara

No. of Crew:13

Estimated Volume:44m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	160651	0	8 : 40			To pumwani N.C.C
Loading-1	in		4000	9 : 6	26		for work allocation
	out		0	10 : 5		59	8:45-9:00
Loading-2	in		50	10 : 6	1		Area allocated:
	out		0	10 : 13		7	Government quarters
Loading-3	in		50	10 : 16	3		phase 1 and 2
	out		0	10 : 44		28	At phase 3 Vehicle
Loading-4	in		400	10 : 46	2		developed mechanical
	out		0	11 : 10		24	problems
Loading-5	in		3,000	11 : 20	10		Pumwani
	out		0	11 : 32		12	Third st. Eastleigh
Dumping site	in		20,000	12 : 30	58		Dandora dumping area
Start dumping			0	12 : 37	7		
Finish dumping				12 : 38		1	
Dumping site	out			12 : 45	7		
Reach to workshop	in		7,000	:			Kaloleni workshop
Total			34,500		114	131	Total min.: 245 min.
Collection			3,500		16	130	
Transportation			31,000		69		
Inside the dumping site			0		14	1	Dumping time
Idling time					15		

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 17th May 1997

Vehicle No. KWE 063

Loading Capacity: 7TON

Researcher's name: Antony Ngaara

No. of Crew: 3

Estimated Volume: 45m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out		0	12 : 45			Dumping site
Loading-1	in		13,000	13 : 43	58		Bus station town
	out		0	13 : 50		7	
				:			Juja road - pumwani
				:			
				:			Race course -
				:			
				:			Bus station
				:			
Dumping site	in		13000	14 : 30	40		Dandora
Start dumping				14 : 39	9		
Finish dumping			0	14 : 40		1	Dandora - Komorock-
Dumping site	out		0	14 : 45	5		Outering - Jogo road
Reach to workshop	in		7,000	15 : 50	65		Kaloleni
Total			33000		177	8	Total min.: 185 min.
Collection			0		0	7	
Transportation			33,000		163		
Inside the dumping site			0		14	1	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 17th May 1997

Vehicle No. KWE 070

Loading Capacity: 7.97 TON Researcher's name: E. Kaini

No. of Crew: 6

Estimated Volume: 4.118m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	203,330.0		10 : 54			To Umoja II Depot for Allocation
Loading-1	in	203,344.0	14,000	11 : 44	50		Komarock Sector II (Phase I)
	out		0	12 : 15		31	
Loading-2	in	203,345.0	1,000	12 : 19	4		Komarock phase II
	out		0	12 : 42		23	
Loading-3	in	203,345.2	200	12 : 44	2		Infield
	out	203,346.0	800	13 : 10		26	
Dumping site	in	203,353.0	7,000	13 : 30	20		Dandora
Start dumping				13 : 40	10		
Finish dumping				14 : 10		30	
Dumping site	out			14 : 19	9		20 min. lunch break
Reach to workshop	in			15 : 20	61		
Total			23,000		156	110	Total min.: 266min.
Collection			2,000		6	80	
Transportation			21,000		111	0	
Inside the dumping site			0		19	30	Dumping time
Idling time					20		

Time & Motion Study

Organization: N.C.C

Trip- 1 Date:17th May 1997

Vehicle No. KWE 081

Loading Capacity:8 TON

Researcher's name: S. Kimotho

No. of Crew:11

Estimated Volume:5m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	185,719.0		8 : 20			From workshop to south C
Loading-1	in	185,733.0	14,000	9 : 20	60		(Maimahi rd.) savent quarter
	out	185,733.2	200	9 : 35		15	Monbasa rd.-Imara daima-
Loading-2	in		100	9 : 40	5		Outer ring-Kariogangi south to
	out			9 : 46		6	Dumping site Dandora
Loading-3	in		600	9 : 48	2		
	out			9 : 50		2	
Loading-4	in	185,744.0		10 : 35	45		
	out			10 : 35		0	
Dumping site	in	185,757.0	13,000	11 : 10	35		
Start dumping		185,760.0	3,000	11 : 30	20		
Finish dumping		185,762.0	2,000	11 : 50		20	
Dumping site	out			11 : 54	4		
Reach to workshop	in			:			
Total			32,900		171	43	Total min.: 214 min.
Collection			900		52	23	
Transportation			27,000		95	0	
Inside the dumping site			5,000		24	20	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 2 Date:17th May 1997

Vehicle No. KWE081

Loading Capacity:8 TON

Researcher's name: S. Kimotho

No. of Crew:11

Estimated Volume:4.3m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	185,762.0		11 : 54			Idoling time 11:56-12:16
Loading-1	in	185,782.0	20,000	13 : 35	101		On the way trip two the vehicle
	out			13 : 36			1 have stop for lunch 12:20-13:05
Loading-2	in	185,784.0	2,000	13 : 41	5		Mugoya (Area 4) at Nairobi south C
	out			13 : 43		2	
Loading-3	in		100	13 : 46	3		To dumping site at Dandora
	out			13 : 47		1	
Loading-4	in		100	13 : 50	3		
	out			13 : 53		3	
Loading-5	in		100	13 : 57	4		
	out			13 : 59		2	
Loading-6	in		600	14 : 0	1		
	out			14 : 1		1	
Loading-7	in		100	14 : 3	2		
	out			14 : 4		1	
Loading-8	in		300	14 : 5	1		
	out			14 : 6		1	
Loading-9	in		100	14 : 6	0		
	out			14 : 7		1	
Loading-10	in		50	14 : 7	0		
	out			14 : 9		2	
Loading-11	in		30	14 : 10	1		
	out			14 : 11		1	
Loading-12	in		100	14 : 15	4		
	out			14 : 16		1	
Loading-13	in		200	14 : 16	0		
	out			14 : 17		1	
Loading-14	in		30	14 : 18	1		
	out			14 : 19		1	
Loading-15	in		400	14 : 27	8		
	out			14 : 36		9	
Loading-16	in		900	15 : 7	31		
	out			15 : 8		1	
Dumping site	in	185,803.0	15,890	15 : 59	51		
Start dumping				:			
Finish dumping		185,805.0	2,000	16 : 25			
Dumping site	out	185,806.0	1,000	16 : 25		26	
Reach to workshop	in	185,818.0	12,000	16 : 55		30	
Total			56,000		272	29	Total min.:301min.
Collection			5,110		64	29	
Transportation			47,890		117	0	
Inside the dumping site			3,000		26		Dumping time
Idoling time					65		

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 17th May 1997

Vehicle No. KWE 084

Loading Capacity: 9 TON

Researcher's name: H. Githua N.

No. of Crew: 12

Estimated Volume: 24m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	99,111		8 : 10			Kaloleni to Dagoreti Deport
Loading-1	in	99,129	18,000	8 : 34	24		Riverside paddock via Ngong road
	out		0	8 : 52		18	Valley road-Nyerere road
Loading-2	in	99,141	12,000	9 : 14	22		Riverside garden via riverside drive lane
	out		0	9 : 14		0	
Loading-3	in	99,142	1,000	9 : 15	1		Riverside drive
	out		0	9 : 22		7	
Loading-4	in	99,142		9 : 23	1		Riverside drive
	out		0	9 : 24		1	
Loading-5	in	99,143	1,000	9 : 25	1		Riverside drive
	out		0	9 : 28		3	
Loading-6	in	99,143		9 : 30	2		Riverside drive
	out		0	10 : 0		30	
Loading-7	in	99,147	4,000	10 : 7	7		Riverside drive
	out		0	10 : 20		13	
Loading-8	in	99,150	3,000	10 : 27	7		Riverside drive
	out		0	10 : 34		7	
Loading-9	in	99,150		10 : 35	1		Msangari lane via Waiyaki way
	out		0	10 : 37		2	
Loading-10	in	99,150		10 : 39	2		Mvuli way
	out		0	10 : 40		1	
Loading-11	in	99,151	1000	10 : 43	3		continental Hotel
	out		0	10 : 44		1	
Loading-12	in	99,151		11 : 4	20		Klicorp Flats
	out			11 : 12		8	
							To dandora dumping site via Waiyakiway- Forest road- Thika road
Dumping site	in	99,166	15,000	11 : 44	32		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	99,170	4,000	12 : 0	16		
Reach to workshop	in			:			
Total			59,000		139	91	Total min.:230min.
Collection			22,000		67	91	
Transportation			33,000		56	0	
Inside the dumping site			4,000		16	0	Dumping time
Idoling time							

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 17th May 1997

Vehicle No. KWE 084

Loading Capacity: 9 TON

Researcher's name: H. Githua N.

No. of Crew: 12

Estimated Volume: 23m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	99,170		12 : 0			Dumping site -Dandora
Loading-1	in	99,185	15,000	12 : 26	26		Rhapta road -David Osieri road
	out		0	12 : 32		6	
Loading-2	in	99,186	1,000	12 : 34	2		Rhapta road
	out		0	12 : 36		2	
Loading-3	in	99,186		12 : 38	2		Rhapta road-Mvuli road
	out		0	12 : 40		2	
Loading-4	in	99,187	1,000	12 : 44	4		Terrace close at Ultimate
	out		0	12 : 51		7	security ltd
Loading-5	in	99,187		12 : 52	1		Rhapta road towards sino
	out		0	12 : 54		2	Agricultural clinic
Loading-6	in	99,187		12 : 56	2		Rhapta road-Terrace close
	out		0	12 : 59		3	ultimate ltd
Loading-7	in	99,187		13 : 2	3		Rhapta road
	out		0	13 : 3		1	
Loading-8	in	99,187		13 : 4	1		Rhapta road towards
	out		0	13 : 8		4	marion court
Loading-9	in	99,188	1,000	13 : 12	4		Rhapta road-Prime
	out		0	13 : 16		4	health club
Loading-10	in	99,188		13 : 20	4		Rhapta road - St. Michael road
	out		0	13 : 21		1	
Loading-11	in	99,198	10,000	13 : 36	15		Silver hotel via Waiyaki way
	out		0	14 : 0		24	Chiromo Uhuru Highway
Loading-12	in	99,200	2,000	14 : 3	3		Dead Animal Along
	out		0	14 : 4		1	Ngong road
Loading-13	in	99,204	4,000	14 : 11	7		Kenya Science Teachers College
	out		0	14 : 32		21	Idling time for lunch: 10 minutes
				:			Dagoreti deport
				:			Ngong road- Thika road
				:			to Dandora dumping site
				:			
				:			
Dumping site	in	99,232	28,000	15 : 31	59		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	99,236	4,000	16 : 9			
Reach to workshop	in	99,249	13,000	16 : 45	38		
				:			
Total			79,000		207	78	Total min.:285 min.
Collection			19,000		48	78	
Transportation			56,000		123	0	
Inside the dumping site			4,000		38	0	Dumping time
Idoling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 17th May 1997

Vehicle No. KWE 245

Loading Capacity: 8 TON

Researcher's name: Peter K. Karoki

No. of Crew: 8

Estimated Volume: 12m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	161,325.0		8 : 17			Ngara 8:45 in and left 9:00
Loading-1	in	161,331.0	6,000	9 : 5	48		Presidential route(Thika road
	out			9 : 8		3	
Loading-2	in	161,333.5	2,500	9 : 15	7		Thika road
	out			9 : 27		12	
Loading-3	in	161,344.1	10,600	9 : 42	15		Thika road
	out			9 : 44		2	
Loading-4	in	161,344.9	800	9 : 50	6		Thika road
	out			10 : 37		47	
Loading-5	in	161,353.2	8,300	11 : 4	27		Thika road (Near Kenyatta
	out			11 : 47		43	University)
Loading-6	in	161,364.0	10,800	12 : 13	26		Agakhan Flats
	out			12 : 47		34	
Dumping site	in	161,372.0	8,000	13 : 20	33		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	161,375.2	3,200	13 : 30	10		
Reach to workshop	in			:			
				:			
Total			50,200	:	172	141	Total min.: 313min.
Collection			33,000		96	141	
Transportation			14,000		66	0	
Inside the dumping site			3,200		10	0	Dumping time
Idling time					15		

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 17th May 1997

Vehicle No. KWE 245

Loading Capacity: 8 TON

Researcher's name: Peter K. Karoki

No. of Crew: 8

Estimated Volume: 17m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	161,375.2		13 : 30			
Loading-1	in	161,381.3	6,100	14 : 0	30		Westlands (Kirungi House)
	out			14 : 5		5	
Loading-2	in	161,383.0	1,700	14 : 15	10		Agip
	out			15 : 0		45	
Loading-3	in	161,384.2	1,200	15 : 3	3		Jacaranda Hotel
	out			15 : 40		37	
Loading-4	in	161,387.1	2,900	16 : 50	70		Ngara office
	out			17 : 10		20	
				:			The car had tire problems
				:		0	between 3:40 and 4:50 and we
							had to stand to wait for solution
							near Jacarounda Hotel
Dumping site	in	161,393.0	5,900	17 : 40	30		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	161,396.0	3,000	17 : 55	15		
Reach to workshop	in	161,401.5	5,500	18 : 20	25		
				:			
Total			26,300	:	183	107	Total min.: 290min.
Collection			5,800		13	107	
Transportation			17,500		85	0	
Inside the dumping site			3,000		15	0	Dumping time
Idling time					70		

Time & Motion Study

Organization:N.C.C

Trip- 1 Date:18th May 1997

Vehicle No.KAB292Q

Loading Capacity:7 TON

Researcher's name: Ali AMI nassir

No. of Crew.9

Estimated Volume:6m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	75014	0	8 : 30			Kaloleni- Utalii(Kipande road)
Loading-1	in	75019	5,000	9 : 0	30		Utalii (town)
	out			9 : 6		6	
Loading-2	in	75021	2,000	9 : 12	6		Utalii to
	out		0	12 : 42		210	Dandora along
Loading-3	in			:			Thika road
	out			:		0	
Dumping site	in	75037	16,000	13 : 20	38		From Utalii
Start dumping		75038	1,000	13 : 33	13		
Finish dumping		75038	0	13 : 34		1	
Dumping site	out	75039	1,000	13 : 40	6		
Reach to workshop	in			:			
Total			25,000		93	217	Total min.: 310 min.
Collection			2,000		6	216	
Transportation			21,000		68		
Inside the dumping site			2,000		19	1	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 18th May 1997

Vehicle No. KAB292Q

Loading Capacity: 7 TON

Researcher's name: Ali AMI nassir

No. of Crew: 8

Estimated Volume: 6m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	75039	0	13 : 40			
Loading-1	in	75052	13,000	14 : 20	40		Centar police of
	out		0	15 : 1		41	Harry Thuku road to
							Dandora
							Dandora to workshop via
							Outering BuruBuru road- Rabai
							road to Gogoo road Kalolent
Dumping site	in	75065	13,000	15 : 34	33		Depot
Start dumping		75064	1,000	15 : 38	4		
Finish dumping		75064	0	15 : 40	0	2	
Dumping site	out	75065	1,000	15 : 43	3		
Reach to workshop	in	75075	10,000	16 : 20	37		
Total			38,000		117	43	Total min.: 160 min.
Collection			0		0	41	
Transportation			36,000		110		
Inside the dumping site			2,000		7	2	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1

Date: 18th May 1997

Vehicle No. KAB 388Q

Loading Capacity: 6.95 TON

Researcher's name: Dinah Akinyi

No. of Crew: 1

Estimated Volume: 4.5 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	11648		8 : 22			Kaloleni to petrol station
Loading-1	in	11651	3,000	8 : 57	35		KBS bus station
	out			9 : 5		8	
				:			
				:			
				:			
				:			
				:			
Dumping site	in	11665	14,000	9 : 30	25		Thika road - dumping site
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	11667	2,000	9 : 35	5		
Reach to workshop	in			:			
Total			19,000		65	8	Total min.: 73 min.
Collection			0		0	8	
Transportation			17,000		60		
Inside the dumping site			2,000		5	0	Dumping time
Idling time							

Time & Motion Study

Organization:N.C.

Trip- 2 Date:18th May 1997

Vehicle No.KAB 388Q

Loading Capacity:6.95 TON

Researcher's name: Dinah Akinyi

No. of Crew:1

Estimated Volume:4.5 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	11666		9 : 36			Dandora
Loading-1	in	11681	15,000	10 : 6	30		KBS bus station
	out			10 : 10		4	No work done at this point
Loading-	in			:			
	out			:		0	
Loading-2	in	11681.5	500	10 : 12	2		Afya Centre area
	out			10 : 38		26	(Tom mboya street)
				:			
				:			
				:			Alot of time taken
				:			
				:			to load because of
				:			street boys fighting
Dumping site	in	11694	12,500	11 : 0	22		Dandora
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	11696	2,000	11 : 18	18		
Reach to workshop	in	11696	0	11 : 18	0		From Dandora
Total			30,000		72	30	Total min.: 102 min.
Collection			500		2	30	
Transportation			27,500		52		
Inside the dumping site			2,000		18	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip-3

Date: 18th May 1997

Vehicle No. KAB 388 Q

Loading Capacity: 6.95 TON

Researcher's name: Dinah Akinyi

No. of Crew: 2

Estimated Volume: 4.5 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	11696		11 : 18			Dandora dumping site
Loading-1	in	11708	12,000	11 : 40	22		Tom Mboya street
	out			:			
Dumping site	in	11722	14,000	12 : 7	27		
Start dumping		11723	1,000	12 : 12	5		
Finish dumping				:			
Dumping site	out	11725	2,000	12 : 17	5		
Reach to workshop	in			:			Dandora Dumping site
Total			29,000		59	0	Total min.: 59 min.
Collection			0		0	0	
Transportation			26,000		49		
Inside the dumping site			3,000		10	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 4 Date: 18th May 1997

Vehicle No. KAB 388Q

Loading Capacity: 6.95 TON

Researcher's name: Dinah Akinyi

No. of Crew: 2

Estimated Volume: 4.5 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	11725		12 : 17			
Loading-1	in	11739	14,000	12 : 50	33		City market
	out			12 : 55		5	
				:			
				:			Passed through
				:			Ngara to
				:			
Dumping site	in	11752	13,000	13 : 15	20		Dandora Damping
Start dumping				:			site
Finish dumping		11754	2000	:		0	
Dumping site	out	11754	0	13 : 20	5		
Reach to workshop	in			:			
Total			29,000		58	5	Total min.: 63 min.
Collection			0		0	5	
Transportation			27,000		53		
Inside the dumping site			2,000		5	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 5 Date: 18th May 1997

Vehicle No. KAB 388Q

Loading Capacity: 6.95 TON

Researcher's name: Dinah Akinyi

No. of Crew: 2

Estimated Volume: 4.5 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	11754		13 : 20			Dandora
Loading-1	in	11766	12,000	13 : 55	35		City Market
	out					11	
Loading-2	in	11767	1,000	14 : 6			City Hall Annexe
	out			:			
				:			next to Catholic
				:			Bookshop
Dumping site	in	11781	14,000	14 : 35	29		Dandora office
Start dumping				:			
Finish dumping				:		0	Dandora Dumping site
Dumping site	out			14 : 40	5		
Reach to workshop	in	11793	12,000	14 : 55	15		Kaloleni Depot
Total			39,000		84	11	Total min.: 95 min.
Collection			1,000		0	11	
Transportation			38,000		79		
Inside the dumping site			0		5	0	Dumping time
Idling time							

Time & Motion Study N.C.C

Trip- 1 Date:18th May 1997

Vehicle No.KAB 389Q

Loading Capacity:7TON

Researcher's name: Debora A. Masaba

No. of Crew: 1

Estimated Volume:3.7TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	8910		8 : 34			Jogoo roadLandthics
Loading-1	in	8912	2,000	8 : 39	5		to bus station
	out			8 : 57		18	
				:			Haileselasia Road -
				:			Bunyara
				:			Ring road Ngara-
				:			Muranga road
				:			Thika road - Komorock
				:			
				:			Dandora
				:			
				:			Stopped at office
				:			
				:			to registerat 9.35:mileage
				:			8928
				:			
Dumping site	in	8925.4	13,400	9 : 23	26		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	8927.4	2,000	9 : 33	10		
Reach to workshop	in			:			
Total			17,400		41	18	Total min.: 59 min.
Collection			0		0	18	
Transportation			15,400		31		
Inside the dumping site			2,000		10	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip-2 Date: 18th May 1997

Vehicle No. KAB389Q

Loading Capacity: 7TON

Researcher's name: Debora A. Masaba

No. of Crew: 2

Estimated Volume: 4TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	8927.4		9 : 33			
Loading-1	in	8941	13600	10 : 2	29		From bus station
	out			10 : 5		3	to bunyara road-
				:			Ring road Ngara -Muranga
				:			Thika road - Outering
				:			Komorock - Dumping
				:			site Dandora
Dumping site	in	8953.7	12,700	10 : 26	21		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	8956.5	2,800	10 : 35	9		
Reach to workshop	in	8968.6	12,100	11 : 11	36		
Total			41,200		95	3	Total min.: 98 min.
Collection			0		0	3	
Transportation			38,400		86		
Inside the dumping site			2,800		9	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 18 th May 1997

Vehicle No. KAB390Q

Loading Capacity: 6.95

Researcher's name: Mitchell Adhiaambo

No. of Crew: 2

Estimated Volume: 4 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	8353		8 : 45			Kaloleni through
Loading-1	in	8361	8,000	9 : 15	30		lusaka road Interprce
	out			9 : 18		3	and Darisellan to
							N.C.C workshop
							back through same road via
							ronald ngala and
							Tom Mboya to Bus station
							From bus station passed
							Ronald Ngala via ring road -
							forest road- thika road-
							Dandora
Dumping site	in	8376	15,000	9 : 45	27		
Start dumping				9 : 55	10		
Finish dumping				9 : 56		1	
Dumping site	out	8376.5	500	9 : 56	0		
Reach to workshop	in			:			
Total			23,500		67	4	Total min.: 71 min.
Collection			0		0	3	
Transportation			23,000		57		
Inside the dumping site			500		10	1	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 3 Date: 18 th May 1997

Vehicle No. KAB390Q

Loading Capacity: 6.95

Researcher's name: Mitchell Adhiambo

No. of Crew: 2

Estimated Volume: 4 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	8409.5		11 : 47			From Dandora:
Loading-1	in	8424	14,500	12 : 15	28		through Thika road-
	out			12 : 30		15	Forest road- ring road-
Loading-2	in			:	0		Tom Mboya st.
	out			:		0	
Loading-3	in			:	0		
	out			:		0	
Loading-4	in			:	0		
	out			:		0	
Loading-5	in			:	0		
	out			:		0	
Loading-6	in			:	0		
	out			:		0	
Loading-7	in			:	0		
	out			:		0	
Loading-8	in			:	0		
	out			:		0	From Tom Mboya st.
Loading-9	in			:	0		Ronald Ngala via ring
	out			:		0	road- Thika road to
Loading-10	in			:	0		Dandora
	out			:		0	
Dumping site	in	8439	15,000	12 : 55	25		
Start dumping				12 : 55	0		
Finish dumping				12 : 56		1	
Dumping site	out	8439.5	500	12 : 56	0		
Reach to workshop	in			:			
Total			30,000		53	16	Total min.: 69 min.
Collection			0		0	15	
Transportation			29,500		53		
Inside the dumping site			500		0	1	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 4 Date: 18th May 1997

Vehicle No. KAB390Q

Loading Capacity: 6.95

Researcher's name: Mitchell Adhiambo

No. of Crew: 2

Estimated Volume: 4 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	8439.5		12 : 56			From Dandora:
Loading-1	in	8455	15,500	13 : 26	30		through outer ring road
	out			13 : 31		5	via Jogoo road through
Loading-2	in			:	0		city Centre to Market
	out			:		0	st.
Loading-3	in			:	0		
	out			:		0	
Loading-4	in			:	0		
	out			:		0	
Loading-5	in			:	0		
	out			:		0	
Loading-6	in			:	0		
	out			:		0	
Loading-7	in			:	0		Market st through
	out			:		0	Ronald Ngala- ring
Loading-8	in			:	0		road-Thika road to
	out			:		0	Dandora
Loading-9	in			:	0		
	out			:		0	Dandora-outer ring road
Loading-10	in			:	0		via Jogoo road to
	out			:		0	Kaloleni
Dumping site	in	8470	15,000	13 : 58	27		
Start dumping				13 : 58	0		
Finish dumping				13 : 59		1	
Dumping site	out	8470.5	500	13 : 59	0		
Reach to workshop	in	8482	11,500	15 : 35	96		
Total			42500		153	6	Total min.: 159 min.
Collection			0		0	5	
Transportation			42,000		153		
Inside the dumping site			500		0	1	Dumping time
Idling time							

Time & Motion Study

Organization:N.C.C

Trip- 1 Date:18th May 1997

Vehicle No.KAB 392Q

Loading Capacity:6.9 TON

Researcher's name: Eliud Mbugua Kariuki

No. of Crew:1

Estimated Volume:4 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	7178.7		8 : 27			Kaloleni Depot
Loading-1	in	7181	2300	8 : 45	18		loading point 1:
	out			9 : 4		19	Bus station
				:			
				:			Tractor used for loading
				:			
				:			Route to Dumping site
				:			
				:			Haileselesie - race course
				:			ring road - Ngara
				:			Thika road Outering
				:			Komorock- Dandora
				:			
				:			
				:			Dandora -town centre
				:			Via same route
Dumping site	in	7194	13000	9 : 28	24		
Start dumping				9 : 29	1		
Finish dumping				9 : 30		1	
Dumping site	out	7196.1	2100	9 : 34	4		
Reach to workshop	in			:			
Total			17400		47	20	Total min.: 67 min.
Collection			0		0	19	
Transportation			15300		42		
Inside the dumping site			2100		5	1	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip-2 Date: 18th May 1997

Vehicle No. KAB 392Q

Loading Capacity: 6.9 TON

Researcher's name: Eliud Mbugua Kariuki

No. of Crew: 1

Estimated Volume: 4 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	7198.2		9 : 36			Dandora Depot
Loading-1	in	7211.5	13300	10 : 5	29		Our way back from Dandora
	out			10 : 7		2	was the same except Thika
Loading-2	in	7211.9	400	10 : 13	6		road, forest road and Murange
	out			:			road
Loading-3	in			:	0		
	out			:		0	
Loading-4	in			:	0		
	out			:		0	Loading point:
Loading-5	in			:	0		Hotel Hames- Tom
	out			:		0	street
Loading-6	in			:	0		
	out			:		0	Route:
Loading-7	in			:	0		Haileselasia- Race
	out			:		0	course road - ring
Loading-8	in			:	0		road - Ngara road
	out			:		0	Thika road - Outering
Loading-9	in			:	0		Komorock- Dandora
	out			:		0	
Dumping site	in	7226	14100	10 : 37	24		
Start dumping				10 : 40	3		
Finish dumping				10 : 41		1	
Dumping site	out	7228.1	2100	10 : 45	4		
Reach to workshop	in			:			
Total			29900		66	3	Total min.: 69 min.
Collection			400		6	2	
Transportation			27400		53		
Inside the dumping site			2100		7	1	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 3 Date: 18th May 1997

Vehicle No. KAB 392Q

Loading Capacity: 6.9 TON

Researcher's name: Eliud Mbugua Kariuki

No. of Crew: 2

Estimated Volume: 4 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	7228.1		10 : 52			Dandora Dumping site
Loading-1	in	7241.2	13100	11 : 10	18		
	out			11 : 42		32	
Loading-2	in			:			loading point 1;
	out			:		0	Tom mboya
Dumping site	in	7256.5	15300	12 : 0	18		
Start dumping				12 : 4	4		
Finish dumping				12 : 6		2	
Dumping site	out	7257.8	1300	12 : 8	2		
Reach to workshop	in			:			
Total			29700		42	34	Total min.: 76 min.
Collection			0		0	32	
Transportation			28,400		36		
Inside the dumping site			1,300		6	2	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 4 Date: 18th May 1997

Vehicle No. KAB 392Q

Loading Capacity: 6.9 TON

Researcher's name: Eliud Mbugua Kariuki

No. of Crew: 1

Estimated Volume: 4 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	7258.1		12 : 18			Dandora depot
Loading-1	in	7269.2	11,100	12 : 43	25		Loading point
	out			12 : 47		4	City Market
							Route:
							Koinange st
							- Biashara st Moi avenue -
							Muranga road
							Thika road outer ring road
Dumping site	in	7282	12800	13 : 11	24		Komorock Dandora
Start dumping		7282.8	800	13 : 12	1		
Finish dumping				13 : 13		1	
Dumping site	out	7283.1	300	13 : 15	2		
Reach to workshop	in	7293.9	10800	13 : 40	25		
Total			35,800		77	5	Total min.: 82 min.
Collection			0		0	4	
Transportation			34,700		74		
Inside the dumping site			1,100		3	1	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 18th May 1997

Vehicle No. KUL 990

Loading Capacity: 7.83 TON Researcher's name: B. C. Dzuya

No. of Crew: 4

Estimated Volume: 7

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out			9 : 3			Kaloleni to Town deport
Loading-1	in	202,048		10 : 13	70		Tubman road through moi avenue
	out			10 : 37		24	
Loading-2	in	202,050	2,000	10 : 45	8		central car Park through city hall
	out			11 : 50		65	wab and Taifa road
Loading-3	in	202,051	1,000	11 : 55	5		Cathedral Car park on Kaunda St.
	out			12 : 30		35	
Loading-4	in	202,061	10,000	13 : 22	52		Parklands 2nd Avenue to
	out			13 : 24		2	Highridge to Muranga road
Loading-5	in	202,062	1,000	13 : 30	6		through masari road off
	out			13 : 44		14	Parklands rd.
				:			
				:			Dumping site through parklands
				:			road-Forest rd.-Muranga rd.-
				:			Thika rd.-Outer ring rd.-
Dumping site	in	202,076	14,000	14 : 0	16		Komarock rd.-back-Outer
Start dumping				14 : 13	13		ring rd. and Jogoo rd.
Finish dumping				14 : 57		44	
Dumping site	out			15 : 0	3		
Reach to workshop	in	202,090	14,000	15 : 45	45		
Total			42,000		218	184	Total min.:402min.
Collection			14,000		71	140	
Transportation			28,000		131	0	
Inside the dumping site			0		16	44	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 18th May 1997

Vehicle No KUL991

Loading Capacity: 7.88 TON

Researcher's name: Martin Sitati

No. of Crew: 10

Estimated Volume: 3.8 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	155326	0	8 : 50			To pumwani office
Loading-1	in	155333	7,000	9 : 37	47		to collect crews then
	out		0	10 : 13		36	to city centre for
Loading-2	in	155333.6	600	10 : 16	3		duty allocation
	out		0	11 : 17		61	through Gikomba -
Loading-3	in	155333.8	200	11 : 18	1		Ladhies road-
	out		0	11 : 37		19	Race course - Akamba
Loading-4	in	155333.9	100	11 : 43	6		bus station
	out			12 : 35		52	
							Idling time 20 min
							Muranga road - slip
							road Nduberi road
							to Dumping site
							through Muranga road
							Thika road Outering
							Komarock road
							From Dumping site
							through Komarock
							Juja road pumwani
							Jogoo road to
							Kaloleni
							Idling time during
							lunch hour - 30min
Dumping site	in	155348	14,100	13 : 3	28		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	155352.7	4,700	14 : 10	67		
Reach to workshop	in	155363	10,300	14 : 55	45		
Total			37,000		197	168	Total min.: 365 min.
Collection			900		10	118	
Transportation			31,400		120		
Inside the dumping site			4,700		67	0	Dumping time
Idling time						50	

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 18th May 1997

Vehicle No. KUL 993

Loading Capacity: 7.98

Researcher's name: Alexander Gaititi

No. of Crew: 7

Estimated Volume: 12m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	177685.4	0	9 : 3			From workshop to
Loading-1	in	177708.2	22,800	10 : 4	61		Jogoo road- Lusaka
	out		0	12 : 8		124	Langata- Bagathi- Ngong
							to N.c.c Ngong Depot
							9:21-9:27
							From Ngong Depot to Ngong
							road-Valley road-Nyerere
							road-University way-Moi
							Ave.-Tom mboya st.-Lagos
							rd.-NCC Central Depot
							9:49-9:59
							Route Tom mboya -Muranga
							Thika road -outering-
							Komarock to Dumping
							site
							Dandora- Kariobangi south
							outering road - numia -
							City Centre -Jogoo road -
							Workshop
							Central Depot-River rd.-
							Ngara rd.- River rd.-Tom
							mboya rd.-Ragos rd.-
							Central Depot
							12:20-12:22
Dumping site	in	177725.1	16,900	12 : 53	45		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	177727	1,900	13 : 3	10		
Reach to workshop	in	177738.3	11,300	13 : 59	56		
Total			52,900		172	124	Total min.: 296 min.
Collection			0		0	124	
Transportation			51,000		144		
Inside the dumping site			1,900		10	0	Dumping time
Idling time					18		

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 18th May 1997

Vehicle No. kul 994

Loading Capacity: 7 ton

Researcher's name: George Ng'aNg'a Kamau

No. of Crew: 3

Estimated Volume: 2 ton

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	164116		8 : 30			
Loading-1	in	164118	2,000	8 : 40	10		Bus station
	out			:			
				:			
				:			
				:			Route:
				:			Kaloleni depot
				:			Ladies road -
				:			Race course -
				:			Bus station
				:			
				:			
				:			Bus station-
				:			Race course-
				:			Juja road to
				:			Dandora
Dumping site	in	164128	10,000	9 : 32	52		
Start dumping				9 : 35	3		
Finish dumping				:			
Dumping site	out	164130	2,000	9 : 40	5		Dandora
Reach to workshop	in			:			
Total			14,000		70	0	Total min.: 70 min.
Collection			0		0	0	
Transportation			12,000		62		
Inside the dumping site			2,000		8	0	Dumping time
Idling time							

Time & Motion Study

Organization:N.C.C

Trip- 2 Date:18th May 1997

Vehicle No.kul 994

Loading Capacity:7 ton

Researcher's name: George Ng'aNg'a Kamau

No. of Crew: 3

Estimated Volume:2 ton

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	164130		9 : 40			
Loading-1	in	164143	13,000	10 : 3	23		Tom Mboya st.
	out			10 : 45		42	
							Route
							Ronald Ngara- Race course - Juja road
							Dandora
Dumping site	in	164154	11,000	11 : 19	34		Dandora
Start dumping				11 : 21	2		
Finish dumping				11 : 24	0	3	
Dumping site	out	164156	2,000	11 : 26	2		
Reach to workshop	in			:			
Total			26000		61	45	Total min.: 106 min.
Collection			0		0	42	
Transportation			24,000		57		
Inside the dumping site			2,000		4	3	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 3 Date: 18th May 1997

Vehicle No. kul 994

Loading Capacity: 7 ton

Researcher's name: George Ng'aNg'a Kamau

No. of Crew: 3

Estimated Volume: 2 ton

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	164156		11 : 26			
Loading-1	in	164171	15,000	12 : 43	77		Market street
	out			12 : 48		5	
				:			
				:			
				:			
				:			
				:			Route:
				:			Koinange st. -
				:			Biashara st. -
				:			Slip road - Muranga
				:			road - Juja road -
				:			Ngara road
				:			
				:			
				:			Tractor used for loading
Dumping site	in	164187	16,000	13 : 45	57		Dandora
Start dumping				13 : 50	5		
Finish dumping				13 : 52		2	
Dumping site	out	164189	2,000	13 : 57	5		
Reach to workshop	in	164199	10,000	14 : 55	58		
Total			43,000		202	7	Total min.: 209 min.
Collection			0		0	5	
Transportation			41,000		192		
Inside the dumping site			2,000		10	2	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 18th May 1997

Vehicle No. KWE 063

Loading Capacity: 7 TON

Researcher's name: C. Dzuya

No. of Crew: 2

Estimated Volume: 3m³

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out		8 : 20			To N.C.C depot office Lagos road
Loading-1	in		8 : 40	20		KBS Bus station through Accra road
	out		9 : 0		20	
Dumping site	in		9 : 30	30		Dandora through Tom Mboya-
Start dumping			9 : 38	8		Muranga-Ngara-Juja-Komarock
Finish dumping			9 : 40		2	and Back through same route
Dumping site	out		9 : 45	5		
Reach to workshop	in		:			
Total		0		63	22	Total min.: 85min.
Collection		0		0	20	
Transportation		0		50	0	
Inside the dumping site		0		13	2	Dumping time
Idling time						

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 18th May 1997

Vehicle No. KWE 063

Loading Capacity: 7 TON

Researcher's name: C. Dzuya

No. of Crew: 2

Estimated Volume: 3m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out			9 : 45			
Loading-1	in			10 : 18	33		Tom Mboya street to dumping
	out			10 : 40		22	site through Jogoo road-Rabai road
				:			
				:			
Dumping site	in			11 : 4	24		Dandora dumping site
Start dumping				11 : 10	6		Komarock-Juja-Thika road
Finish dumping				11 : 12		2	Muranga road-mama Ngina
Dumping site	out			11 : 17	5		Moi Avenue-Haile selessie-
Reach to workshop	in			:			Ronald Ngala
Total			0		68	24	Total min.: 92min.
Collection			0		0	22	
Transportation			0		57	0	
Inside the dumping site			0		11	2	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 3 Date: 18th May 1997

Vehicle No. KWE 063

Loading Capacity: 7 TON

Researcher's name: C. Dzuya

No. of Crew: 2

Estimated Volume: 3m³

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site			11 : 17			
Loading-1			12 : 0	43		Ronald Ngala street through
			12 : 10		10	Muranga road-Thika road-
			:			Moi Avenue-Tom Mboya -
			:			Ronald Ngala
Dumping site			13 : 20	70		Dandora through Ronald
Start dumping			13 : 26	6		Ngara-Accra Mama Ngina-Muranga
Finish dumping			13 : 27		1	Ngara-Juja Komarock rd. and
Dumping site			13 : 31	4		back through same route
Reach to workshop			14 : 0	29		
Total		0		152	11	Total min.: 163min.
Collection		0		0	10	
Transportation		0		142	0	
Inside the dumping site		0		10	1	Dumping time
Idling time						

Time & Motion Study

Organization:N.C.C

Trip- 1 Date:18th May 1997

Vehicle No.KWE 071

Loading Capacity:7.99 TON

Researcher's name: Julius Masaba

No. of Crew:4

Estimated Volume:4 TON

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop out	203377		10 : 53			Jogoo road
			:			Mumias road-
			:			Outering road-
			:			stayed Depot for 10min
			:			Komorock road
Dumping site in	203393	16000	11 : 45	52		
Start dumping			:			
Finish dumping			:		0	
Dumping site out	203396	3,000	12 : 5	20		
Reach to workshop in	203412	16,000	12 : 50	45		
Total		35,000		117	0	Total min.: 117 min.
Collection		0		0	0	
Transportation		32,000		87		
Inside the dumping site		3,000		20	0	Dumping time
Idling time				10		

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 18th May 1997

Vehicle No. KWE 081

Loading Capacity: 8 TON

Researcher's name: Samuel Kimotho

No. of Crew: 4

Estimated Volume: 42m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	185881		8 : 30			Kaloleni to city Center
Loading-1	in	185897	16,000	10 : 53	143		Deport
	out			12 : 36		103	Vehicle had a
Loading-2	in	185897	0	12 : 39	3		puncture and taken
	out			14 : 19		100	to garage for
Loading-3	in	185897.9	900	14 : 30	11		service
	out			15 : 15		45	Idling time for
							servicing 9:20 to 10:45
							loading point 1:
							Moi Avenue near
							Ambassader
							Loading point 2:
							Ronald Ngara
							Post office
							Loading point 3:
							Ronald Ngara
							Jogoo road - Lusaka
							road- BuruBuru-
							Kariobangi south -
							Dandora Dumping site
							Idling time for
							lunch 3:26 to 3:39
							4 loaders in the
							exercise
Dumping site	in	185919	21,100	16 : 45	90		
Start dumping				17 : 3	18		
Finish dumping				17 : 13		10	
Dumping site	out	185924	5,000	17 : 17	4		
Reach to workshop	in	185934	10,000	18 : 36	79		
Total			53,000		348	258	Total min.: 606 min.
Collection			900		14	248	
Transportation			47,100		214		
Inside the dumping site			5,000		22	10	Dumping time
Idling time					98		98min lunch break

Time & Motion Study

Organization:N.C.C

Trip- I Date:18 th May 1997

Vehicle No.Kwe 084

Loading Capacity:9.5 TON

Researcher's name: Hillary Githua N.

No. of Crew: 11

Estimated Volume:24m³

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop out	9921.4		8 : 13			Kaloleni via Jogoo road to Dumping site(Dandora)
Dumping site in	9927.2	5,800	8 : 31	18		
Start dumping			:			
Finish dumping			:		0	
Dumping site out	9929.4	2,200	8 : 40	9		
Reach to workshop in			:			
Total		8,000		27	0	Total min.: 27 min.
Collection		0		0	0	
Transportation		5,800		18		
Inside the dumping site		2,200		9	0	Dumping time
Idling time						

Time & Motion Study

Organization: N.C.C

Trip-2 Date: 18 th May 1997

Vehicle No. Kwe 081

Loading Capacity: 9.5 TON

Researcher's name: Hillary Githua N.

No. of Crew: 11

Estimated Volume: 24m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumpingsite	out	99274	0	8 : 40			Dandora-Dagoret Depot
							8:40-9:26
Loading-1	in	99304	30,000	9 : 35	55		Deport-Milimani Hotel along
	out		0	10 : 0		25	Ngong Valley road
Loading-2	in	99305	1,000	10 : 3	3		Sagret Hotel via Milimani road
	out		0	10 : 13		10	
Loading-3	in	99305.4	400	10 : 15	2		Sagret - Heron court Hotel
	out		0	10 : 30		15	
Loading-4	in	99307.5	2,100	10 : 35	5		Heron court - Silver spring hotel
	out		0	10 : 54		19	
Loading-5	in	99310	2,500	11 : 0	6		Along Archwing kodek road-
	out		0	11 : 7		7	Abloy Limo via wood Avenue
Loading-6	in	99310	10	11 : 10	3		Limo- Black rose apartment
	out		0	11 : 25		15	Via Kirichwa road
Loading-7	in	99312.9	2,900	11 : 32	7		University Flats(Yaya Centre)
	out		0	12 : 5		33	via ring road Kilimani
Loading-8	in	99316.2	3,300	12 : 15	10		Flora Hostel Consolata(sisters)
	out		0	12 : 18		3	off 5th Ngong Avenue
Loading-9	in	99316.3	100	12 : 19	1		Tiva A and B Flats off 5th
	out		0	12 : 23		4	Nfgong Avenue
Loading-10	in	99316.8	500	12 : 27	4		Ashoka Flats off
	out		0	12 : 40		13	3rd Ngong avenue
Loading-11	in	99317.2	400	12 : 42	2		Mama Dorris Flat off
	out		0	12 : 52		10	3rd Ngong Avenue
Loading-12	in	99320.6	3400	13 : 22	30		Panafrica hotel off valley road
	out		0	14 : 10		48	
							Idle time: 9:35 to 9:58
							10:43 to 10:54
							1:03 to 1:15
							1:45 to 2:05
							2:10 to 2:30
							2:30 to 2:56
Dumping site	in	99349.9	29,300	15 : 7	57		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	99353.9	4,000	15 : 40	33		
Reach to workshop	in	99365.1	11,200	16 : 0	20		
Total			91110		238	202	Total min.: 440 min.
Collection			16,610		61	148	
Transportation			70,500		40		
Inside the dumping site			4,000		33	0	Dumping time
Idling time					104	54	

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 18th May 1997

Vehicle No. Kwe 245

Loading Capacity: 8TON

Researcher's name: Peter kiama Karoki

No. of Crew: 11

Estimated Volume: 13m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	161443.7		8 : 0			To Ngara office
Loading-1	in	161448.5	4,800	8 : 25	25		Ardi Co.Saving and
	out			8 : 36		11	credit
Loading-2	in	161448.9	400	8 : 37	1		Ngara uphill hotel
	out			8 : 45		8	
Loading-3	in	161449.8	900	8 : 50	5		Near Catholic Relief
	out			9 : 5		15	SCC(westlands)
Loading-4	in	161452.7	2,900	9 : 15	10		Westlands
	out			9 : 37		22	
Loading-5	in	161452.9	200	9 : 39	2		Green house(westlands)
	out			9 : 51		12	
Loading-6	in	161456.2	3,300	10 : 5	14		Bids Apartments
	out			10 : 30		25	
Loading-7	in	161457.9	1,700	10 : 39	9		MP Shah Hospital
	out			11 : 37		58	
Loading-8	in	161465.9	8,000	12 : 15	38		Ngara office
	out			12 : 20		5	
Dumping site	in	161479.8	13,900	12 : 43	23		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	161482.1	2,300	12 : 53	10		
Reach to workshop	in	161495.7	13,600	15 : 53	180		Car wash 13:30 to 15:32
Total			52,000		317	156	Total min.: 473 min.
Collection			17,400		79	156	
Transportation			32,300		106		
Inside the dumping site			2,300		10	0	Dumping time
Idling time					122		car wash

Time & Motion Study

Organization:N.C.C

Trip- 1 Date:19th May 1997

Vehicle No.KAB 292Q

Loading Capacity:6 TON

Researcher's name: George N. Kamau

No. of Crew:9

Estimated Volume:2.5 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	75075		8 : 20			
Loading-1	in	75095	20,000	13 : 32	312		Mfangano Lane
	out			14 : 10		38	
Loading-2	in	75095.2	200	14 : 15	5		Mfangano st
	out			14 : 30		15	
Loading-3	in	75096.2	1,000	14 : 38	8		Bank street
	out			15 : 0		22	
				:			Puncture after leaving
				:			workshop.vehicle left
				:			to Garage in industrial
				:			area via Ladhiesroad
				:			Haiteselasie-Uhuru highway
				:			Garage 9:30-12:48
							We were delayed in both
							case by traffic jam
Dumping site	in	75111.2	15,000	16 : 0	60		Dandora through Tom
Start dumping				:			Mboya- Ngara road-
Finish dumping				16 : 2		2	Muranga road-Thika road
Dumping site	out	75112.2	1,000	16 : 4	2		
Reach to workshop	in	75120.2	8,000	16 : 38	34		
Total			45,200		421	77	Total min.: 498 min.
Collection			1,200		13	75	
Transportation			43,000		208		
Inside the dumping site			1,000		2	2	Dumping time
Idling time					198		

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 19th May 1997

Vehicle No: KAB 382Q

Loading Capacity: 7 TON

Researcher's name: Debora A. Masaba

No. of Crew: 2

Estimated Volume: 7 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	7293.9		8 : 0			Garage 8:09-8:34
Loading-1	in	7304	10,100	10 : 19	139		Ngara depot 8:51
	out			10 : 22		3	Muranga road - Thika road -
Loading-2	in	7304.1	100	10 : 24	2		outring road- Komorock
	out			10 : 27		3	to Dumping site
							Stopped on the way at
							10:43-10:45
Dumping site	in	7311.6	7,500	10 : 48	21		no trips
Start dumping				:			instead vehicle transporting
Finish dumping				:			workers
Dumping site	out	7318	6,400	10 : 57	9		11:30 Reached in town but
Reach to workshop	in	7335	17,000	12 : 0	63		the tractor broke down
Total			41,100		234	6	Total min.: 240 min.
Collection			100		2	6	
Transportation			34,600		196		
Inside the dumping site			6,400		9	0	Dumping time
Idling time					27		

Time & Motion Study

Organization: N.C.C

Trip- I Date: 19th May 1997

Vehicle No. KAB 388Q

Loading Capacity: 3 TON

Researcher's name: C. Dzuya

No. of Crew: 3

Estimated Volume: 2m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	11,793		8 : 14			NCC workshop at Industrial
Loading- I	in			:			area through Lusaka road
	out			:			Enterprise road-Daresaalam road
							garage road
Dumping site	in						
Start dumping				:			
Finish dumping				:			
Dumping site	out			:			
Reach to workshop	in	11,846	53,000	16 : 25	491		Back through the same routes to
							Jogoo road
Total			53,000		491	0	Total min.: 491 min.
Collection			0		0	0	
Transportation			53,000		491	0	
Inside the dumping site			0		0	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 19 th May 1997

Vehicle No. KAB 389Q

Loading Capacity: 6.9 TON

Researcher's name: Eliud M. Kariuki

No. of Crew: 3

Estimated Volume: 2 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	8977		9 : 29			Kaloleni-Kiejeku road
Loading-1	in	8983	6,000	9 : 54	25		maka sigh road Limuru
	out			10 : 6		12	road parklands-Lower
Loading-2	in	8985	2,000	10 : 8	2		Kabete road-Brook side
	out			10 : 14		6	drive
Loading-3	in	8986	1,000	10 : 16	2		
	out			10 : 21		5	Dandora via muranga
Loading-4	in	8987	1,000	10 : 26	5		road - Thika road - outering road
	out			10 : 29		3	Komarock road to Dumping
Loading-5	in			:			outring road Komarock road
	out			:		0	Komarocroad to Dumping site
Dumping site	in	9002	15,000	10 : 56	27		
Start dumping		9003	1,000	11 : 0	4		
Finish dumping				11 : 1		1	
Dumping site	out	9004	1,000	11 : 5	4		
Reach to workshop	in			:			
Total			27,000		69	27	Total min.: 96 min.
Collection			4,000		9	26	
Transportation			21,000		52		
Inside the dumping site			2,000		8	1	Dumping time
Idling time							

Time & Motion Study

Organization:N.C.C

Trip- 2 Date:19 th May 1997

Vehicle No.KAB 389Q

Loading Capacity:6.9 TON

Researcher's name: Eliud M. Kariuki

No. of Crew:3

Estimated Volume:2 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	9016		11 : 48			Ngara Deport
Loading-1	in	9016.7	700	11 : 52	4		Hare Krisna temple-
	out			14 : 30		158	Ngara road-Ojijo road
Loading-2	in	9019.7	3000	14 : 40	10		Parklands - Westlands
	out			14 : 41		1	
Loading-3	in	9019.9	200	14 : 43	2		To Dandora dumoing site:
	out			15 : 0		17	Parklands-Ojijo road-
Loading-4	in	9020.3	400	15 : 5	5		Ngara road-Muranga road-
	out			15 : 10		5	Thika road-Outering-
Loading-5	in	9020.4	100	15 : 12	2		Komarock to site
	out	9020.7	300	15 : 29		17	
Dumping site	in	9032	11300	15 : 55	26		Dandora-Komarock-
Start dumping		9034	2000	15 : 58	3		outering-Jogoo-
Finish dumping				16 : 0		2	Kaloleni Deport
Dumping site	out	9036	2000	16 : 2	2		
Reach to workshop	in	9046	10000	16 : 30	28		
Total			30000		82	200	Total min.: 282 min.
Collection			4,000		19	198	
Transportation			22,000		58		
Inside the dumping site			4,000		5	2	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 19th May 1997

Vehicle No. KUI. 990

Loading Capacity: 7.9

Researcher's name: George Chege

No. of Crew: 6

Estimated Volume: 10.8m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	202,099		8 : 20			Vehicle had leftover refuse
		202,111	12,000	9 : 30	70		Went to NCC garage (Industrial area)
				9 : 36		6	to (Re) fuel .
				:			Reported at Makadara depot
				:		0	Jogoo road Police station area
Dumping site	in	202,119	8,000	9 : 55	19		Dandora
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	202,122	3,000	10 : 33	38		
Reach to workshop	in			:			
Total			23,000		127	6	Total min.: 133min.
Collection			0		0	0	
Transportation			20,000		89	0	
Inside the dumping site			3,000		38	0	Dumping time
Idling time						6	Fuel

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 19th May 1997

Vehicle No. KUL 990

Loading Capacity: 7.9

Researcher's name: George Chege

No. of Crew: 6

Estimated Volume: 10.8m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	202,122		10 : 33			
Loading-1	in	202,128	6,000	10 : 49	16		Dandora-Mutarakwa-Outering
	out			10 : 54		5	numias road-Amasya crescent-
Loading-2	in			10 : 54	0		BuruBuru-Phase IV
	out			10 : 59		5	
Loading-3	in			11 : 0	1		
	out			11 : 5		5	
Loading-4	in			11 : 6	1		
	out			11 : 8		2	
Loading-5	in	202,129	1,000	11 : 9	1		
	out			11 : 16		7	
Loading-6	in			11 : 18	2		
	out			11 : 27		9	
Loading-7	in			11 : 29	2		
	out			11 : 32		3	
Loading-8	in			11 : 33	1		
	out	202,130	1,000	11 : 39		6	
Loading-9	in			11 : 40	1		
	out			11 : 43		3	
Loading-10	in			11 : 44	1		
	out			11 : 50		6	
Loading-11	in			11 : 50	0		
	out			11 : 55		5	
Loading-12	in			11 : 57	2		
	out			12 : 4		7	
Loading-13	in			12 : 5	1		
	out	202,131	1,000	12 : 17		12	
Loading-14	in			12 : 18	1		
	out			12 : 26		8	
Loading-15	in			12 : 28	2		
	out			12 : 45		17	
Loading-16	in	202,132	1,000	12 : 48	3		
	out			13 : 34		46	Collected garbage that fell off the vehicle while moving.
Loading-17	in	202,134	2,000	13 : 43	9		
	out			13 : 53		10	This included unloading
Dumping site	in	202,142	8,000	14 : 20	27		recyclable garage at Kariobangi
Start dumping				:			
Finish dumping				:			
Dumping site	out	202,144	2,000	15 : 1	41		Returned working tools to
Reach to workshop	in	202,158	14,000	15 : 40	39		Makadara depot-Kaloleni workshop
Total			36,000		151	156	Total min.: 307min.
Collection			6,000		28	156	
Transportation			28,000		82	0	
Inside the dumping site			2,000		41	0	Dumping time
Idling time							

Time & Motion Study

Organization:N.C.C

Trip- 1 Date:19 May 1997

Vehicle No.KUL 991

Loading Capacity:8 TON

Researcher's name: Hillary Githua N.

No. of Crew:7

Estimated Volume:24m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	155363.3		8 : 20			workshop - Muoroto(I.N.C)
							8:33-8:40
Loading-1	in	155376.7	13,400	10 : 0	100		Muoroto - Garage 8:56-9:23
	out			12 : 30		150	-Central Deport 9:42-9:51
							via Haileselesie -
							Tom Mboya st-Race course-
							General store 10:00-12:30
Dumping site	in	155378.4	1,700	12 : 45	15		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	155378.5	100	12 : 58	13		
Reach to workshop	in			:			
Total			15,200		128	150	Total min.: 278 min.
Collection			0		0	150	
Transportation			15,100		72		
Inside the dumping site			100		13	0	Dumping time
Idling time					43		

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 19 May 1997

Vehicle No. KUL 991

Loading Capacity: 8 TON

Researcher's name: Hillary Githua N.

No. of Crew: 7

Estimated Volume: 24m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	155378.5		12 : 58			Dumping site
Loading-1	in	155379.9	1,400	13 : 8	10		Central Deport- General
	out			13 : 40		32	store- Tom Mboya st-
				:			Haifeselasia - Race course
Dumping site	in	155382	2,100	13 : 52	12		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	155382.9	900	14 : 4	12		
Reach to workshop	in			:			
Total			4400		34	32	Total min.: 66 min.
Collection			0		0	32	
Transportation			3,500		22		
Inside the dumping site			900		12	0	Dumping time
Idling time							

Time & Motion Study

Organization:N.C.C

Trip- 3 Date:19 May 1997

Vehicle No.KUJ. 991

Loading Capacity:8 TON

Researcher's name: Hillary Githua N.

No. of Crew:7

Estimated Volume:24m³

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Dumping site	155382.9		14 : 4			Dumping site
Loading-1 in	155383.2	300	14 : 20	16		Central Depot to
out			14 : 45		25	General store
						through Lagos-
						River road -
						Koinane st to
						Race course
Dumping site in	155387.2	4,000	15 : 7	22		FromGeneralstore-
Start dumping			:			Ngara Depot
Finish dumping			:		0	
Dumping site out	155387.3	100	15 : 31	24		
Reach to workshop in	155406.1	18,800	16 : 30	59		Stop over at Aire Force
						Matere 15:52-16:03
Total		23200		121	25	Total min.: 146 min.
Collection		0		0	25	
Transportation		23,100		86		
Inside the dumping site		100		24	0	Dumping time
Idling time				11		

Time & Motion Study

Organization: N.C.C.

Trip-2 Date: 19th May 1997

Vehicle KUL 993

Loading Capacity: 6.22

Researcher's name: D. Akinyi

No. of Crew: 7

Estimated Volume: 4.5 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out			:			Dandora dumping site
Loading-1	in	177,830		14 : 25			Bishan Plaza(westlands)
	out			14 : 27		2	
Loading-2	in	177,831	1,000	14 : 31	4		Caltex petrol station
	out			14 : 37		6	
Loading-3	in	177,831	100	14 : 50	13		Westlands service station
	out			15 : 25		35	
		177,835	3,300	15 : 38	13		Took Headman to handover report at the General office Ngara
				:			
Dumping site	in	177,848	13,800	16 : 0	22		Dandora
Start dumping				:			Kaloleni Deport
Finish dumping				:		0	
Dumping site	out	177,850	2,000	16 : 20	20		
Reach to workshop	in	177,860	9,700	16 : 55	35		
Total			29,900		107	43	Total min.: 150min.
Collection			4,400		30	43	
Transportation			23,500		57	0	
Inside the dumping site			2,000		20	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 19th May 1997

Vehicle No. KUL 994

Loading Capacity: 8 TON

Researcher's name: Peter Kiama Karoki

No. of Crew: 8

Estimated Volume: 10m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	164199		8 : 28			Garage
Loading-1	in	164223.5	24500	10 : 40	132		Kariobangi south
	out			12 : 35		115	
				:			Idling time:
				:			10:08 to 10:25 at
				:			Umoja office
				:			8:35 to 9:07 at
				:			the Garage
				:			
Dumping site	in	164226.3	2800	12 : 45	10		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	164228.4	2100	13 : 5	20		
Reach to workshop	in			:			
Total			29400		162	115	Total min.: 277 min.
Collection			0		0	115	
Transportation			27300		93		
Inside the dumping site			2100		20	0	Dumping time
Idling time					49		

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 19 th May 1997

Vehicle No. KUL 994

Loading Capacity: 8 TON

Researcher's name: Peter Kiama Karoki

No. of Crew: 8

Estimated Volume: 8 m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	164228.4		13 : 5			Dumping site
Loading-1	in	164232.4	4,000	13 : 15	10		Kariobangi south
	out			13 : 30		15	
Dumping site	in	164236	3,600	15 : 15	105		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	164236.9	900	15 : 24	9		
Reach to workshop	in	164251.1	14,200	15 : 55	31		
Total			22700		155	15	Total min.: 170 min.
Collection			0		0	15	
Transportation			21,800		146		
Inside the dumping site			900		9	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 19 th May 1997

Vehicle No. KWE063

Loading Capacity:

Researcher's name: Ali Ami Nassir

No. of Crew: Machine

Estimated Volume: 6m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out		3000	8 : 18			From Kaloleni to Garage (8:30)
Loading-1	in		7,000	10 : 0	102		Ngara Area
	out			10 : 12		12	
Loading-2	in		200	10 : 15	3		Ngala Area
	out			10 : 16		1	
Loading-3	in		50	10 : 17	1		To dumping:
	out			10 : 18		1	limuru road - Masai road
							Agakhan through -
							Limuru road -Forest
							road Thika road-
							Outering road
							Komarock to Dandora
							Idling time: 9:20 to 9:59
Dumping site	in			11 : 15	57		
Start dumping				11 : 21	6		At Dandora
Finish dumping				11 : 23		2	
Dumping site	out			11 : 27	4		
Reach to workshop	in			:			
Total			10,250		173	16	Total min.: 189 min.
Collection			3,250		4	14	
Transportation			7,000		120		
Inside the dumping site			0		10	2	Dumping time
Idling time					39		

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 19 th May 1997

Vehicle No KWE063

Loading Capacity: 7 TON

Researcher's name: Ali Ami Nassir

No. of Crew: 5

Estimated Volume: 6m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out			11 : 29			Dandora to Pangani
Loading-1	in			12 : 54	85		Marie stopes Clinic
	out			12 : 56		2	at Pangani
Loading-2	in			13 : 10	14		From Pangani to Utalii
	out			15 : 1		111	College through Thika road
				:			to Dandora via Ring
				:			road- Juja road-outering
				:			road
				:			
				:			
				:			
				:			Idling time:
				:			12:26 to 12:56
				:			
				:			
Dumping site	in			16 : 9	68		At Dandora
Start dumping				16 : 15	6		Back to workshop through
Finish dumping				16 : 17		2	Juja road - Thika road
Dumping site	out			16 : 19	2		outering- BuruBuru
Reach to workshop	in			16 : 39	20		Jogoo road to Kaloleni
Total			0		195	115	Total min.: 310 min.
Collection			0		14	113	
Transportation			0		143		
Inside the dumping site			0		8	2	Dumping time
Idling time					30		

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 19th May 1997

Vehicle No. KW1 071

Loading Capacity: 7.98

Researcher's name: Alexander Gaititi

No. of Crew: 6

Estimated Volume: 3m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	203430.1		8 : 19			Workshop to City park
Loading-1	in	203443.2	13,100	10 : 43	144		via Jogooroad-Enterprise-
	out			11 : 26		43	Lusaka-Ring road-Kariokor
							Forest road- Limuru-
							road to N.C.C garage (8:27-
							8:59)
							Garage rd.-Enterprise rd.-
							Dar-es-salaam rd.-Lusaka rd.-
							Jogoo rd.-Ring rd.-Kariokor-
							Ring rd. Ngara-Forest rd.-
							Limuru rd.-City park rd.-NCC
							City Park Section 9:25-9:44
							City park section
							Idling time: 9:45 to 10:40
							due to lack of loading point
							kees
Dumping site	in	203445	1,800	11 : 33	7		Dumping site- city
Start dumping				11 : 35	2		park
Finish dumping				11 : 47		12	N.B Truck operates
Dumping site	out	203455.1	10,100	11 : 48	1		inside city park from
Reach to workshop	in	203477.2	22,100	16 : 27	279		11:48 to 4:00
							we were idle
Total			47100		433	55	Total min.: 488 min.
Collection			0		0	43	
Transportation			37,000		324		
Inside the dumping site			10,100		3	12	Dumping time
Idling time					106		

Time & Motion Study

Organization: N.C.C

Trip-1 Date: 19/05/97

Vehicle No. KWE 081

Loading Capacity: 7.97 TON

Researcher's name: Julisius Masaba

No. of Crew: 9

Estimated Volume: 4 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	185954.2		8 : 19			Likoni to Daresalam
Loading-1	in	185956.8	2,600	9 : 1	42		road to Garage road
	out			9 : 23		22	to the workshop
Loading-2	in	185961.3	4,500	9 : 57	34		
	out			10 : 0		3	stoped at the workshop
							8:31 - 8:56
							Garage road -
							Lungalunga- Outering -
							Komorock road
Dumping site	in	185973	11,700	10 : 42	42		
Start dumping				:			
Finish dumping							
Dumping site	out	185975	2000	10 : 57	15		
Reach to workshop	in	185988.2	13,200	11 : 27	30		
Total			34000		163	25	Total min.: 188 min.
Collection			4,500		34	25	
Transportation			27,500		89		
Inside the dumping site			2,000		15	0	Dumping time
Idling time					25		

Time & Motion Study

Organization: N.C.C

Trip-2

Date: 19/05/97

Vehicle No. KWE 081

Loading Capacity: 7.97 TON

Researcher's name: Julisius Masaba

No. of Crew: 9

Estimated Volume: 4 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	185988		14 : 54			Mkena - Lusaka - witu
Loading-1	in	185990.6	2,600	15 : 2	8		Rentokil
	out			16 : 1		59	
							To Dumping site:
							Mombasa road -
							outering road - mutarakwa
							road - Komarock
							road
Dumping site	in			16 : 42	41		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	186012.7	22,100	16 : 48	6		
Reach to workshop	in	186017.3	4,600	17 : 41	53		
Total			29,300		108	59	Total min.: 167 min.
Collection			0		0	59	
Transportation			7,200		102		
Inside the dumping site			22,100		6	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 19th May 1997

Vehicle No. KWE 084

Loading Capacity: 8.0 TON

Researcher's name: Samuel Kimotho

No. of Crew: 1

Estimated Volume: 4.2m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	99367		7 : 55			Koloneni-Jagoo road-
Loading-1	in	99384	17,000	11 : 5	190		Lusaka road-Enterprise road
	out			11 : 10		5	Salamu road to NCC
Loading-2	in	99384.1	100	11 : 15	5		
	out			11 : 16		1	Enterprise road-Mbagathi
Loading-3	in	99384.7	600	11 : 18	2		road-Ngong road-Dagoret
	out			11 : 25		7	road to NCC for picking
Loading-4	in	99385	300	11 : 36	11		worker
	out			11 : 40		4	
Loading-5	in	99385.4	400	11 : 50	10		Dagoret-Ngara road for
	out			12 : 6		16	dropping worker
Loading-6	in	99386.4	1,000	12 : 17	11		Uhuru high way-Lusaka road
	out			12 : 30		13	Jagoo road-Koloneni
Loading-7	in	99387	600	12 : 35	5		
	out			12 : 45		10	
Loading-8	in	99387	0	12 : 48	3		Koloneni-Jagoo road-
	out			12 : 56		8	Lusaka road-Uhuru high way
Loading-9	in	99388.5	1,500	13 : 20	24		Valley road-Milimani road
	out			13 : 25		5	
Loading-10	in	99388.9	400	13 : 34	9		The vehicle went back Uhuru
	out			14 : 5		31	road for picking worker
Loading-11	in	99389.2	300	14 : 15	10		
	out			14 : 20		5	
Loading-12	in	99389.2	0	14 : 20	0		Dagoret-Ngara road-Uhuru
	out			14 : 20		0	high way-Musiamu road-
Loading-13	in	99390.7	1,500	14 : 28	8		Forest road-Thika road-
	out			14 : 30		2	Ring road to Dandora
Loading-14	in	99391.1	400	14 : 36	6		
	out			14 : 40		4	
Loading-15	in	99391.4	300	14 : 56	16		Dumping site-Karubang
	out			15 : 5		9	south road-Ring road
Loading-16	in	99391.4	0	15 : 19	14		Jagoo road to workshop
	out			15 : 25		6	
Dumping site	in	99459	67,600	16 : 8	43		Idling time
Start dumping				16 : 10	2		8:09 to 8:30
Finish dumping		99461	2000	16 : 14		4	9:05 to 9:25
Dumping site	out	99463	2,000	16 : 19	5		15:05 to 15:17
Reach to workshop	in	99474	11,000	16 : 41	22		
Total			107,000		396	130	Total min.: 526 min.
Collection			7,400		122	126	
Transportation			95,600		214		
Inside the dumping site			4,000		7	4	Dumping time
Idling time					53		Fueling/Picking workers

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 19th May 1997

Vehicle No. KWE245

Loading Capacity: 6.9 TON

Researcher's name: Mitchell Adhiambo

No. of Crew: 6

Estimated Volume: 4 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	161500		9 : 45			Kaloleni
Loading-1	in	161502	2,000	9 : 54	9		Dunga road via Jogoo
	out			9 : 55		1	Enterprice road-Mukenia
Loading-2	in	161503	1,000	10 : 0	5		
	out			10 : 15		15	
Loading-3	in	161503	0	10 : 16	1		Mkea through Dunga
	out			12 : 55		159	road - Lusaka via Jogoo
				:			mumias road via
				:			mutaraka road to
				:			Dandora
				:			
Dumping site	in	161518	15,000	13 : 25	30		Dandora
Start dumping				13 : 25	0		
Finish dumping				13 : 27		2	
Dumping site	out			13 : 27	0		
Reach to workshop	in			:			
Total			18,000		45	177	Total min.: 222 min.
Collection			1,000		6	175	
Transportation			17,000		39		
Inside the dumping site			0		0	2	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 19th May 1997

Vehicle No. KWE245

Loading Capacity: 6.9 TON

Researcher's name: Mitchell Adhiambo

No. of Crew: 6

Estimated Volume: 4 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from dumping site	out	161518		13 : 27			
Loading-1	in	161534	16,000	14 : 10	43		Dandora- Mutarakwa road
	out			15 : 35		85	via munias road- Jogoo
				:			Lusaka road- Dunga road
				:		0	Enterprice to wading
				:			site at Kampala
				:		0	
Dumping site	in	161549	15,000	16 : 20	45		
Start dumping				16 : 21	1		
Finish dumping				16 : 25		4	
Dumping site	out			16 : 25	0		
Reach to workshop	in	161564	15,000	16 : 45	20		
Total			46,000		109	89	Total min.: 198 min.
Collection			0		0	85	
Transportation			46,000		108		
Inside the dumping site			0		1	4	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 19th May 1997

Vehicle No.

Loading Capacity: 7.83

Researcher's name: B. Chizi

No. of Crew:

Estimated Volume:

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out			8 : 14			
Loading-1	in	8,491		10 : 28	134		Ngara opposite NCC deport
	out			10 : 30		2	
				:			Through Muranga rd-
				:			to Thika rd. to Outer ring rd.-
				:			Komarock rd. to Dumping site
				:			
				:			
Dumping site	in	8,505	14,000	11 : 0	30		
Start dumping				11 : 0	0		
Finish dumping				11 : 2		2	
Dumping site	out			11 : 2	0		
Reach to workshop	in			11 : 20	18		To collect spare parts at the garage (Industrial area)
Total			14,000		182	4	Total min.:186min.
Collection			0		0	2	
Transportation			14,000		182	0	
Inside the dumping site			0		0	2	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 19th May 1997

Vehicle No.

Loading Capacity: 7.83

Researcher's name: B. Chizi

No. of Crew:

Estimated Volume: 7

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out			:			
Loading-1	in	8,526		12 : 31			Ngara road at Muhoroni
	out			14 : 28		117	Close
Dumping site	in	8,529	3,000	14 : 55	27		Through Muranga road-Thika road
Start dumping				14 : 56	1		outering road-Komarock
Finish dumping				14 : 56		0	and dandora and
Dumping site	out	8,540	11,000	15 : 0	4		Back to workshop Kaloleni
Reach to workshop	in	8,553	13,000	15 : 28	28		
Total			27,000		60	117	Total min.: 177min.
Collection			0		0	117	
Transportation			16,000		55	0	
Inside the dumping site			11,000		5	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 20th May 97

Vehicle No. GK 354

Loading Capacity:

Researcher's name: E. Kainu

No. of Crew: 3

Estimated Volume: 12m³

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out			10 : 54			Westlands limuru road
Loading-1	in			11 : 6	12		City park market
	out			11 : 45		39	
Loading-2	in			:			city park market- Forest road-
	out			:		0	Muranga road-Thika road-
Loading-3	in			:	0		Outering to Dumping site
	out			:		0	
Dumping site	in			12 : 10	25		Dandora
Start dumping				12 : 19	9		Mathare-Gikomba-Jogoo
Finish dumping				12 : 20		1	to Kaloleni
Dumping site	out			12 : 26	6		
Reach to workshop	in			13 : 8	42		
Total			0		94	40	Total min.: 134 min.
Collection			0		0	39	
Transportation			0		79		
Inside the dumping site			0		15	1	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 20th May 1997

Vehicle No. KAB289Q

Loading Capacity: 6 TON

Researcher's name: M. Adhiambo

No. of Crew: 8

Estimated Volume: 3 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out			8 : 10			
Loading-1	in			8 : 35	25		Buruburu phase IV
	out			8 : 45		10	
Loading-2	in			8 : 46	1		Lagorinyo court
	out			9 : 10		24	
Loading-3	in			9 : 11	1		Buburu phase II
	out			9 : 25		14	
Loading-4	in			9 : 30	5		Langa Linga court
	out			9 : 35		5	
Loading-5	in			9 : 36	1		Lamiro court
	out			9 : 39		3	
Loading-6	in			9 : 40	1		Lukere court
	out			9 : 50		10	
Loading-7	in			9 : 51	1		tushonde court
	out			9 : 52		1	
Loading-8	in			9 : 53	1		
	out			9 : 55		2	
Loading-9	in			10 : 0	5		Kikambuoni court
	out			10 : 5		5	
Loading-10	in			10 : 9	4		Kibaoni court
	out			10 : 21		12	
Loading-11	in			10 : 24	3		Kipsuat court
	out			10 : 35		11	
Loading-12	in			10 : 35	0		Kadamo court
	out			10 : 40		5	
Loading-13	in			10 : 40	0		kiso court
	out			10 : 49		9	
Loading-14	in			10 : 49	0		
	out			10 : 50		1	
Loading-15	in			10 : 51	1		
	out			10 : 53		2	
Loading-16	in			10 : 54	1		
	out			10 : 55		1	
Loading-17	in			10 : 55	0		
	out			11 : 0		5	
Loading-18	in			11 : 0	0		
	out			11 : 4		4	
Loading-19	in			11 : 5	1		
	out			11 : 10		5	

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 20 th May 1997

Vehicle No. KAB289Q

Loading Capacity: 6 TON

Researcher's name: M. Adhiambo

No. of Crew: 8

Estimated Volume: 3 TON

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Dumping site in			11 : 45	35		
Start dumping			11 : 46	1		
Finish dumping			11 : 47		1	
Dumping site out			11 : 47	0		
Reach to workshop in			:			
Total		0		87	130	Total min.: 217 min.
Collection		0		26	129	
Transportation		0		60		
Inside the dumping site		0		1	1	Dumping time
Idling time						

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 20 th May 1997

Vehicle No. KAB289Q

Loading Capacity: 6 TON

Researcher's name: M. Adhiambo

No. of Crew: 8

Estimated Volume: 3 TON

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out			11 : 47			From Dandora through
Loading-1	in			12 : 10	23		Komarock road
	out			12 : 25		15	Dandora through Mumial
Loading-2	in			12 : 26	1		road to Buruburu prase
	out			12 : 55		29	
Loading-3	in			13 : 5	10		
	out			13 : 10		5	
Loading-4	in			13 : 10	0		
	out			13 : 20		10	
Loading-5	in			13 : 21	1		Buruburu phase4
	out			13 : 25		4	
Loading-6	in			13 : 29	4		Nagomeni court
	out			13 : 35		6	
Loading-7	in			13 : 36	1		Songon court
	out			13 : 40		4	
Loading-8	in			13 : 41	1		Thima court
	out			13 : 42		1	
Loading-9	in			13 : 44	2		Akis court
	out			13 : 50		6	
Loading-10	in			13 : 55	5		Hhage court
	out			13 : 56		1	
Loading-11	in			14 : 0	4		Ntima court
	out			14 : 1		1	
Loading-12	in			14 : 2	1		Nkema court
	out			14 : 6		4	
Loading-13	in			14 : 6	0		Baohmi court
	out			14 : 10		4	
Loading-14	in			14 : 11	1		
	out			14 : 14		3	
Loading-15	in			14 : 15	1		
	out			14 : 23		8	
Loading-16	in			14 : 23	0		
	out			14 : 24		1	
Loading-17	in			14 : 24	0		
	out			14 : 27		3	
Loading-18	in			14 : 29	2		
	out			14 : 31		2	
Loading-19	in			14 : 32	1		
	out			14 : 40		8	

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 20 th May 1997

Vehicle No. KAB289Q

Loading Capacity: 6 TON

Researcher's name: M. Adhiambo

No. of Crew: 8

Estimated Volume: 3 TON

Location	Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Dumping site in			15 : 25	45		
Start dumping			15 : 26	1		
Finish dumping			15 : 27		1	
Dumping site out			15 : 27	0		
Reach to workshop in			16 : 20	53		
Total		0		157	116	Total min.: 273 min.
Collection		0		58	115	
Transportation		0		98		
Inside the dumping site		0		1	1	Dumping time
Idling time						

Time & Motion Study

Organization: N.C.C

Trip- 1 Date: 20 th May 1997

Vehicle No. KAB 388Q

Loading Capacity: 6.9 TON

Researcher's name: Eliud M. Kariuki

No. of Crew: 1

Estimated Volume: 4 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	11846.1		8 : 6			Kaloleni depot
Loading-1	in	11854.4	8300	9 : 16	70		Truck had to report to Ngara
	out			9 : 47		31	depot for duty allocation
				:			reached Ngara at 8:25 via
				:			Jogoo road- Haileselasia- Ngara
				:			road-Ngara depot
				:			
				:			Ngara depot-
				:			Ojjo road- parklands road
				:			ring road-westlands-
				:			westlands market
				:			route to Dandora ;Ring road-
				:			parklands road Linuru Ngara
				:			road-parks road-Landhies road
Dumping site	in	11874	19600	10 : 30	43		Jogoo road-Mutarakwa-dandora
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	11875	1000	10 : 47	17		
Reach to workshop	in			:			
Total			28900		130	31	Total min.: 161 min.
Collection			0		0	31	
Transportation			27900		113		
Inside the dumping site			1000		17	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 2 Date: 20 th May 1997

Vehicle No. KAB 388Q

Loading Capacity: 6.9 TON

Researcher's name: Eliud M. Kariuki

No. of Crew: 1

Estimated Volume: 3 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	11875		10 : 47			Dandora depot
Loading-1	in	11887	12,000	11 : 6	19		Dandora-Komarock-Outering
	out			11 : 53		47	road-Thika road-Forest road
Loading-2	in			:			Limuru-City park(Hawkers
	out			:		0	market
Loading-3	in			:	0		to dumping
	out			:		0	Same route as above
Dumping site	in	11899	12,000	12 : 12	19		
Start dumping		11901	2,000	12 : 19	7		
Finish dumping		11902	1000	12 : 20		1	
Dumping site	out	11903	1,000	12 : 26	6		
Reach to workshop	in			:			
Total			28,000		51	48	Total min.: 99 min.
Collection			0		0	47	
Transportation			24,000		38		
Inside the dumping site			4,000		13	1	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 3 Date: 20 th May 1997

Vehicle No. KAB 388Q

Loading Capacity: 6.9 TON

Researcher's name: Eliud M. Kariuki

No. of Crew: 1

Estimated Volume: 4.5 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	11903		12 : 43			Dandora
Loading-1	in	11915	12,000	13 : 3	20		
	out			13 : 16		13	Route same as for trip two
Loading-2	in			:			
	out			:		0	Same collection point
Dumping site	in	11927	12,000	13 : 35	19		
Start dumping				:			
Finish dumping				:		0	
Dumping site	out	11931	4,000	13 : 51	16		
Reach to workshop	in			:			
Total			28,000		55	13	Total min.: 68 min.
Collection			0		0	13	
Transportation			24,000		39		
Inside the dumping site			4,000		16	0	Dumping time
Idling time							

Time & Motion Study

Organization: N.C.C

Trip- 4 Date: 20 th May 1997

Vehicle No. KAB 388Q

Loading Capacity: 6.9 TON

Researcher's name: Eliud M. Kariuki

No. of Crew: 1

Estimated Volume: 4 tons

Location		Mileage (km)	Distance (m)	Time	Moving time (min.)	Loading time (min.)	Remarks (route)
Start from workshop	out	11931		13 : 51			Dandora dumping site
Loading-1	in	11945	14000	14 : 25	34		Ojijo road
	out			14 : 36		11	
Loading-2	in	11947.5	2500	14 : 41	5		Ojijo road- forest road-Kolobot
	out			:			road-Samburu lane near stima
Loading-3	in			:	0		place To dumping
	out			:		0	Muranga road-Thika
Loading-4	in			:	0		road-Outering road
	out			:		0	
Dumping site	in	11960	12500	15 : 24	43		
Start dumping		11961	1000	15 : 29	5		
Finish dumping				15 : 30		1	
Dumping site	out	11962	1000	15 : 34	4		
Reach to workshop	in	11973.8	11800	15 : 50	16		
Total			42800		107	12	Total min.: 119 min.
Collection			2,500		5	11	
Transportation			38,300		93		
Inside the dumping site			2,000		9	1	Dumping time
Idling time							