3-3　相手国側負担事業の概要

本計画が実施される場合の「ケ」国政府の分担事項は以下のとおりである。

- 本計画の実施上必要な資料／情報の提供
- 工事のために必要な現場事務所、資材置き場、作業場等の用地の提供
- 工事に必要な土取場、土捨場、産廃捨て場用地の確保
- 本計画に関し日本に口座を開設する銀行の手数料の負担
- 本計画の資機材輸入の免税措置、通関手続きおよび速やかな国内輸送のための措置
- 本計画に従事する日本人および実施に必要な物品／サービス購入の際の課税免除
- 本計画に従事する日本人が「ケ」国へ入国および滞在するために必要な法的措置
- 本計画を実施するために必要な許認可の取得または発行（EIA 承認、建設許可、工事中の交通規制等の許可、迂回路の設置許可、河川内工事許可、土工事許可）
- プロジェクト実施に支障となる電柱・通信線・その他埋設管等の移設
- 道路建設後の適切な使用および維持管理
- 本計画実施において住民または第三者と問題が生じた場合、その解決への協力
- 両国の分担取り決めの基づく本計画実施上必要となる経費のうち、日本国の無償資金協力によるもの以外の経費の負担
- 工事中のサイトの安全確保

3-4　プロジェクトの運営・維持管理計画

(1) 運営・維持管理の体制

対象道路は、ケニア都市道路公社（KURA）により維持管理される。ケニア都市道路公社は2009年７月に正式発足したばかりの組織であり、実績はまだ無いため、組織としての実施能力については未知数である。ただし、人員的には道路省・地方自治省・ナイロビ市等の道路担当部局の技官が転属していること、組織変更前にはプロジェクト実施や維持管理についての問題は特にないこと等から、組織が機能すれば、今後大きな問題はないと推測される。

(2) 維持管理業務の内容

必要な維持管理業務は次のとおりである。

- 定期的維持・補修
- 路面・排水施設・道路付属物等の点検・清掃
- 不定期的維持・補修
- 舗装クラックのシーリング、パッチング、路面表示の再塗装、その他破損個所の補修

(3) 現状の維持管理業務の実施状況と留意点

現状の維持管理業務の実施状況は次のとおりである。

- 既存車道、舗装の補修は比較的よく実施されている。
- 排水施設の清掃が計画的に実施されていない。市内の至る所で排水清掃実施状況を見かけたが、詰まったままで長年機能を失っている個所や、雨の後の冠水箇所も見受けられる。

事業効果を十分に発現・持続させるため、道路の維持管理を十分に行い、常に良好な走行条件を保つとともに、施設の耐久性の向上を図ることが重要であり、特に次の点に留意する必要がある。

- 定期的に点検を行い、施設の状況を把握しておくこと。
- 清掃、特に排水施設の清掃を十分に行うこと。
- 維持管理に必要な予算を確保すること。

3-5　プロジェクトの概算事業費

3-5-1　協力対象事業の概算事業費

本協力対象事業を実施する場合に必要となる事業費総額は 24.77 億円となり、先に述べた日本と「ケ」国との負担区分に基づく双方の経費内訳は、下記(3)に示す積算条件によれば、次のとおりと見積もられる。ただし、この額は交換公文上の供与限度額を示すものではない。

(1)　日本側負担経費

ナイロビ国西部環状道路建設計画

概略総事業費　　約 2,287 百万円

ナイロビ市未接続道路整備　　延長　約 8.4 km

費　目				概略事業費（百万円）	
施　設	道路工	掘削工 舗装工	盛土工 法面工	1,238	2,197
	排水工	側溝工 カルバート工	パイプ工	735	
	道路付帯工	路側工 標識設置 防護柵	擁壁工 区画線 道路照明	224	
実施設計・施工監理				90	

(2)　「ケ」国側負担経費　156.0 百万シリング（約 190.3 百万円）

① 家屋移転補償費	12.7百万シリング	（約15.5百万円）
② 土地収用費	111.8百万シリング	（約136.4百万円）
③ 移転補償費（人）	5.0百万シリング	（約6.1百万円）
④ 外部による移転監視費	1.9百万シリング	（約2.3百万円）
⑤ ユーティリティー移設費	16.0百万シリング	（約19.5百万円）
⑥ 環境アセスメント対策費	7.8百万シリング	（約9.5百万円）
⑦ 銀行手数料	0.8百万シリング	（約1.0百万円）

(3)　積算条件

① 積 算 時 点：平成21年4月
② 為替交換レート：1 US$＝96.08円　　1 Ksh＝1.22円
③ 施 工 期 間：詳細設計・工事の期間は、実施工程に示したとおり。
④ そ　の　他：日本国政府の無償資金協力の制度を踏まえて行うこととする。

3-5-2 運営・維持管理費

本プロジェクトで改修される道路の定期点検・日常維持管理および補修はケニア都市道路公社（KURA）により実施される。

維持管理に必要な年間の費用は、2,342 千シリング（約 US$30,400）と見込まれる。その内訳を表 3-5-1 に示す。

表 3-5-1 主な維持管理項目と年間費用

単位：シリング

1. 定期点検

施設名	点検項目	巡回の頻度	点検人員	使用資機材	所要数量	単価	金額
舗装 路肩・法面 路面標示 排水施設	ｸﾗｯｸ、不陸、ﾎﾟｯﾄﾎｰﾙ等 雨水による侵食、崩壊等 損傷、変形、汚れ、剥離 障害物の有無	12回/年 所要日数 1日/回	2名	スコップ、 ハンマー、 カマ、バリケード 小型トラック	延24人日/年 延12台・日/年 ＝96時間･台/年 (1日8時間)	2,500/日 2,500/時	60,000 240,000
					小 計		300,000

2. 日常維持管理

施設名	点検項目	巡回の頻度	点検人員	使用資機材	所要数量	単価	金額
清掃 排水施設 舗装 路肩 路面標示	土砂、障害物の撤去 清掃 草刈り、清掃 清掃	4回/年 所要日数 4日/回	5名	スコップ、 ハンマー、 カマ、バリケード 小型トラック (2台) （第1日・4日のみ2日間）	延80人日/年 延8台/年 ＝64時間･台/日 (1日8時間)	5,000/人･日 6,000/時･台	400,000 384,000
					小 計		784,000
					定期点検・清掃合計		1,084,000

3. 補 修

施設名	実施項目	補修の頻度	単価 (年・km当たり)	対象道路区間
舗装	ポットホールのパッチング等	5年に1回	69,200	8.36km
路肩／法面	破損部分の補修	5年に1回	9,500	
排水施設	破損部分の補修	2年に1回	57,400	
道路付帯施設他	破損部分の補修	5年に1回	4,800	
躯体	破損部分の補修	10年に1回	9,600	
		小 計	150,500	1,258,000
			合 計	2,342,000

3-6　協力対象事業実施に当たっての留意事項

「ケ」国側の負担事項について 3-2-4-3 節および 3-3 節に述べている。プロジェクトの実施に大きな影響を与える事項として、道路用地内で商業活動を営むプロジェクト影響住民（PAPs）の移転を住民移転計画書（RAP）に基づき工事開始までに完了させる必要がある。RAP は既に承認済みであり、移転の為の代替地も用意されているため、実施機関は十分な余裕を持った移転期限を公示して影響住民の自発的な退去を促す努力が求められる。

この他に道路用地内の登記されてしまった土地の買い戻し、埋設物・架空線の移設も工事開始前に解決すべき事項であり、これらの「ケ」国側負担事項の進捗状況を適宜フォローアップしていくことが円滑な事業実施に不可欠である。

実施設計の開始以降は、コンサルタントを中心として日本側関係機関と連携しながら、「ケ」国側実施機関に対する助言や指導等を行い、工事開始までに必要な措置が完了するよう補助していくべきであると思われる。

第4章　プロジェクトの妥当性の検証

4-1　プロジェクトの効果

プロジェクト実施による直接効果および間接効果を下表に示す。

表 4-1-1　プロジェクト実施による直接効果および間接効果

現状と問題点	協力対象事業での対策	直接効果・改善程度	間接効果・改善程度
現道は渡河部で分断されているため、迂回路での渋滞が激しい。 歩道が未整備のため、徒歩・自転車通勤者の通行が困難である。	・道路の改修	①オフピーク時の通行時間がML3~ML6(4.61km)で 14 分から 8 分に、ML7(3.75km)で 13 分から 6 分に短縮される。 ②歩道・自転車道が整備され、歩行者・自転車の通行が安全かつ快適となる。	①プロジェクト道路の改修により、周辺道路の交通渋滞が緩和される。 ②物流のアクセスが改善され、地域経済の活性化に寄与する。

4-2　課題・提言

4-2-1　相手国側の取り組むべき課題・提言

プロジェクトの効果を十分に発現・持続させるために、「ケ」国が取り組むべき課題は次のとおりである。

①維持管理を十分に行うこと。特に排水施設の清掃は、道路の早期劣化を防ぐために重要である。

②長期的な維持管理プログラムに従った道路維持管理予算を確保し、人材育成を行うこと。

4-2-2　技術協力・他ドナーとの連携

現在、ナイロビ市内では、交差点改良や交通信号の設置、歩道の整備などの道路整備事業が自国予算で実施されており、プロジェクト完了後の運営・維持管理についても特に問題は無く、技術協力のニーズは低い。本プロジェクト道路は、ナイロビ市中心部の環状道路の一部を形成するものである。環状道路の一部区間は EU の援助によって整備が進められる計画であり、本プロジェクトとの相乗効果が期待される。

4-3　プロジェクトの妥当性

以下の点から、我が国の無償資金協力により協力事業を実施することは妥当であると判断される。

①プロジェクトの直接受益者は道路利用者および周辺地域住民であり、間接受益者はナイロビ市民 300 万人であり、その数が多数である。

②「ケ」国が独自の資金と人材・技術で運営・維持管理を行うことができ、過度に高度な技術を必要としない。

③本事業は、国家開発計画「富と雇用創出のための経済再生戦略投資プログラム」のなかの重要課題の一つである基本インフラ整備の一環を担う。また、ナイロビ市人口は急激な勢いで増加しており、渋滞対策における緊急性も高い。

④環境社会面で道路改修効果後の交通事故対策について、交通安全施設、交差点改良、歩道等の対策を十分に講じている。

⑤我が国の無償資金協力の制度により、特段の困難なくプロジェクトの実施が可能である。

4-4　結論

本プロジェクトは、前述のような効果が期待されると同じに、円滑で安全な都市交通を確保し、地域の社会経済活動を活性化させ、広く住民の生活改善に寄与するものである。したがって、我が国の無償資金協力を実施することの妥当性が確認される。ナイロビ市内の道路網が整備され、維持管理が確実に実施されることにより、本プロジェクトの効果はさらに大きくなるものと考えられる。

《資　　料》

1．　調査団員氏名・所属

2．　調査日程

3．　関係者(面会者)リスト

4．　討議議事録（M/D）

5．　テクニカルノート

6．　ECZ 環境許可書

7．　事業事前計画表(概略設計時)

8．　収集資料リスト

9．　技術資料

1. 調査団員氏名、所属

(1) 概略設計現地調査（2009 年 3 月 22 日～2009 年 4 月 30 日）

	氏　名	担　当	所　属
1	高橋　嘉行	総括	JICA ケニア事務所長
2	若宮　愛	計画管理	JICA 経済基盤開発部運輸交通・情報通信第一課
3	礒元　賢志	業務主任／交通計画	片平エンジニアリング・インターナショナル
4	村上　啓一	副業務主任／道路設計・付帯設備設計	片平エンジニアリング・インターナショナル
5	井澤　衛	橋梁・構造物設計	片平エンジニアリング・インターナショナル
6	青木 康司	自然条件調査	片平エンジニアリング・インターナショナル
7	畠山　祐二	環境社会配慮	片平エンジニアリング･インターナショナル（補強）
8	佐藤　正	施工計画・調達／積算	片平エンジニアリング・インターナショナル
9	山宿　壮	施工計画・調達／積算Ⅱ	片平エンジニアリング・インターナショナル（自社負担）

(2) 概略設計概要説明（2009 年 10 月 21 日～2009 年 10 月 28 日）

	氏　名	担　当	所　属
1	讃井　一将	総括	JICA 経済基盤開発部運輸交通・情報通信グループ
2	礒元　賢志	業務主任／交通計画	片平エンジニアリング・インターナショナル
3	村上　啓一	副業務主任／道路設計・付帯設備設計	片平エンジニアリング・インターナショナル

2. 調査日程

(1) 概略設計現地調査（2009 年 3 月 23 日～4 月 29 日）

Name			Mr.Takahashi	Mr. Ito	Ms. Wakamiya	Mr.Isomoto	Mr.Murakami	Mr.Sato	Mr.Aoki	Mr.Izawa	Mr.Hatakeyama	Mr.Yamajuku
Position			Team Leader, Chief Representative (JICA Kenya Office)	Deputy Team Leader, Deputy Director General (JICA HQ)	Officer in charge of the Project (JICA HQ)	Project Manager / Transport Plan (Katahira & Engineers International)	Assistant Project Manager/Road Design (Katahira & Engineers International)	Civil Work Plan and Procurement (Katahira & Engineers International)	Natuaral Condition Survey (Katahira & Engineers International)	Bridge & Structure Design (Katahira & Engineers International)	Environment Study (Project Environemnt)	Civil Work Plan and Procurement II (Katahira & Engineers International)
No.	Date	Day										
1	23-Mar-09	Mon				Arrive at Nairobi / Visit at **JICA Kenya Office**			Arrive at Nairobi / Visit at **JICA Kenya Office**			
2	24-Mar-09	Tue				Coutecy call at **Ministry of Local Government, CCN**			Coutecy call at **Ministry of Local Government, CCN**			
3	25-Mar-09	Wed				Consutation on Local Consultants Contract	Site survey		Consutation on Local Consultants Contract			
4	26-Mar-09	Thu				Site survey			Site survey			
5	27-Mar-09	Fri				Consutation on Local Consultants Contract	Site survey		Consutation on Local Consultants Contract			
6	28-Mar-09	Sat			Haneda-Kansai	Site survey	Site survey	Haneda-Kansai	Site survey	Haneda-Kansai		
7	29-Mar-09	Sun			Dubai-Nairobi			Dubai-Nairobi		Dubai-Nairobi		
8	30-Mar-09	Mon	Kick off meeting with **Local Government, CCN**		Coutecy visit at **Embassy of Japan / JICA Kenya Office** / Kick off meeting with **Local Government, CCN**							
9	31-Mar-09	Tue		Tanzania-Kenya	Consultation of the project with GoK		Site survey		Supervision of Local Consultants	Site survey		
10	01-Apr-09	Wed		Site visit			Consultation of Road Plan	Site survey	Supervision of Local Consultants	Site survey		
11	02-Apr-09	Thu		Visit at Doner (EU, WB etc) / Site visit of project site			Consultation of Road Plan	Data collection	Supervision of Local Consultants	Site survey		
12	03-Apr-09	Fri		Nairobi-Dubai	Visit at Doner (EU, WB etc) / Site visit of project site		Consultation of Road Plan	Data collection	Supervision of Local Consultants	Consultation of Bridge & Structure Design	Meeting with **Local Government**	
13	04-Apr-09	Sat		Kansai-Haneda			Site survey		Site survey			
14	05-Apr-09	Sun					Data analysis		Supervision of L.C.			
15	06-Apr-09	Mon			Confirmation of MD	Confirmation of MD / Study of the Project Site / Supervision of Local Consultants		Planing of Execution of Civil Works	Supervision of Local Consultants	Consultation of Bridge & Structure Design	Environmnetal and Social Impact Study	
16	07-Apr-09	Tue	AM **Signing of Minuite of Discussion**		AM **Signing of Minuite of Discussion** PM Nairobi-Dubai	AM **Signing of Minuite of Discussion** PM Site Survey		Planing of Execution of Civil Works	Supervision of Local Consultants	Consultation of Bridge & Structure Design	Environmnetal and Social Impact Study	
17	08-Apr-09	Wed			Kansai-Haneda	Study of the Project Site	Consultation of Road Plan	Planing of Execution of Civil Works	Supervision of Local Consultants	Consultation of Bridge & Structure Design	Environmnetal and Social Impact Study	Arrive at Nairobi
18	09-Apr-09	Thu				AM Site visit with **MoL, MoLG, CCN** PM Study of the Project site	Consultation of Road Plan	Planing of Execution of Civil Works	AM Site visit with **MoL, MoLG, CCN** PM Supervision of Local Consultants	Consultation of Bridge & Structure Design	Environmnetal and Social Impact Study	Site visit with **MoL, MoLG, CCN**
19	10-Apr-09	Fri				Study of the Project Site	Consultation of Road Plan	Planing of Execution of Civil Works	Study of the Project Site / Supervision of Local Consultants		Environmnetal and Social Impact Study	Planing of Execution of Civil Works

Name			Mr.Takahashi	Mr. Ito	Ms. Wakamiya	Mr.Isomoto	Mr.Murakami	Mr.Sato	Mr.Aoki	Mr.Izawa	Mr.Hatakeyama	Mr.Yamajuku
Position			Team Leader, Chief Representative (JICA Kenya Office)	Deputy Team Leader, Deputy Director General (JICA HQ)	Officer in charge of the Project (JICA HQ)	Project Manager / Transport Plan (Katahira & Engineers International)	Assistant Project Manager/Road Design (Katahira & Engineers International)	Civil Work Plan and Procurement (Katahira & Engineers International)	Natuaral Condition Survey (Katahira & Engineers International)	Bridge & Structure Design (Katahira & Engineers International)	Environment Study (Project Environemnt)	Civil Work Plan and Procurement II (Katahira & Engineers International)
No.	Date	Day										
20	11-Apr-09	Sat					Data analysis	Data analysis	Data analysis	Data analysis	Data analysis	Data analysis
21	12-Apr-09	Sun					Data analysis	Data analysis	Data analysis	Data analysis	Data analysis	Data analysis
22	13-Apr-09	Mon					Consultation of Road Plan	Planing of Execution of Civil Works	Supervision of Local Consultants	Consultation of Bridge & Structure Design	Environmnetal and Social Impact Study	Planing of Execution of Civil Works
23	14-Apr-09	Tue					Consultation of Road Plan	Planing of Execution of Civil Works	Supervision of Local Consultants	Consultation of Bridge & Structure Design	Environmnetal and Social Impact Study	Planing of Execution of Civil Works
24	15-Apr-09	Wed					Consultation of Road Plan	Planing of Execution of Civil Works	Supervision of Local Consultants	Consultation of Bridge & Structure Design	Environmnetal and Social Impact Study	Planing of Execution of Civil Works
25	16-Apr-09	Thu					Consultation of Road Plan	Planing of Execution of Civil Works	Supervision of Local Consultants	Consultation of Bridge & Structure Design	Environmnetal and Social Impact Study	Planing of Execution of Civil Works
26	17-Apr-09	Fri					AM Meeting with MoLG, MoL, CCN PM Report to JICA Office	Planing of Execution of Civil Works	AM Meeting with MoLG, MoL, CCN PM Supervision of Local Consultants	Consultation of Bridge & Structure Design	AM Meeting with MoL, CCN PM Emvironmental and Social Impact Study	Planing of Execution of Civil Works
27	18-Apr-09	Sat					Data analysis	Data analysis	Site survey	Site survey	Data analysis	Data analysis
28	19-Apr-09	Sun					Nairobi-Dubai	Data analysis	Data analysis	Data analysis	Data analysis	Nairobi-Dubai
29	20-Apr-09	Mon					Kansai-Haneda	Data collection	Supervision of Local Consultants	Data collection	Environmnetal and Social Impact Study	Kansai-Haneda
30	21-Apr-09	Tue				Visit at EOC/ Study of the Project Site		Data collection	Supervision of Local Consultants	Data collection	Environmnetal and Social Impact Study	
31	22-Apr-09	Wed				Study of the Project Site		Data collection	Supervision of Local Consultants	Data collection	Environmnetal and Social Impact Study	
32	23-Apr-09	Thu				Study of the Project Site		Data collection	Supervision of Local Consultants	Data collection	Environmnetal and Social Impact Study	
33	24-Apr-09	Fri				Report to JICA Kenya Office & Embassy of Japan		Report to JICA Kenya Office & Embassy of Japan	Data collection	Report to JICA Kenya Office & Embassy of Japan	Environmnetal and Social Impact Study	
34	25-Apr-09	Sat				Data analysis		Nairobi-Dubai	Data analysis	Nairobi-Dubai		
35	26-Apr-09	Sun				Data analysis		Kansai-Haneda	Data analysis	Kansai-Haneda		
36	27-Apr-09	Mon				AM Meeting with MoLG, MoL, CCN PM Report to JICA Office			AM Data collection PM Report to JICA Ofice		AM Meeting with MoLG, MoL, CCN PM Report to JICA Office	
37	28-Apr-09	Tue				Data analysis			Data collection		Nairobi-Dubai	
38	29-Apr-09	Wed				Nairobi-Dubai			Nairobi-Dubai		kansai-Haneda	
39	30-Apr-09	Thu				Kansai-Haneda			Kansai-Haneda			

(2) 概略設計概要説明（2009 年 10 月 21 日～2009 年 10 月 28 日）

		Mr. Kazumasa SANUI Team Leader (JICA HQ)	Mr. Kenji ISOMOTO	Mr. Keiichi MURAKAMI
10/21/2009	Wed	Tokyo (EK 6257 and EK 317, 19:55) →		
10/22/2009	Thu	→ Dubai (05:30) Dubai (EK 719, 10:40) → Nairobi (14:50)		
10/23/2009	Fri	AM Chief Representative of JICA Kenya Office PM at JICA 16F : Draft Explanation & Minutes Discussion to MoR, MoLG, KURA, Nairobi City		
10/24/2009	Sat	Internal Meeting for Discussion		
10/25/2009	Sun	Internal Meeting for Discussion		
10/26/2009	Mon	AM at JICA 16F : Minutes Discussion with MoLG, KURA, Nairobi City Signing on M/D at MoLG (P.M.)		
10/27/2009	Tue	Signing M/D at MoR (A.M.) 11:30 Embassy of Japan Nairobi (EK 720, 16:40) → Dubai (22:40)	Nairobi (JO 835, 14:15) → Juva (16:15)	Nairobi (EK 720, 16:40) → Dubai (22:40)
10/28/2009	wed	Dubai (EK 316 and EK 6252, 03:10) → Tokyo (20:25)		Dubai (EK 316 and EK 6252, 03:10) → Tokyo (20:25)

3. 関係者（面会者）リスト

在ケニア日本国大使館

岩谷　滋雄	特命全権大使
鈴木　武彦	一等書記官

JICA ケニア事務所

高橋　嘉行	所長
中澤　敏之	所員
中川　茂雄	所員
Mr. Steve N. Mogere	所員
川村　康予	所員

地方自治省(Ministry of Local Government: MOLG)

Mr. Sammy Kirui, CBS	Permanent Secretary
Mr. Tom N. Omai	
Mr. Silas O. Nyambok	
Mr. E. Kibe	
Mr. S. Nyambok	
Mr. Joshva Maitho Ndiango	
Mr. Marclus Mwai	

道路省(Ministry of Road and Public: MRPW)

Eng. Michael M.S. Kamau, CBS	Permanent Secretary
Eng. J. M. Mwatu	Principal Superintending Engineer

土地省(Ministry of Lands: MOL)

Mr. Ephantus Murage	Director of Surveys
Mr. Bowers Owino	Dupty Director of Surveys
Mr. C. Mwangi	
Mr. S. Kiruma	Chief Cartographer

環境省(National Environment Management Authority: NEMA)

Mr. Wilkister Magangi

労働省(Ministry of Labor and Human Resource Development: MLHRD)

Mr. Samuel M. Kariuki

Mr. Nicholas W. Mugambi

ナイロビ市役所(City Council of Nairobi: CCN)

Mr. G.C.K. Katsolleh	Ag. Town Clerk
Mr. Philip M. A. Kisia	
Mr. Kainga K. Mario	Dep. of Environment
Mr. Erastus K. Chepkwony	
Mr. Mumo Richard	
Mr. Eston Kimathi	
Mr. Anderson M. Njenga	
Mr. Benjamin K. Njenga	
Mr. Marrian Mutete Kioko	
Mr. Isaac Wagangi	
Eng. Cristine A. Ogut	

ケニア都市道路公社(KURA)

Eng. Joseph N. Nkadayo	Director General & CEO
Mr. James W. Theuri	General Manager
Eng. Silas M. kinoti	General Manager

4. 討議議事録（M/D）

Minutes of Discussions

on

the Preparatory Survey

on

the Project for the Construction

of

Nairobi Missing Links 3, 6 & 7

Referring to the results of Preliminary Study conducted in August 2008, the Government of Japan decided to conduct a Preparatory Survey for Basic Design on the Project for the Construction of Nairobi Missing Links 3,6 & 7 (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Kenya the Preparatory Survey team for Basic Design headed by Mr. Yoshiyuki TAKAHASHI, Chief Representative, JICA Kenya Office, and is scheduled to stay in the country from March 23rd to April 29th, 2009.

The Team held discussions with the concerned officials the Government of Kenya. In the course of the discussions, both sides have confirmed the main items described in the attached sheets. The Team will proceed to further works and prepare the Preparatory Survey Report.

Nairobi, April 7, 2009

Mr. Yoshiyuki Takahashi
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Mr. Sammy Kirui, CBS
Permanent Secretary
Office of the Deputy Prime Minister and
Ministry of Local Government
The Republic of Kenya

Eng. Michael M.S. Kamau, CBS
Permanent Secretary
Ministry of Roads
The Republic of Kenya

Eng. Joseph N. Nkadayo
Director General & CEO
Kenya Urban Road Authority
The Republic of Kenya

Mr. G.C.K. Katsolleh
Ag. Town Clerk
City Council of Nairobi
The Republic of Kenya

ATTACHMENT

1. Objective of the Project

The objective of the Project is to construct the Missing Link of No.3, 6 and 7 in Nairobi City in order to formulate a radial and circumferential road network and to encourage non-motorized transport.

2. Project Site

The site of the Project is shown in Annex-1.

3. Responsible and Implementing Organizations

3-1. The responsible Ministries are Ministry of Road (MOR) and Office of the Deputy Prime Minister and Ministry of Local Government (ODPM&MOLG).

The organization charts of the responsible Ministries are shown in Annex-2 and Annex-3.

3-2. The implementing organizations are Kenya Urban Road Authority (KURA) and City Council of Nairobi (CCN). The organization charts of the implementing organizations are shown in Annex-4 and Annex-5.

4. Items Requested by the Government of Kenya

After discussions with the Team, the items described below were requested by the Kenyan side.

Construction of Missing Link 3, 6 and 7(ML 3, 6 and 7) which contain unpaved sections and paved sections

ML3: Mandera Road/ Riverside Drive to Lantana Road/ Westlands (1.76km)

ML6: Ole Dume Road/ Mazeras Road to Mandera Road (2.85km)

ML7: James Gichuru Road/ Mugumo Road to Argwings Kodhek Road/ Ngong Road (3.75km)

(1) Unpaved Section

ML3: Riverside Drive – Lantana Road (0.66km)

ML6: Mazeras Road - Mandera Road (2.40km)

ML7: Mugumo Road - Argwings Kodhek Road (2.20km)

- Construction of 3 bridges: Nairobi River(ML3), Kirichwa Ndogo River(ML7), Kirichwa Kubwa River(ML7)

- Road Pavement Construction (2-lane carriageway)
- Construction of Non-Motorized Transport(NMT) facilities
- Construction of storm water drainage system
- Street light facilities
- Traffic signals and/or roundabouts to be installed as per the recommendations of the final report

(2) Paved Section

ML3: Mandera Road - Riverside Drive(0.95km)
Lantana Road -Westlands (0.15km)
ML6: Ole Dume Road - Mazeras Road (0.45km)
ML7: James Gichuru Road - Mugumo Road (0.75km)
Argwings Kodhek Road - Ngong Road(0.80km)

- Construction of storm water drainage system
- Construction of NMT facilities
- Widening intersections needed
- Traffic signals and/or roundabouts to be installed as per the recommendations of the final report
- Construction of culverts
- Overlay of the section heavily damaged
- Street light facilities
- Widening to 4-lane carriageways if necessary

JICA will assess the appropriateness of the request and will recommend to the Government of Japan. JICA will report the result to the Kenyan side when explaining the draft report.

5. Japan's Grant Aid Scheme

5-1. The Kenyan side understands the Japan's Grant Aid scheme (for General Project) explained by the Team, as described in Annex-6.

5-2. The Kenyan side will take the necessary measures, as described in Annex-7, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6. Schedule of the study

6-1. The consultants will proceed to further study in Kenya until April 29th, 2009.

6-2. JICA will prepare the draft report in English and dispatch a mission to Kenya in order to explain its contents around the beginning of October, 2009.

6-3. After the contents of the report is accepted in principle by the Government of Kenya, JICA will complete the final report in English and send it to the Government of Kenya around by January, 2010.

7. Other Relevant Issues

7-1. Both sides confirmed that the Kenyan side will install beacons along the boundary lines on both sides of Project Road and the truncations of the intersections in appropriate manner based on the related regulations by the end of June, 2009.

7-2.Both sides confirmed that the Kenyan side should conduct the necessary procedure concerning the environmental assessment (including stakeholder meetings for effective public participation about the outline of the Project, the EIA survey, RAP etc.) based on the relevant law of Kenya by the end of September, 2009.

7-3. Both sides confirmed that the Kenyan side shall secure the land necessary for the Project with its own expenses by the commencement of the construction.

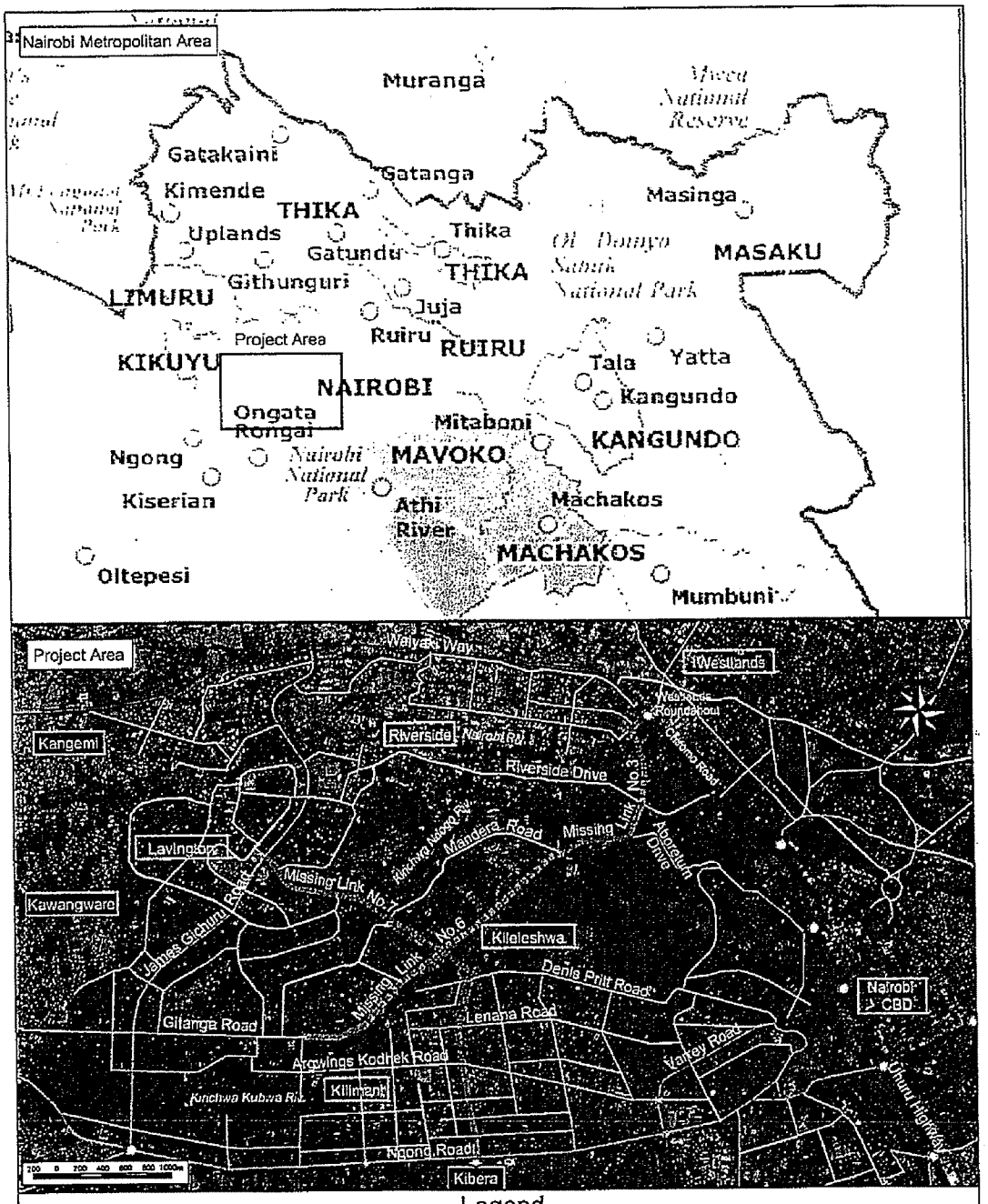
7-4. The Kenyan side confirmed that the following undertakings should be taken by the Kenyan side at the Kenyan expenses.

- Relocation of existing utilities (power, telecommunication lines, water lines, plants, trees etc) and removal of obstructing facilities by the commencement of the construction in accordance with necessary procedure,
- Necessary arrangement and coordination with concerned Ministries, Agencies and other relevant organizations,
- Budget allocation to the Public Relation of stakeholder meetings, public hearings etc for the Project through electronic and/or print media,
- Securing and clearance of the temporary yard,
- Securing of site for disposal of waste

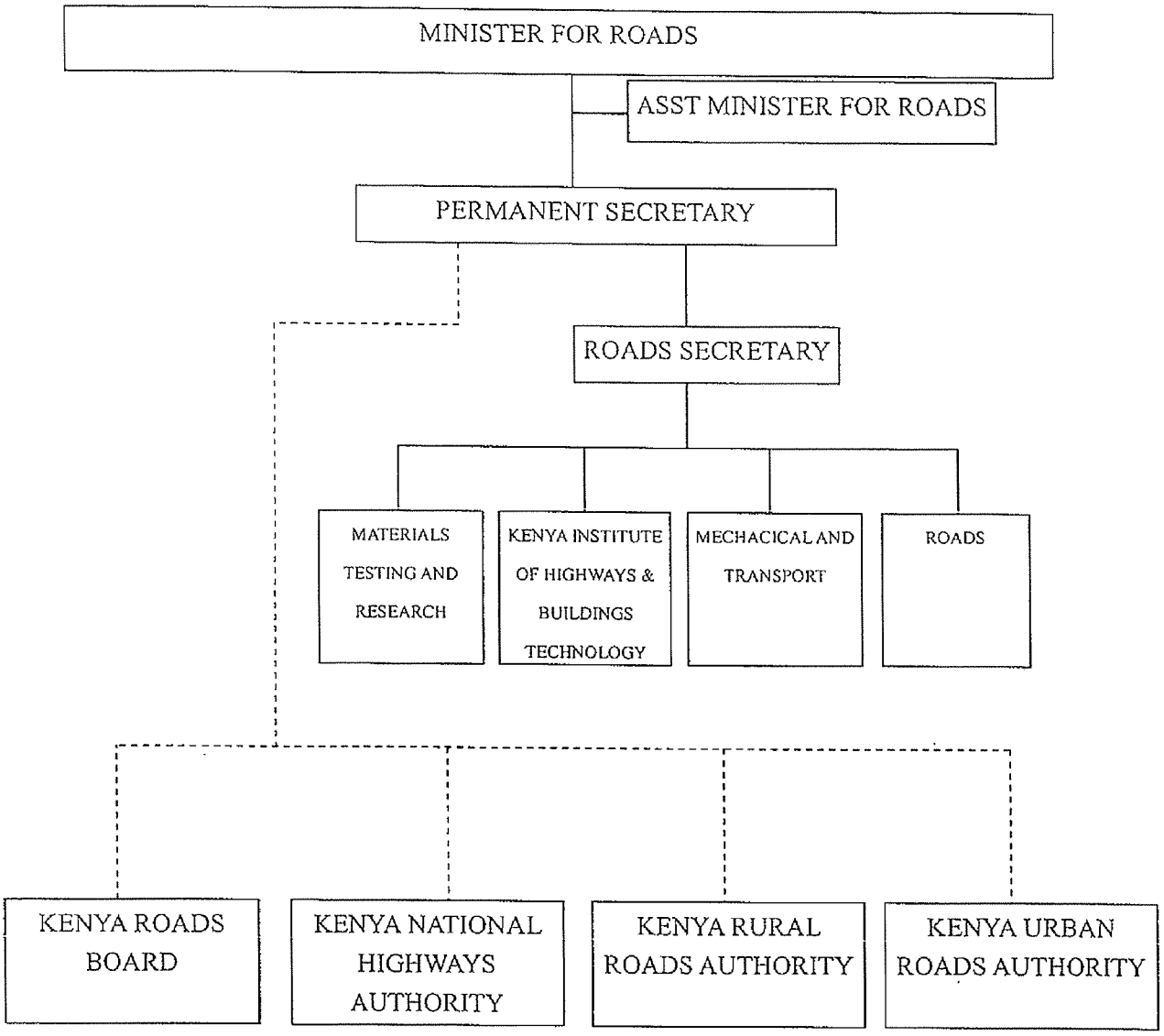
7-5. The Kenyan side shall provide security for all concerned Japanese nationals working for the Project, if deemed necessary.

7-6. The Kenyan side shall secure enough budget and personnel necessary for the operation and maintenance of the facilities implemented by the Project, including the periodical maintenance work after the completion of the Project.

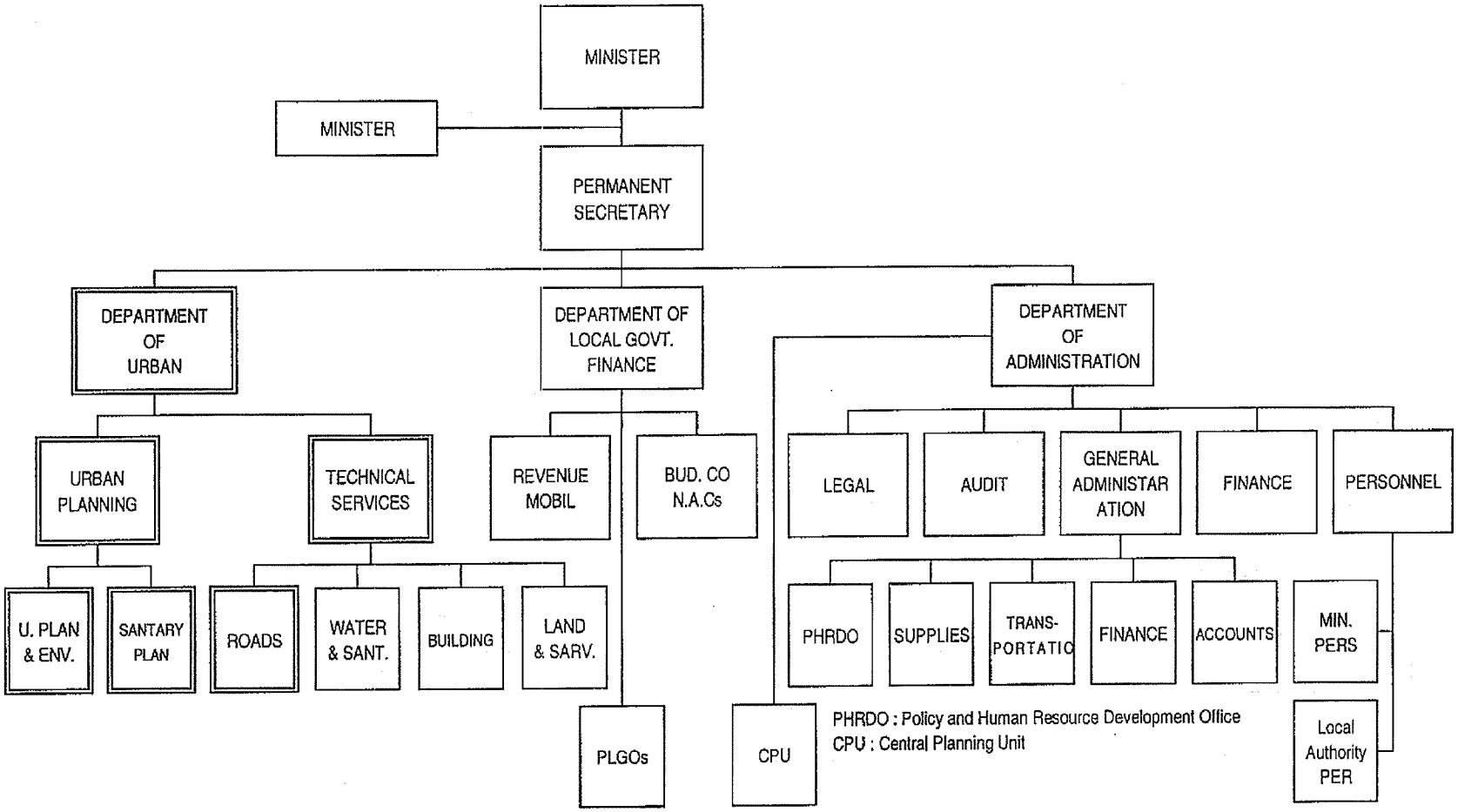
7-7. The Kenyan side shall provide all necessary information requested in the Questionnaire, which the Team handed to the Kenyan side, by April 29, 2009.



Project Site Map

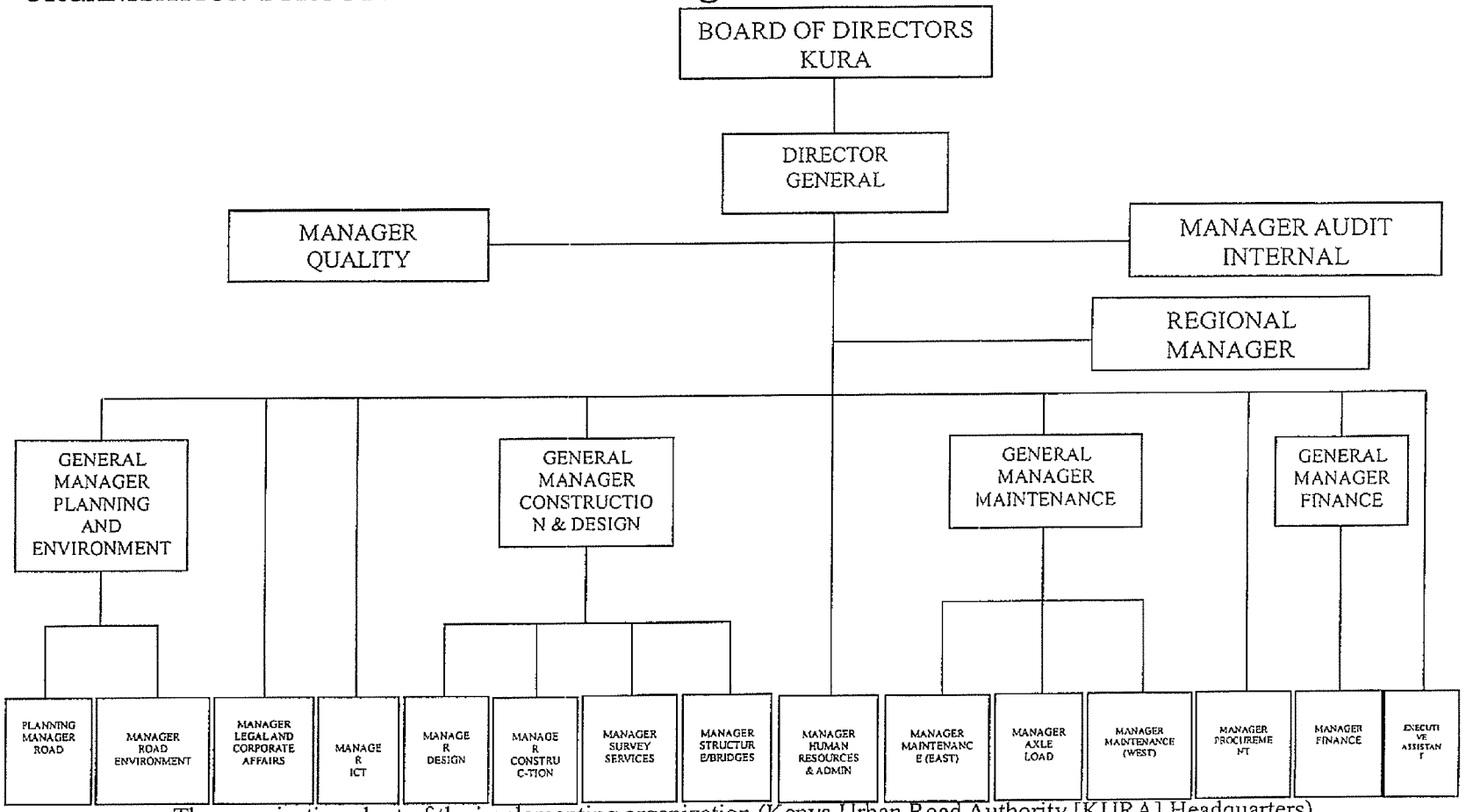


The organization chart of the responsible Ministry (The Ministry of Road [MOR])



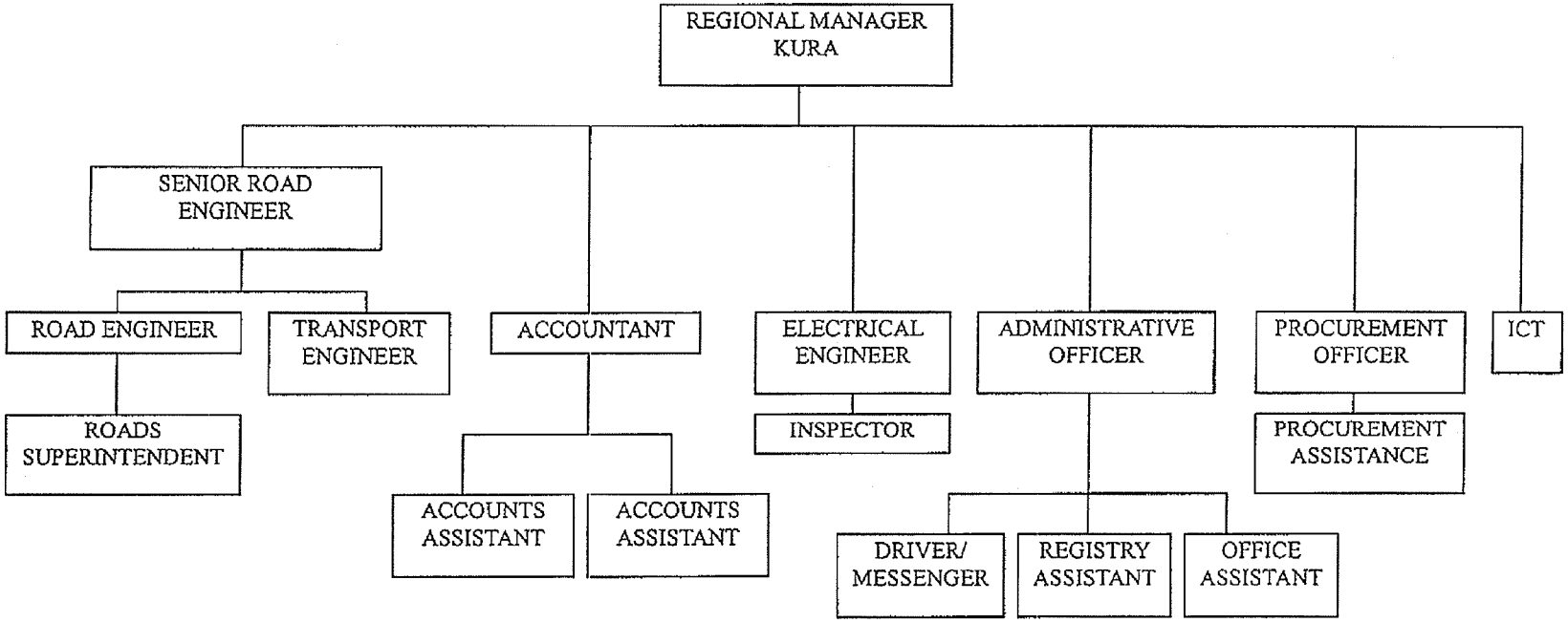
The organization chart of the responsible Ministry (Office of the Deputy Prime Minister and Ministry of Local Government [ODPM & MOLG]

ORGANISATION STRUCTURE FOR KURA HEADQUARTE



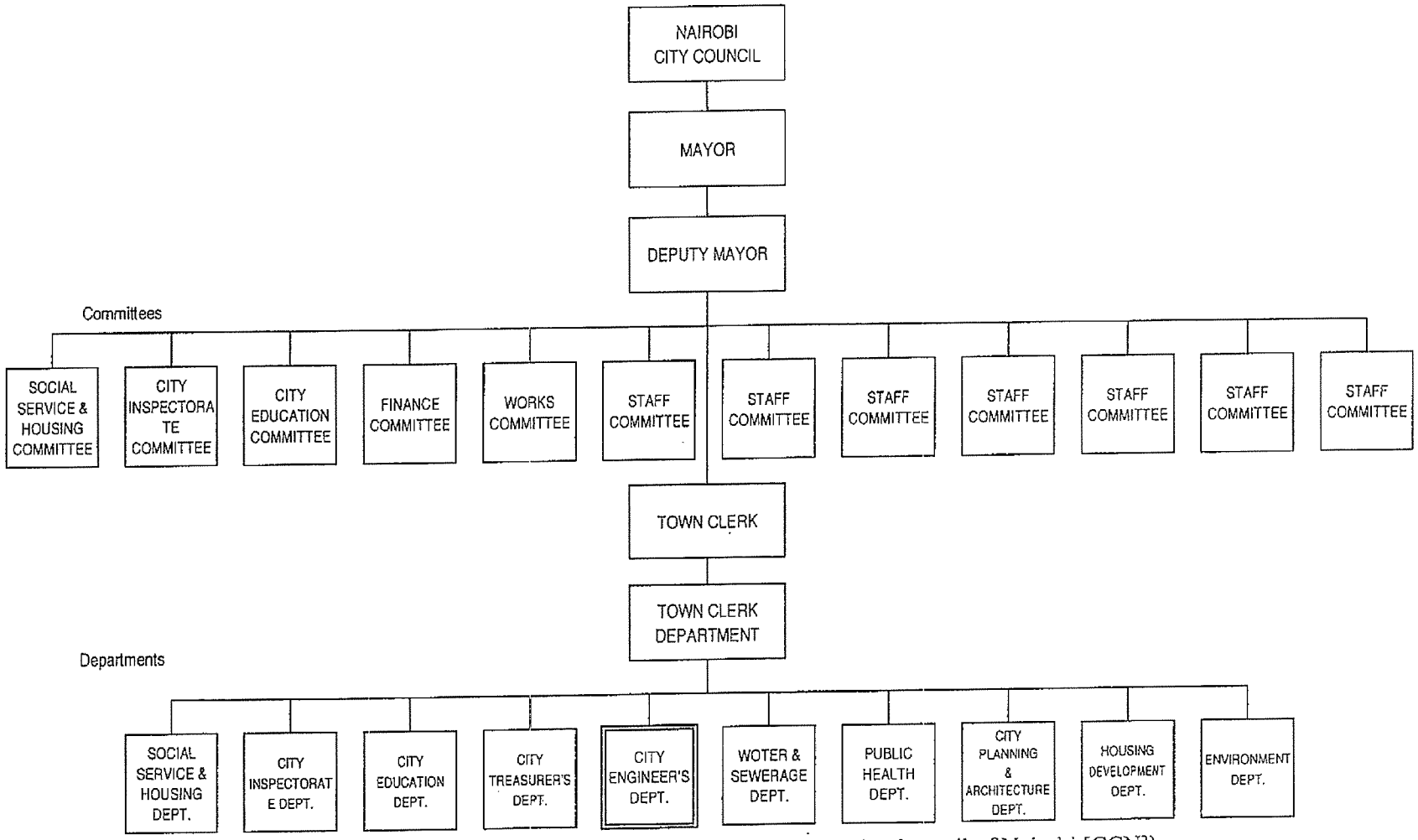
The organization chart of the implementing organization (Kenya Urban Road Authority [KURA] Headquarters)

REGIONAL ORGANIZATION CHART



NOTE: Regional Roads Manager reports directly to Director General

The organization chart of the implementing organization (Kenya Urban Road Authority [KURA] Regional Organization)



The organization chart of the implementing organization (City Council of Nairobi [CCN])

JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as part of this realignment, JICA was reborn on October 1, 2008. After the rebirth of JICA, following the decision of the GOJ, Grant Aid for General Project is extended by JICA.

Grant Aid is non-reimbursable fund to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

Japanese Grant Aid is conducted as follows-

- Preparatory Survey (hereinafter referred to as "the Survey")
  - The Survey conducted by JICA
- Appraisal &Approval
  - Appraisal by The GOJ and JICA, and Approval by the Japanese Cabinet
- Determination of Implementation
  - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - Agreement concluded between JICA and a recipient country
- Implementation -Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide a basic document necessary for the appraisal of the Project by JICA and the GOJ. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the implementation of the Project.

- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- Preparation of a basic design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA uses (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

The Report on the Survey is reviewed by JICA, and after the appropriateness of the Project is confirmed, JICA recommends the GOJ to appraise the implementation of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the E/N will be singed between the GOJ and the Government of the recipient country to make a plead for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

The consultant firm(s) used for the Survey will be recommended by JICA to the recipient country to also work on the Project's implementation after the E/N and the G/A, in order to maintain technical consistency.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

(4) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex-7.

(6) "Proper Use"

The Government of recipient country is required to maintain and use the facilities constructed and the equipment purchased under the Grant Aid properly and effectively

and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.

(10) Social and Environmental Considerations

A recipient country must ensure the social and environmental considerations for the Project and must follow the environmental regulation of the recipient country and JICA socio-environmental guideline.

(End)

Annex-7

Major Undertakings to be taken by Each Government

NO	Items	To be covered by the Grant	To be covered by Recipient side
1	To secure land		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates and fences in and around the site		●
4	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
5	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine(Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and customs clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	●	
6	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
7	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract		●
8	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
9	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment		●

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

Minutes of Discussions
on the Basic Design Study
on The Project for the Construction of Nairobi Western Ring Roads
in the Republic of Kenya
(Explanation on Draft Report)

In March 2009, Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Basic Design Study Team on the Project for the Construction of Nairobi Western Ring Roads (hereinafter referred to as "the Project") to the Republic of Kenya (hereinafter referred to as "Kenya"), and through discussion, field survey as well as after technical examination of the results in Japan, JICA prepared a draft report of the study.

In order to explain and consult with the officials of the Government of Kenya on the components of the draft report, JICA sent to Kenya the Basic Design Explanation Team (hereinafter referred to as "the Team") which is headed by Kazumasa Sanui, Assistant Director of Economic Infrastructure Department, JICA from October 22 to October 27, 2009.

As the result of the discussion, both parties confirmed the main items described on the attached sheets hereto;

Nairobi, October 26, 2009

Mr. Kazumasa Sanui
Leader
Basic Design Explanation Team
Japan International Cooperation Agency
Japan

Mr. Sammy Kirui, CBS
Permanent Secretary
Office of the Deputy Prime Minister and
Ministry of Local Government
The Republic of Kenya

Eng. Michael M.S. Kamau, CBS, HSC
Permanent Secretary
Ministry of Roads
The Republic of Kenya

Eng. Silas M. Kinoti
Manager – Roads
Kenya Urban Roads Authority (KURA)
for Eng. Joseph N. Nkadayo
Director General & CEO
Kenya Urban Roads Authority (KURA)
The Republic of Kenya

Mr. Philip M.A. Kisia, MBS
Town Clerk
City Council of Nairobi
The Republic of Kenya

ATTACHMENT

1. Contents of the Draft Report

The Kenyan side agreed and fully accepted the contents of the draft final report explained by the Team.

2. Japans' Grant Aid scheme

The Kenyan side understands the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Kenya as explained by the Team and described in Annex-1.

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items and send it to the Government of Kenya by January, 2010.

4. Cost Estimation

The Project Cost Estimation, as attached in Annex-2, is confidential and should never be duplicated or disclosed to any outside parties before the signing of all the contracts for the Project.

5. Other Relevant Issues

5-1. The Team confirmed with the Kenyan side that the Project title to be changed from the previous title ("The Project for the Construction of Nairobi Missing Links 3, 6 and 7") to read as follows; "The Project for the Construction of Nairobi Western Ring Roads".

5-2. The Kenyan side proposed, on April 28, 2009, that 24 meter wide road reserve includes dual carriage way two lanes both ways. The Team examined and came to a conclusion that dual two-lane carriage way is technically difficult due to site topography and the expected traffic volume. The Kenyan side accepted the Team's counterproposal of single carriage way two lanes.

5-3. The Kenyan side confirmed that it has obtained Environmental Impact Assessment License and Resettlement Action Plan (RAP) agreed with the Project Affected Persons (PAPs).
The Kenyan side shall complete the land acquisition and relocations before commencement of the Construction Work.

5-4. The Kenyan side shall bear the banking commissions as a condition for the Japan's Grant Aid to be implemented, and secure the sufficient budget to cover the following cost.

1) The commissions for the banking services based upon Banking Arrangement (B/A)
2) The advising commission of the Authorization to Pay (A/P).

5-5. The Kenyan side ensured that tax exemption for the Project shall be fulfilled in a timely manner, as a condition for the Japan's Grant Aid to be implemented.

5-6. The Kenyan side shall secure enough budget and personnel necessary for operation and maintenance of the roads, bridges and relevant facilities constructed by the Project.

5-7. The Team requested the Kenyan side to clarify the responsible organization(s) for each undertaking issue as shown in Annex-4 for the purpose of smooth implementation of the Project. The Kenyan side should agree and inform JICA Kenya Office within 2 weeks from the signing date, namely November 10, 2009.

Annex-1: Major Undertakings to be taken by Each Government
Annex-2: Project Cost to be borne by Japan's Grant Aid
Annex-3: Environmental Impact Assessment Licence
Annex-4: Responsible Organization for Undertakings of Kenyan side

Annex-1

Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient side
1	To secure land		•
2	To clear, level and reclaim the site when needed		•
3	Relocation, improvement and/or repair of existing utilities(power lines, telecommunication lines, water lines, etc.), if necessary		•
4	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		•
	2) Payment commission		•
5	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine(Air) transportation of the products from Japan to the recipient country	•	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		•
	3) Internal transportation from the port of disembarkation to the project site	•	
6	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		•
7	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract		•
8	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		•
9	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for the transportation and installation of the equipment		•

CONFIDENTIAL

Project Cost to be Borne by Japan's Grant Aid

The total project cost necessary to implement the Project is estimated at 2,286.6 Million Yen. The costs to be borne by both governments, Japan and Kenya, as described in the draft report of the Basic Design Study and respective details are estimated as follows on the conditions shown in (3) below.

(1) Cost borne by the Government of Japan

Total Cost : approximately 2,286.6 Million Yen

Item			Estimated Cost (Million Yen)
Facility	Road	Total	2,196.3
		Earthwork	276.1
		Pavement	964.2
		Facility Structure	334.4
		Drainage	621.6
Detailed Design / Construction & Supervision			35.1
			55.2

Notes:

The cost estimates in the above table are provisional and will be further examined by the Government of Japan for the approval of the Grant.

(2) Cost borne by the Government of Kenya

Total Cost approximately 156.0 Million Ksh (Approximately 190.3 Million Yen)

1) Social Cost for Relocation of houses	12.7 Million Ksh	(app. 15.5 Mil.Yen)
2) Land Acquisition Cost	111.8 Million Ksh	(app.136.4 Mil.Yen)
3) Social Cost for Relocation of Person	5.0 Million Ksh	(app. 6.1 Mil.Yen)
4) Supervision Cost for Relocation	1.9 Million Ksh	(app. 2.3 Mil.Yen)
5) Utility Relocation Cost	16.0 Million Ksh	(app. 19.5 Mil.Yen)
6) Environmental Assessment Cost	7.8 Million Ksh	(app. 9.5 Mil.Yen)
7) Bank Commission	0.8 Million Ksh	(app. 1.0 Mil.Yen)

(3) Conditions in Cost Estimate

1) Time of Cost Estimate : April, 2009
2) Exchange Rate : 1US Dollar = 96.08 Yen 1 Ksh= 1.22 Yen
3) Construction Period : approximately 16.5 months
4) Cost estimate is implemented in accordance with the guideline of Japan's Grant Aid.

Annex-3

Environmental Impact Assessment Licence

Application Reference No. EIA/466
Registration No: 0003981
For official use

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT
ENVIRONMENTAL IMPACT ASSESSMENT LICENCE

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Dated this.....15TH.....day...SEPT..... of 20...09

Signature.....

(SEAL)

Director General
The National Environment Management Authority

CONDITIONS OF LICENCE

1. This licence is valid for a period of ..24...MONTHS. (time within which the project should commence) from the date hereof.
2. The Director-General shall be notified of any transfer/variation/surrender of this licence.

3. The proponent shall take care of the temporary occupiers who will be displaced by the project.

4. The proponent shall adhere to Environmental Management and Coordination (Noise and Excessive Vibrations Pollution Control) Regulations of 2009 during construction.

5. The proponent shall ensure that valuable trees species that will cut down are replaced.

6. The proponent shall ensure that a functional traffic management plan is in place.

7. The proponent shall ensure that blasting is not done at night.

8. The proponent shall also put clear signage to warn motorists and pedestrians.

9. The proponent shall ensure that construction activities are undertaken during the day (and not at night) between 08.00 hrs and 17.00 hrs; and that transportation of construction material to site are undertaken during weekdays (and not weekends) off peak hours.

10. The proponent shall ensure strict adherence to the Environmental Management Plan developed throughout the project cycle.

11. The proponent shall collaborate with the EIA Expert(s) and contractor(s) to ensure that proposed mitigation measures are adhered to during the construction phase and where necessary appropriate mending –up activities undertaken and a report of the same submitted to NEMA. Emphasis must be given to control of dust, noise, vibrations and occupational hazards and provision of sanitary accommodation to construction workforce.

12. The proponent shall comply with the relevant principal laws, by-laws and guidelines issued for development of such a project within the jurisdiction of the Ministry of Lands, City Council of Nairobi, Nairobi City Water and Sewerage Company, Ministry of Roads, Kenya Roads Board and other relevant Authorities.

13. The proponent shall ensure that the development adheres to zoning specifications issued for development of such a project within the jurisdiction of the City Council of Nairobi with emphasis on approved land use for the area.

14. The proponent shall ensure that during the construction phase, the operations adhere to Occupational Safety and Health Act, No. 15 of 2007.

15. The proponent shall ensure that environmental protection facilities or measures to prevent pollution and ecological deterioration such as proper disposal of excavated soils, re-vegetation, landscaping, storm water drains, traffic management plans are designed, constructed and employed simultaneously with the proposed Project.

16. The proponent shall ensure that records on conditions of licences/approval and project monitoring and evaluation shall be kept on the project site for inspection by NEMA's Environmental Inspectors.

17. The proponent shall submit an Environmental Audit Report in the first year of occupation/operation/commissioning to confirm the efficacy and adequacy of the Environmental Management Plan.

18. The proponent shall comply with NEMA's improvement orders throughout the project cycle.

Annex-4

Responsible Organization for Undertakings of Kenyan side

Before Exchange of Note (January 2010)

Item	MoR KURA	MoLG CCN
To provide data & information for the Project		
To execute RAP		

Before Construction (September 2010)

Item	MoR KURA	MoLG CCN
To execute land acquisition		
To relocate PAPs		
To remove & relocate existing trees		
To relocate public utilities & other obstacles		
To maintain the route of inland transportation		
To make Banking Arrangement (B/A) & Authorization to Pay (A/P)		
To bear advising commission of A/P & payment commission to the bank		
To accord Japanese nationals necessary legal rights for their entry & stay in Kenya		
To exempt Japanese nationals engaged in the Project from customs duties, internal taxes and other fiscal levies		

During Construction (~ January 2012)

	MoR KURA	MoLG CCN
To ensure TAX exemption and custom clearance of the product at the port of disembarkation		
To maintain the route of inland transportation		
To provide all necessary permissions, licenses & certificates for the project		
To provide necessary coordination with related agencies and personal		
To arrange traffic control during construction of existing road		
To coordinate and solve any issues related to the Project that may be raised from residents & third parties		
To secure the office, construction & stock yard		
To secure borrow pit, quarry & waste disposal site		
To relocate public utilities & other obstacles		

After Construction

Item	MoR KURA	MoLG CCN
To demolish existing bridges		
To install underground duct pipe		
To install traffic signal, if necessary		
To maintain the road & facilities		

5. 技術協議資料（テクニカル・ノート）

The Preparatory Survey on
the Project for the Construction of
Nairobi Missing Links 3, 6 & 7

TECHNICAL NOTE

Kenyan Counterpart Team and JICA Preparatory Survey Team discussed and confirmed following matters. It is, however, understood that the decision for the draft report will be made through the discussions with concerned Japanese agencies during the analysis in Japan.

Design Conditions;

a.	Road Classification	: Urban Collector Road
b.	Design Speed	: Basically 50 kph, Absolute Value 30 kph
c.	Lane Width	: Basically 3.3 m, and 3.0 m for Exclusive Right Turn Lane
d.	Median Width	: Basically 1.5 m, and 0.6 m for Widening Section near Intersection
e.	Shoulder Width	: 0.6 m for Outer Lane
f.	Sidewalk Width	: Basically 2.5 m, however reduced to secure other facilities, if necessary
g.	Cycle Lane Width	: Basically 2.0 m, however reduced to secure other facilities, if necessary
h.	Maximum Grade	: Basically 8.0 %
i.	Pavement	: Basically Design Load for up to 15years based on Revised Future Traffic Demand (especially Heavy Vehicle Demand)
j.	Live Load (Bridge)	: Equivalent Load with HA Load in BS5400
k.	Intersection	: Basically, Roundabout or Conventional Intersection (either signalized or non-signalized), based on the evaluation criteria, such as space available, traffic conditions, classifications of crossing roads, etc.
l.	Drainage	: Basically 0.75m wide
m.	Facility Space	: Basically 0.8m wide

Basic Design Drawings will be prepared in Japan based on the above design conditions. The drawings will be presented to Kenyan side during the explanation of Draft Final Report, which is scheduled in October 2009.

27 April 2009

Noted by:	Noted by:	Noted by:
Eng. James W. Theuri General Manager Planning & Environment Kenya Urban Road Authority	Eng. Christine A. Ogut City Engineer City Council of Nairobi	Mr. Kenji Isomoto Chief Consultant JICA Preparatory Survey Team

6. ECZ 環境許可書

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18. The proponent shall comply with NEMA's improvement orders throughout the project cycle.

7. 事業事前計画表（概略設計時）

1．案件名
ケニア国ナイロビ西部環状道路建設計画
2．要請の背景（協力の必要性・位置付け）
「ケ」国のインフラ整備は、自国の経済成長の促進のためだけではなく、モンバサ港を拠点とした周辺国との物流のハブ機能の役割を有していることから、同国だけではなく周辺諸国にとっても重要な課題である。 2008 年に発行されたケニアの長期開発計画「Vision2030」は、高い生活水準、国際的な競争力及び経済的繁栄を 2030 年までに達成することを国家目標としている。同計画では、「経済」、「社会」、「政治」を 3 本柱とし、「経済成長率 10%の維持」、「衛生的かつ安全な環境で人々が住め、平等で、公正、結束力のある社会」、「法に従い、すべてのケニア国民の人権と自由を守る政治の上に成り立つ民主政治のシステム」の実現を掲げている。インフラ開発は その 3 つの柱を支える基盤の一つとして位置づけられており、道路分野に関しては、道路整備、維持管理能力の向上、都市部の渋滞対策、過積載車両の増加への対策等を含む交通インフラ全般の整備に取り組むこととしている。 同国最大の都市であり、首都であるナイロビ市においては、広域交通を処理する国際幹線道路が市内中央部を縦貫し、かつ地域交通を処理する環状道路網の未形成による道路網の非効率的な配置、人口の急増などにより、交通渋滞が深刻化し、車輌運行に影響を及ぼすとともに、維持管理費、交通事故の増加の原因ともなっている。 その結果、ナイロビ市近郊の労働者は高い交通費の負担を強いられ、特に低所得者階層の多くは以前と比較して高額な水準に達した公共交通を利用できず、徒歩や自転車等、いわゆる非駆動系交通（NMT）に依存しており、マスタープラン策定時（2004 年）に実施したパーソントリップ調査によると、右モードによる移動は、全トリップ数の 49%を占めている。 同市の人口は、現在の約 300 万人から 2025 年には約 430 万人へ増加するものと推測されており、交通渋滞も含め、生活環境がますます悪化することが予想される。 「ケ」国政府にとって、ナイロビ市内の道路網の整備は緊急課題であり、特に市内環状線の一部を担う未接続道路 3 路線（3・6・7 号線）の建設は最重要課題の一つであると位置付けてられている。
3．プロジェクト全体計画概要
（1）プロジェクト全体計画の目標 ・未整備状態である道路を整備することにより、ナイロビ地域のアクセス改善と道路利用者の移動時間短縮および交通事故の減少を目標とする ・裨益対象の範囲及び規模：ナイロビ市民約 300 万人 （2）プロジェクト全体計画の成果 ・ナイロビ市内の道路が整備される （3）プロジェクト全体計画の主要活動 ・未接続道路 3 路線（3・6・7 号線）を整備する ・道路整備後の維持管理を行う （4）投入 ・日本側：無償資金協力 22.87 億円 ・「ケ」国側： （ア）必要な人員：維持管理要員：約 20 名 （イ）施設の運営維持管理に係る経費：2.34 百万シリング

（5）実施体制
・主管官庁：道路省（MOR）
・実施機関：ケニア都市道路公社（KURA）

4．無償資金協力案件の内容

（1）サイト
「ケ」国　ナイロビ市　Westlands / Kileleshwa / Lavington / Kilimani 地区

（2）概要
・以下の道路の整備（舗装〔車道・歩道・自転車道〕、排水設備、照明設備、交通安全設備の整備、小規模橋梁 5 か所の建設を含む）
1) 未接続道路 3 号線：　Mandera Rd / Arboretum Dr / Riverside Dr / Lantana Rd / Westlands 間 (1.76km)
2) 未接続道路 6 号線：　Ole Dume Rd / Mazeras Rd / ML7 / Mandera Rd 間 (2.85km)
3) 未接続道路 7 号線：　James Gichuru Rd / Mugumo Rd / Nyeri Rd / ML6 / Denis Pritt Rd / Lenana Rd / Argwings Kodhek Rd / Ngong Rd 間 (3.75km)

（3）相手国負担事項
① プロジェクト用地確保、家屋移転
② ユーティリティーの移設

（4）概算事業費
・概算事業費 24.77 億円（日本側負担 22.87 億円、「ケ」国側負担 1.90 億円）

（5）工期
・詳細設計・入札期間を含め約 24.5 ヶ月(予定)

（6）貧困、ジェンダー、環境および社会面の配慮
・特に無し

5．外部要因リスク（プロジェクト全体計画の目標達成に関して）

特に無し

6．過去の類似案件からの教訓の活用

特に無し

7．プロジェクト全体計画の事後評価に係る提案

（1）プロジェクト全体計画の目標達成を示す成果指標

成果指標	区間（整備距離）	現況値（2009 年）	計画値（2012 年）
平均所要時間	ML6～ML3（計 4.6km） Gitanga Rd ～ Westlands R/A	オフピーク時：14 分 ピーク時：21 分 （迂回区間通過延長：7.4km）	オフピーク時：8 分 ピーク時：12 分 （整備区間通過延長：5.2km）
	ML7（3.8km） James Gichuru Rd ～ Ngong Rd	オフピーク時：13 分 ピーク時：23 分 （迂回区間通過延長：4.7km）	オフピーク時：6 分 ピーク時：9 分 （整備区間通過延長：3.8km）

（2）その他の成果指標
・特になし

（3）評価のタイミング
・2012 年以降（施設供用開始後）

8. 収集資料リスト

収 集 資 料 リ ス ト

調　査　名:　ケニア国　ナイロビミッシングリンク建設計画準備調査

番号	資 料 の 名 称	形 態 図書・ビデオ 地図・写真等	オリジナル・コピー	発 行 機 関	発行年
1	Well Being in Kenya (A Socio Economic Profile)	図書	オリジナル	Kenya National Bureau of Statics	2008
2	Economic Survey 2008	図書	オリジナル	Kenya National Bureau of Statics	2008
3	Labor Force Analytical Report	図書	オリジナル	Kenya National Bureau of Statics	2008
4	Resettlement Action Plan (Draft)	図書	コピー	MOLG, CCN	2009
5	Manual For Traffic Signs in Kenya	図書	コピー	Ministry of works Roads Department	1975
6	Road Design Guidelines for Urban Roads (2nd Draft)	図書	コピー	MOLG	2001
7	Standard Drainage Structures Manual, Part1 Stndard Small Span Concrete Bridges	図書	コピー	MOR	1987
8	Contract for Construction of Likoni Road Missing Link	図書	コピー	MOLG	2006
9	Tender Document for Constuction of Ole Odume Road Missing Link	図書	コピー	CCN	2006
10	Estimates of Development Expenditure (2007/2008)	図書	コピー	GOK	2007
11	Estimates of Development Expenditure(2008/2009)	図書	コピー	GOK	2008
12	Tender Document for Rehabilitation of Mbagathi Way	図書	コピー	MOR	2005

9. 技術資料

9.1 交通調査結果

Jct. No.	Jct. Name	WEEKDAY/ SUNDAY	Time		MT											NMT			
			MT	NMT	Motor Cycles	Cars	P/ups Jeeps	Matatu / Minibus	Large Bus	Light Truck	Medium Truck	Heavy Truck	Artic Truck	MT Total	PCU	Pedes -trian	Bicycle	Carts	NMT Total
					0.5	1.0	1.0	1.5	2.0	1.5	2.0	2.5	3.0	-		-	-	-	-
1	Westlands	Weekday	24hr	16hr	3,181	103,870	65,353	30,933	5,667	3,882	2,778	1,756	4,196	221,616	256,904	30,030	359	21	30,410
		Sunday	12hr	12hr	621	49,220	31,822	15,448	2,721	1,515	813	660	1,597	104,417	120,306	28,556	176	22	28,754
2	Rhapta	Weekday	16hr	12hr	689	17,415	8,504	367	30	246	92	12	0	27,355	27,457	24,405	617	58	25,080
3	Riverside	Weekday	24hr	16hr	712	18,436	10,354	1,988	41	348	208	47	4	32,138	33,278	11,469	577	11	12,057
		Sunday	12hr	12hr	136	6,065	3,603	815	13	69	48	11	6	10,766	11,230	3,544	206	6	3,756
4	Aboretum	Weekday	16hr	12hr	435	20,021	8,876	2,003	70	260	65	36	1	31,767	32,872	9,356	241	0	9,597
5	Mandera	Weekday	24hr	16hr	521	15,424	10,867	4,914	128	184	77	44	2	32,161	34,725	12,135	180	1	12,316
		Sunday	12hr	12hr	111	3,437	4,423	1,292	36	50	18	8	1	9,376	10,060	3,120	66	6	3,192
6	ML6/ML7	Weekday	16hr	12hr	233	4,103	3,188	103	21	67	32	4	0	7,751	7,779	9,697	232	7	9,936
7	Gitanga	Weekday	24hr	16hr	828	14,723	10,326	5,394	1,522	133	153	74	10	33,163	37,319	8,807	1,188	13	10,008
		Sunday	12hr	12hr	176	7,407	5,173	2,372	820	106	34	9	4	16,101	18,128	4,877	539	4	5,420
8	James Gichuru	Weekday	24hr	16hr	691	14,806	16,117	3,963	192	539	280	80	18	36,686	39,220	3,438	772	0	4,210
		Sunday	12hr	12hr	187	5,234	5,710	983	52	161	66	41	4	12,438	13,104	2,526	574	5	3,105
9	Nyeri	Weekday	16hr	12hr	205	6,325	4,676	1,182	40	109	47	7	2	12,593	13,238	5,789	211	1	6,001
10	Denis Pritt	Weekday	16hr	12hr	211	5,054	3,560	195	11	99	42	7	0	9,179	9,284	8,366	331	2	8,699
11	Lenana	Weekday	16hr	12hr	415	7,134	4,695	720	84	266	61	72	0	13,447	13,986	13,352	242	25	13,619
12	Argwings Kodhek	Weekday	24hr	16hr	540	18,971	11,008	4,878	1,294	298	87	43	7	37,126	40,904	24,957	663	12	25,632
		Sunday	12hr	12hr	144	8,431	5,138	3,319	785	86	35	7	0	17,945	20,406	10,737	367	13	11,117
13	Chania	Weekday	16hr	12hr	778	6,906	3,844	2,665	899	233	40	17	10	15,392	17,437	10,748	293	11	11,052
14	Ngong	Weekday	24hr	16hr	665	16,590	10,614	6,917	1,699	721	286	134	48	37,674	43,443	33,209	588	39	33,836
		Sunday	12hr	12hr	417	13,941	10,116	5,765	1,794	246	164	55	28	32,526	37,420	25,239	471	12	25,722
15	Waiyaki	Weekday	16hr	12hr	1,013	25,444	19,156	15,005	3,024	2,489	1,530	1,029	1,057	69,747	86,199	9,964	548	2	10,514
Total					12,909	388,957	257,123	111,221	20,943	12,107	6,956	4,153	6,995	821,364	-	294,321	9,441	271	304,033
PCU					6,455	388,957	257,123	166,832	41,886	18,161	13,912	10,383	20,985	-	924,692	-	-	-	-

9.2 舗装計算

（1）CBR 試験結果

TRIAL PIT LOGS & CBR RESULT

TP1 (ML3 STA1+700 Right Side)

0
0.10 ASPHALT
0.35 Brown gravelly CLAY (pavement leyers)
Moist black silty CLAY
CBR=1
1.20
1.30 Weathered ROCK

TP2 (ML3 STA1+250 Left Side)

0
MADE GROUND
0.45
Lateritic GRAVEL
CBR=42
1.50
1.60 Weathered ROCK

TP3 (ML3 1+100 Left Side)

0
MADE GROUND
0.30
CBR=7 Reddish brown gravelly CLAY
0.90
1.00 Weathered ROCK

TP4 (ML3 0+600 Right Side)

0
0.10 ASPHALT
0.40 Crushed STONE (pavement leyers)
CBR=6 Red silty CLAY
(concrete beam crosses pit – top 1.3m below ground level)
1.00

TP5 (ML3 0+400 Left Side)

0
0.05 ASPHALT
0.40 HARDCORE (pavement layers)
CBR=10 Red clayey lateritic GRAVEL
1.00

TP6 (ML3 0+050 Right Side)

0
0.15 MADE GROUND
0.40 Brown gravelly CLAY with roots
CBR=6 Brown CLAY with roots
1.00

TP7 (ML6 2+700 Right Side)

0
0.15 MADE GROUND with refuse
CBR=16 Brown sandy CLAY
0.55
Brown lateritic GRAVEL
1.00

TP8 (ML6 2+300 Left Side)

0
Red sandy CLAY
CBR=8
1.00

TP9 (ML6 2+100 Left Side)

0
MADE GROUND
0.30
CBR=10 Red sandy CLAY
1.00

TP10 (ML6 1+850 left Side)

0
MADE GROUND
0.40
CBR=20 Weathered ROCK
0.90

TP11 (ML6 1+450 Left Side)

0
0.20 Brown CLAY with some boulders
CBR=20 Weathered ROCK
0.70

TP12 (ML6 1+000 Left Side)

0
0.10 Brown CLAY
0.30 Slightly weathered brown TRACHYTE
CBR=61

TP13 (ML6 0+500 Right Side)

0
0.20 Dark brown sandy CLAY
0.50 Slightly weathered brown TRACHYTE
CBR=4

TP14 (ML6 0+050 Left Side)

0
0.10 ASPHALT
0.30 CONCRETE
0.60 Red gravelly CLAY
Weathered ROCK in base of pit
CBR=16

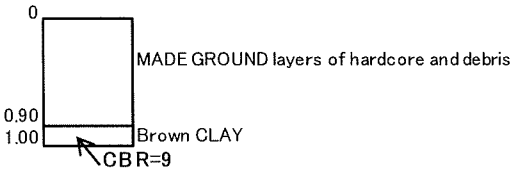
TP15 (ML7 0+050 Left Side)

0
0.20 MADE GROUND
Lateritic GRAVEL
0.60
Stiff black sandy CLAY
CBR=3
1.00

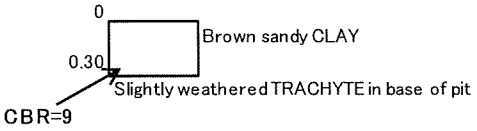
TP16 (ML7 0+700 Left Side)

0
0.10 ASPHALT
0.40 HARDCORE (pavement layers)
Red sandy CLAY
CBR=5
1.00

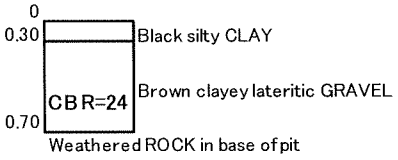
TP17 (ML7 0+900 Left Side)



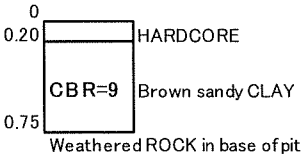
TP18 (ML7 1+150 Right Side)



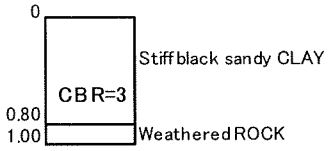
TP19 (ML7 1+650 Left Side)



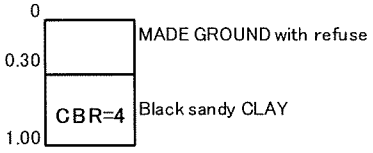
TP20 (ML7 1+900 Left Side)



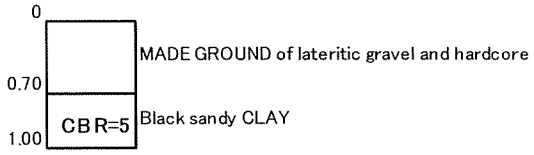
TP21 (ML7 2+000 Left Side)



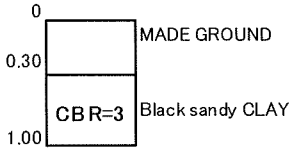
TP22 (ML7 2+400 Right Side)



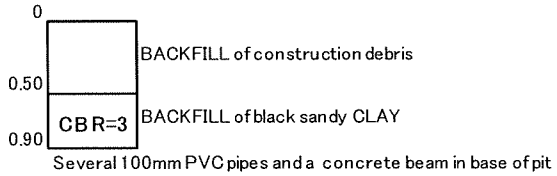
TP23 (ML7 2+850 Left Side)



TP24 (ML7 3+150 Left Side)



TP25 (ML7 3+750 Left Side)



（2）設計 CBR

No.	路線	地質	CBR結果						
1	ML3-4	Moist black silty clay	1	破棄	→置換			設計CBR	6
2	ML3-3	Lateritic gravel	42	棄却					
3	ML3-3	Reddish browm gravelly clay	7			9地点			
4	ML3-2	Red silty clay	6		ML3&6	γ=0.437		平均値	10.4
5	ML3-1	Red clayey lateritic gravel	10		環状線	42-20/42-6=0.61>γ	棄却	標準偏差	5.1
6	ML3-1	Brown clay with roots	6			8地点		区間CBR	5
7	ML6-4	Brown lateric gravel	16			γ=0.468			
8	ML6-3	Red sandy clay	8			20-16/20-6=0.29<γ	採用		
9	ML6-3	Red sandy clay	10						
10	ML6-3	Weathered rock	20						
11	ML6-2	Weathered rock	20						
12	ML6-2	Slightly weathered brown Trachyte	61	破棄	ML6	3地点		平均値	13.3
13	ML6-2	Slightly weathered brown Trachyte	4		放射線	γ=0.941		標準偏差	8.3
14	ML6-1	Red gravelly clay	16			16-4/20-4=0.75<γ	採用	区間CBR	5
15	ML7-1	Stiff black sandy clay	3 ->6	改良					
16	ML7-1	Red sandy clay	5			5地点			
17	ML7-2	Brown clay	9		ML7	γ=0.642		平均値	6.3
18	ML7-2	Slightly weathered Trachyte	5		放射線	24-9/24-3=0.71>γ	棄却	標準偏差	3.7
19	ML7-2	Brown clay lateric gravel	24	棄却				区間CBR	3
20	ML7-2	Brown sandy clay	9						
21	ML7-2	Stiff black sandy clay	3	破棄		3地点			
22	ML7-3	Black sandy clay	4		ML7	γ=0.941		平均値	6.0
23	ML7-3	Black sandy clay	5		環状線	9-5/9-4=0.80<γ	採用	標準偏差	2.6
24	ML7-4	Black sandy clay	3 ->6	改良				区間CBR	3
25	ML7-4	Backfill of black sandy clay	3 ->6	改良					

設計CBR	ML3&6	5%
	ML7放射	4%
	ML7環状	3%

（3）交通荷重

Daily Traffic Demand in PCU by Ln Regression (unit: pcu's per day)

No.	Section	From	To	2005	2010	2015	2020	2025	
No.3	1	Westlands R/A	Ring Rd Kileleshwa	7,300	19,800	27,100	32,300	36,300	
	2	Ring Rd Kileleshwa	Nairobi River	7,600	20,500	28,100	33,500	37,700	
	3	Nairobi River	Riveside Dr	8,100	21,800	29,800	35,500	39,900	
	4	Riveside Dr	Arboretum Dr	8,000	21,500	29,400	35,000	39,300	
No.6	5	Arboretum Dr	Mandera Rd						4車線化の可能性あるため除外
	6	Mandera Rd	Ring Rd Kilimani						
	7	Ring Rd Kilimani	Denis Pritt Rd	5,800	15,800	21,600	25,700	28,900	
	8	Denis Pritt Rd	Ole Odume Rd	6,200	16,800	23,000	27,400	30,800	
No.7	9	James Gichuru Rd	Ring Rd Kileleshwa	6,000	16,300	22,300	26,500	29,800	
	10	Ring Rd Kileleshwa	Denis Pritt Rd						
	11	Denis Pritt Rd	Lenana Rd	6,700	18,200	24,900	29,600	33,300	
	12	Lenana Rd	Argwings Kodhek Rc	8,200	22,200	30,400	36,200	40,700	
	13	Argwings Kodhek Rc	Chania Ave						
	14	Chania Ave	Ngong Rd	7,200	19,600	26,800	31,900	35,800	

		2005	2010	2015	2020	2025
ML3&6環状部	平均値	20,467	28,000	33,350	37,500	
ML6放射部	平均値	16,800	23,000	27,400	30,800	
ML7放射部	平均値	16,300	22,300	26,500	29,800	
ML7環状部	平均値	21,280	29,140	34,680	38,980	

	Bus	M-Truck	L-Truck	A-Truck (Trailer/Tank Lorry)
Distribution	0.9%	0.9%	0.5%	0.2%
Ave. PCU	2.50	2.50	3.00	3.00

w_{18} per lane

2013~2020	2013~2022	2013~2027
7.12E+05	9.21E+05	1.49E+06
5.88E+05	7.60E+05	1.23E+06
5.68E+05	7.32E+05	1.18E+06
7.39E+05	9.57E+05	1.55E+06

舗装設計荷重

ML3&6環状部

		PCU	Bus	M-truck	L-truck	A-truck	換算係数	Bus	M-truck	L-truck	A-truck
								1.0	1.0	4.0	4.0
2013~2020	2010	20,467	76	73	32	16		2.77E+04	2.66E+04	4.67E+04	2.34E+04
8年間ESAL	2011	21,797	81	77	34	17		2.96E+04	2.81E+04	4.98E+04	2.48E+04
1.42E+06	2012	23,214	86	82	36	18		3.14E+04	2.99E+04	5.26E+04	2.63E+04
2013~2022	2013	24,723	92	88	38	19		3.36E+04	3.21E+04	5.55E+04	2.77E+04
10年間ESAL	2014	26,330	98	94	41	21		3.58E+04	3.43E+04	5.98E+04	3.07E+04
1.84E+06	2015	28,000	104	99	43	22		3.80E+04	3.61E+04	6.28E+04	3.21E+04
2013~2027	2016	29,008	108	103	45	23		3.94E+04	3.76E+04	6.57E+04	3.36E+04
15年間ESAL	2017	30,052	112	107	47	24		4.09E+04	3.91E+04	6.86E+04	3.50E+04
2.98E+06	2018	31,134	116	111	48	24		4.23E+04	4.05E+04	7.01E+04	3.50E+04
	2019	32,255	120	115	50	25		4.38E+04	4.20E+04	7.30E+04	3.65E+04
	2020	33,350	124	118	52	26		4.53E+04	4.31E+04	7.59E+04	3.80E+04
	2021	34,150	127	121	53	27		4.64E+04	4.42E+04	7.74E+04	3.94E+04
	2022	34,970	130	124	54	27		4.75E+04	4.53E+04	7.88E+04	3.94E+04
	2023	35,809	133	127	56	28		4.85E+04	4.64E+04	8.18E+04	4.09E+04
	2024	36,668	136	130	57	29		4.96E+04	4.75E+04	8.32E+04	4.23E+04
	2025	37,500	139	133	58	29		5.07E+04	4.85E+04	8.47E+04	4.23E+04
	2026	38,400	142	136	60	30		5.18E+04	4.96E+04	8.76E+04	4.38E+04
	2027	39,322	146	140	61	31		5.33E+04	5.11E+04	8.91E+04	4.53E+04

ML6放射部

		PCU	Bus	M-truck	L-truck	A-truck	換算係数	Bus	M-truck	L-truck	A-truck
								1.0	1.0	4.0	4.0
2013~2020	2010	16,800	62	60	26	13		2.26E+04	2.19E+04	3.80E+04	1.90E+04
8年間ESAL	2011	17,892	66	64	28	14		2.41E+04	2.34E+04	4.09E+04	2.04E+04
1.17E+06	2012	19,055	71	68	30	15		2.59E+04	2.48E+04	4.38E+04	2.19E+04
2013~2022	2013	20,294	75	72	32	16		2.74E+04	2.63E+04	4.67E+04	2.34E+04
10年間ESAL	2014	21,613	80	77	34	17		2.92E+04	2.81E+04	4.98E+04	2.48E+04
1.52E+06	2015	23,000	85	82	36	18		3.10E+04	2.99E+04	5.26E+04	2.63E+04
2013~2027	2016	23,828	88	85	37	19		3.21E+04	3.10E+04	5.40E+04	2.77E+04
15年間ESAL	2017	24,686	92	88	38	19		3.36E+04	3.21E+04	5.55E+04	2.77E+04
2.45E+06	2018	25,575	95	91	40	20		3.47E+04	3.32E+04	5.84E+04	2.92E+04
	2019	26,496	98	94	41	21		3.58E+04	3.43E+04	5.99E+04	3.07E+04
	2020	27,400	102	97	43	22		3.72E+04	3.54E+04	6.28E+04	3.21E+04
	2021	28,058	104	100	44	22		3.80E+04	3.65E+04	6.42E+04	3.21E+04
	2022	28,731	107	102	45	23		3.91E+04	3.72E+04	6.57E+04	3.36E+04
	2023	29,421	109	105	46	23		3.98E+04	3.83E+04	6.72E+04	3.36E+04
	2024	30,127	112	107	47	24		4.09E+04	3.91E+04	6.86E+04	3.50E+04
	2025	30,800	114	109	48	24		4.16E+04	3.98E+04	7.01E+04	3.50E+04
	2026	31,538	117	112	49	25		4.27E+04	4.09E+04	7.15E+04	3.65E+04
	2027	32,298	120	115	50	25		4.38E+04	4.20E+04	7.30E+04	3.65E+04

ML7放射部

		PCU	Bus	M-truck	L-truck	A-truck	換算係数	Bus	M-truck	L-truck	A-truck
								1.0	1.0	4.0	4.0
2013~2020	2010	16,300	60	58	25	13		2.19E+04	2.12E+04	3.65E+04	1.90E+04
8年間ESAL	2011	17,360	64	62	27	14		2.34E+04	2.26E+04	3.94E+04	2.04E+04
1.13E+06	2012	18,488	68	66	29	15		2.52E+04	2.41E+04	4.23E+04	2.19E+04
2013~2022	2013	19,690	73	70	31	15		2.66E+04	2.56E+04	4.53E+04	2.19E+04
10年間ESAL	2014	20,970	78	74	33	16		2.85E+04	2.70E+04	4.82E+04	2.34E+04
1.48E+06	2015	22,300	83	79	35	17		3.03E+04	2.88E+04	5.11E+04	2.48E+04
2013~2027	2016	23,081	86	82	36	18		3.14E+04	2.99E+04	5.26E+04	2.63E+04
15年間ESAL	2017	23,889	89	85	37	19		3.25E+04	3.10E+04	5.40E+04	2.77E+04
2.37E+06	2018	24,725	92	88	38	19		3.36E+04	3.21E+04	5.55E+04	2.77E+04
	2019	25,590	95	91	40	20		3.47E+04	3.32E+04	5.84E+04	2.92E+04
	2020	26,500	98	94	41	21		3.58E+04	3.43E+04	5.99E+04	3.07E+04
	2021	27,136	101	96	42	21		3.69E+04	3.50E+04	6.13E+04	3.07E+04
	2022	27,787	103	99	43	22		3.78E+04	3.61E+04	6.28E+04	3.21E+04
	2023	28,454	106	101	44	22		3.87E+04	3.69E+04	6.42E+04	3.21E+04
	2024	29,137	108	104	46	23		3.94E+04	3.80E+04	6.57E+04	3.36E+04

	2025	29,800	111	106	46	23		4.05E+04	3.87E+04	6.72E+04	3.36E+04
	2026	30,515	113	108	47	24		4.12E+04	3.94E+04	6.86E+04	3.50E+04
	2027	31,247	116	111	49	25		4.23E+04	4.05E+04	7.15E+04	3.65E+04
ML7環状部								Bus	M-truck	L-truck	A-truck
		PCU	Bus	M-truck	L-truck	A-truck	換算係数	1.0	1.0	4.0	4.0
2013~2020	2010	21,280	79	76	33	17		2.88E+04	2.77E+04	4.82E+04	2.48E+04
8年間ESAL	2011	22,663	84	81	35	18		3.07E+04	2.96E+04	5.11E+04	2.63E+04
1.48E+06	2012	24,136	90	86	37	19		3.29E+04	3.14E+04	5.40E+04	2.77E+04
2013~2022	2013	25,705	95	91	40	20		3.47E+04	3.32E+04	5.84E+04	2.92E+04
10年間ESAL	2014	27,376	102	97	43	21		3.72E+04	3.54E+04	6.28E+04	3.07E+04
1.91E+06	2015	29,140	108	104	45	23		3.94E+04	3.80E+04	6.57E+04	3.36E+04
2013~2027	2016	30,160	112	107	47	24		4.09E+04	3.91E+04	6.86E+04	3.50E+04
15年間ESAL	2017	31,216	116	111	48	24		4.23E+04	4.05E+04	7.01E+04	3.50E+04
3.10E+06	2018	32,309	120	115	50	25		4.38E+04	4.20E+04	7.30E+04	3.65E+04
	2019	33,440	124	119	52	26		4.53E+04	4.34E+04	7.59E+04	3.80E+04
	2020	34,660	129	123	54	27		4.71E+04	4.49E+04	7.88E+04	3.94E+04
	2021	35,492	132	126	55	28		4.82E+04	4.60E+04	8.03E+04	4.09E+04
	2022	36,344	135	129	56	29		4.93E+04	4.71E+04	8.18E+04	4.23E+04
	2023	37,216	138	132	58	29		5.04E+04	4.82E+04	8.47E+04	4.23E+04
	2024	38,109	141	135	59	30		5.15E+04	4.93E+04	8.61E+04	4.38E+04
	2025	38,980	145	138	61	31		5.29E+04	5.04E+04	8.91E+04	4.53E+04
	2026	39,916	148	142	62	31		5.40E+04	5.18E+04	9.05E+04	4.53E+04
	2027	40,874	152	145	63	32		5.55E+04	5.29E+04	9.20E+04	4.67E+04

（4）舗装厚の計算

①ML6放射部（一般部）

CBR= 5 %　　SN = 3.0

1) ACP Thickness
Considering a minimum thickness D1 = 7.5 cm of asphalt concrete.

SN1 of asphalt = 0.390 x 7.5 ／ 2.54 = 1.152

2) Base Course Thickness
Considering a minimum thickness D2 = 15 cm

SN2 of the Base = 0.135 x 15 ／ 2.54 = 0.797

3) Subbase Thickness
Considering a minimum thickness D2 = 20 cm

SN3 of Subbase = 0.108 x 20 ／ 2.54 = 0.850

SN1 + SN2+ SN3 = 2.799　OK

Asphalt Concrete Course	**7.5**	**cm**
Bituminous treated Base Course	**15.0**	**cm**
Crushed Gravel Base Course	**20.0**	**cm**

②ML放射部（特殊部：岩盤上）

※）岩盤上の標準構造
（計算にはよらない）

Asphalt Concrete Course	**10.0**	**cm**
Lean Concrete	**10.0**	**cm**

③ML3およびML6桑状部（一般部）

CBR= 5 %　　SN = 3.1

1) ACP Thickness
Considering a minimum thickness D1 = 7.5 cm of asphalt concrete.

SN1 of asphalt = 0.390 x 7.5 ／ 2.54 = 1.152

2) Base Course Thickness
Considering a minimum thickness D2 = 20 cm

SN2 of the Base = 0.135 x 20 ／ 2.54 = 1.063

3) Subbase Thickness
Considering a minimum thickness D2 = 20 cm

SN3 of Subbase = 0.108 x 20 ／ 2.54 = 0.850

SN1 + SN2+ SN3 = 3　OK

Asphalt Concrete Course	**7.5**	**cm**
Bituminous treated Base Course	**20.0**	**cm**
Crushed Gravel Base Course	**20.0**	**cm**

④ML3桑状部（特殊部）

CBR= 6 %　　SN = 2.8
（路床置換材）

1) ACP Thickness
Considering a minimum thickness D1 = 7.5 cm of asphalt concrete.

SN1 of asphalt = 0.390 x 7.5 ／ 2.54 = 1.152

2) Base Course Thickness
Considering a minimum thickness D2 = 15 cm

SN2 of the Base = 0.135 x 15 ／ 2.54 = 0.797

3) Subbase Thickness
Considering a minimum thickness D2 = 20 cm

SN3 of Subbase = 0.108 x 20 ／ 2.54 = 0.850

SN1 + SN2+ SN3 = 2.799　OK

Asphalt Concrete Course	**7.5**	**cm**
Bituminous treated Base Course	**15.0**	**cm**
Crushed Gravel Base Course	**20.0**	**cm**

⑤ML7放射部(一般部)

CBR= 4 % SN = 3.2

1) ACP Thickness
Considering a minimum thickness D1 = 7.5 cm of asphalt concrete.

SN1 of asphalt = 0.390 x 7.5 / 2.54 = 1.152

2) Base Course Thickness
Considering a minimum thickness D2 = 15 cm

SN2 of the Base = 0.135 x 15 / 2.54 = 0.797

3) Subbase Thickness
Considering a minimum thickness D2 = 30 cm

SN3 of Subbase = 0.108 x 30 / 2.54 = 1.276

SN1 + SN2+ SN3 = 3.124 OK

Asphalt Concrete Course	**7.5**	**cm**
Bituminous treated Base Course	**15.0**	**cm**
Crushed Gravel Base Course	**30.0**	**cm**

⑥ML7放射部(特殊部)

CBR= 6 % SN = 3.2

1) ACP Thickness
Considering a minimum thickness D1 = 7.5 cm of asphalt concrete.

SN1 of asphalt = 0.390 x 7.5 / 2.54 = 1.152

2) Base Course Thickness
Considering a minimum thickness D2 = 15 cm

SN2 of the Base = 0.135 x 15 / 2.54 = 0.797

3) Subbase Thickness
Considering a minimum thickness D2 = 30 cm

SN3 of Subbase = 0.108 x 30 / 2.54 = 1.276

SN1 + SN2+ SN3 = 3.124 OK

Asphalt Concrete Course	**7.5**	**cm**
Bituminous treated Base Course	**15.0**	**cm**
Crushed Gravel Base Course	**30.0**	**cm**

⑦ML7桑状部

CBR= 3 % SN = 3.7

1) ACP Thickness
Considering a minimum thickness D1 = 7.5 cm of asphalt concrete.

SN1 of asphalt = 0.390 x 7.5 / 2.54 = 1.152

2) Base Course Thickness
Considering a minimum thickness D2 = 20 cm

SN2 of the Base = 0.135 x 20 / 2.54 = 1.063

3) Subbase Thickness
Considering a minimum thickness D2 = 35 cm

SN3 of Subbase = 0.108 x 35 / 2.54 = 1.488

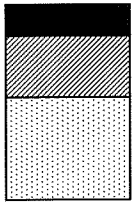
SN1 + SN2+ SN3 = 3.7 OK

Asphalt Concrete Course	**7.5**	**cm**
Bituminous treated Base Course	**20.0**	**cm**
Crushed Gravel Base Course	**35.0**	**cm**

（5）計算結果一覧

舗装検討結果一覧

①ML6放射部（一般部）



表層+基層　7.5cm
上層路盤　15cm
下層路盤　25cm

路床CBR=5

設計CBR5
交通荷重
586,000
SN=3.0

②ML6放射部（特殊部）（岩盤部0+500~1+500付近）

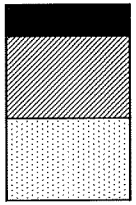
表層+基層　10cm
均しｺﾝ　10cm

路床=岩盤

岩盤上の
標準構造

表層+基層：ｱｽｺﾝ（基層4.5cm+表層3.0）
上層路盤：粒調路盤CBR=80
下層路盤：切込路盤(ｸﾗｯｼｬｰﾗﾝ)CBR=30

③ML3およびML6環状部（一般部）

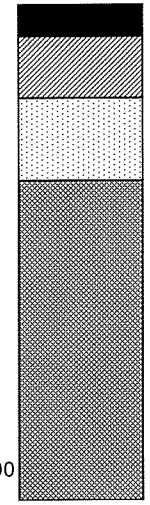


表層+基層　7.5cm
上層路盤　20cm
下層路盤　20cm

設計CBR5
交通荷重
712,000
SN=3.1

路床CBR=5

④ML3環状部（特殊部）（終点部150m：1+610～1+760）

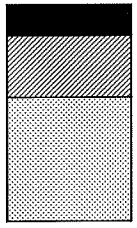


表層+基層　7.5cm
上層路盤　15cm
下層路盤　20cm
路床置換
(CBR>6)　77.5cm

設計CBR6
交通荷重
712,000
SN=2.8

（GL-1.2以深はRock）

⑤ML7放射部（一般部）（0+250~1+800）

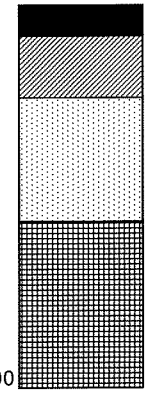


表層+基層　7.5cm
上層路盤　15cm
下層路盤　30cm

路床CBR=4

設計CBR4
交通荷重
566,000
SN=3.2

⑥ML7放射部（特殊部）（0+000~0+250付近）

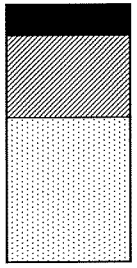


表層+基層　7.5cm
上層路盤　15cm
下層路盤　30cm
路床置換
CBR>15　40cm

設計CBR4
交通荷重
566,000
SN=3.2

合成CBR6

⑦ML7環状部（1+800～3+750）

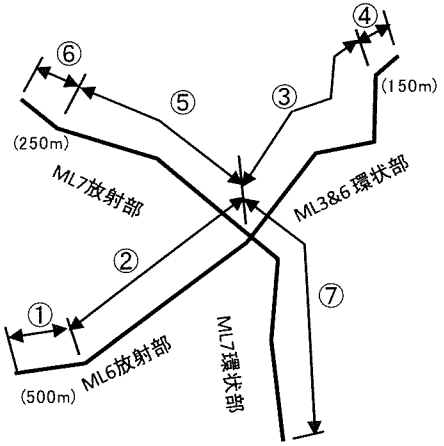


表層+基層　7.5cm
上層路盤　20cm
下層路盤　35cm

路床CBR=3

設計CBR3
交通荷重
739,000
SN=3.7

平面図（断面適用区間）



9.3 排水計算

（1）降雨量データ

Source: Kenya Meteorological Department, Ministry of Transport and Communication

Station 9136164(=164): Dagoretti Corner **Data period: 1970~2004**

No Date: -98
Missing data: -99
Data Unit: x10-1 mm

Sta.	Year	Mon.	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	17th	18th	19th	20th	21st	22nd	23rd	24th	25th	26th	27th	28th	29th	30th	31st
164	1970	1	0	0	30	63	266	14	56	12	1	0	177	13	0	0	0	0	1	0	0	14	29	149	1	0	0	0	0	23	68	9	92
164	1970	2	0	0	0	0	0	0	0	3	0	105	0	0	14	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	-98	-98	-98
164	1970	3	0	0	0	0	17	6	1	41	30	0	0	0	0	30	3	0	0	0	0	7	0	0	114	128	63	138	297	236	19	354	148
164	1970	4	55	558	467	24	2	21	496	8	57	2	7	82	66	23	8	0	0	0	1	31	755	290	396	0	0	38	71	0	15	0	-98
164	1970	5	8	0	77	23	210	1	0	80	213	53	0	15	13	0	0	0	40	7	58	398	0	0	0	0	46	232	561	6	158	0	224
164	1970	6	166	0	35	0	0	0	0	0	0	0	0	3	0	10	2	0	7	19	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	1970	7	2	0	129	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	6	0	14
164	1970	8	0	0	0	0	0	0	3	0	0	0	0	0	0	0	2	0	0	0	0	0	0	8	16	6	0	5	2	4	0	0	4
164	1970	9	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	0	0	0	4	0	-98
164	1970	10	0	0	0	0	15	4	0	0	1	30	151	32	0	0	8	2	0	0	0	0	0	0	18	23	0	0	0	0	0	0	28
164	1970	11	4	9	30	0	7	26	70	3	0	17	116	12	132	0	704	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	1970	12	0	46	14	0	0	0	0	0	0	0	0	0	131	247	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	44
164	1971	1	0	15	0	0	0	0	0	0	0	0	0	0	0	0	17	433	0	0	0	0	0	0	0	23	26	1	0	0	0	0	0
164	1971	2	0	31	15	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	-98	-98	-98
164	1971	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0	0	0	0	0	0	0	53	39	0	2	0	2	75
164	1971	4	0	0	0	0	0	21	0	150	36	39	104	15	6	134	444	131	41	39	437	188	18	0	0	0	85	240	2	0	24	167	-98
164	1971	5	0	210	614	36	0	3	0	44	39	25	0	0	94	0	108	976	300	71	29	390	179	0	0	0	0	0	0	5	0	67	17
164	1971	6	0	1	0	0	0	0	0	0	0	0	0	0	180	9	0	0	7	29	5	0	0	0	0	0	0	0	0	0	0	0	-98
164	1971	7	0	8	0	0	0	28	4	0	0	0	0	0	0	0	2	0	1	35	0	11	0	0	0	0	1	1	0	0	0	0	0
164	1971	8	0	-99	0	0	0	0	0	-99	0	3	-99	20	0	-99	0	0	0	0	0	13	16	35	4	3	0	-99	-99	0	2	0	-99
164	1971	9	0	0	4	8	6	0	0	0	0	0	29	0	0	65	0	0	0	0	0	0	0	0	0	0	372	0	0	0	29	0	-98
164	1971	10	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	57	17	0	0
164	1971	11	0	0	0	27	0	0	0	0	7	0	113	0	0	25	104	0	0	0	8	0	0	14	38	14	74	32	50	67	6	88	-98
164	1971	12	0	84	0	0	0	0	0	0	0	0	0	0	0	0	0	341	123	83	194	4	220	34	98	355	0	0	0	0	0	53	31
164	1972	1	0	4	0	0	62	88	0	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1972	2	0	163	0	0	0	0	33	232	51	3	0	0	0	0	0	9	0	0	0	0	0	8	47	214	0	0	0	0	0	-98	-98
164	1972	3	0	0	2	0	0	0	0	0	0	24	99	0	0	0	43	0	0	0	0	204	0	0	0	0	0	0	0	0	0	0	0
164	1972	4	0	0	0	0	0	0	0	0	0	27	0	19	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	126	10	-98
164	1972	5	0	122	195	4	0	30	537	83	0	15	31	345	40	134	0	152	208	191	65	26	15	0	8	0	22	23	6	2	32	0	0
164	1972	6	0	0	30	855	149	0	2	0	0	0	0	0	0	0	0	15	0	0	0	187	0	0	0	124	16	0	0	0	0	0	-98
164	1972	7	0	0	0	0	0	0	29	0	0	0	71	25	0	2	4	0	0	0	0	0	0	0	34	0	0	0	0	0	0	0	0
164	1972	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	6	10	18	0	0	0	0	0	0	0	1	0
164	1972	9	0	0	0	0	0	5	278	0	0	0	0	0	112	0	0	0	0	6	0	8	0	0	4	41	71	0	0	0	32	0	-98
164	1972	10	0	0	0	0	0	0	0	0	0	0	0	0	0	51	0	100	6	0	0	0	24	0	128	1	326	32	222	0	0	563	462
164	1972	11	0	0	0	74	44	52	109	0	104	98	0	0	37	188	314	0	0	57	42	12	5	24	0	0	0	75	18	0	0	0	-98
164	1972	12	0	0	4	7	0	0	0	0	0	24	0	56	13	20	0	0	0	0	0	0	0	0	0	0	4	2	0	0	0	0	0
164	1973	1	0	0	307	29	258	137	3	15	0	0	0	0	0	0	438	183	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1973	2	0	0	0	0	0	0	39	0	0	0	0	530	0	0	0	51	251	5	0	0	86	11	0	0	0	0	0	0	-98	-98	-98
164	1973	3	0	0	0	0	0	0	44	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	95	0	0	0	7	0	0	0
164	1973	4	0	0	0	8	0	0	0	0	38	6	0	13	3	0	0	0	1391	106	89	0	781	285	113	60	213	0	0	30	6	125	-98
164	1973	5	2	65	0	0	11	69	5	0	0	0	3	0	0	4	0	140	0	0	0	0	36	0	0	0	0	0	0	198	2	0	78
164	1973	6	90	22	0	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	30	0	-98
164	1973	7	0	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	9	0	0
164	1973	8	0	4	17	0	3	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	6	0	0	0	0	0	0	0	0	8
164	1973	9	0	0	0	0	0	0	0	0	63	0	0	0	0	0	0	16	0	0	0	426	9	46	17	14	304	58	65	0	0	0	-98
164	1973	10	0	0	0	0	0	0	0	0	51	0	0	0	0	0	107	0	0	6	0	0	0	0	0	0	5	0	0	53	0	0	0

164	1973	11	0	7	43	0	32	5	36	90	120	10	0	76	0	0	0	0	5	0	13	0	4	0	0	0	0	26	0	16	63	140	-98
164	1973	12	0	94	0	0	0	0	0	0	132	4	0	0	0	0	0	0	0	206	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1974	1	0	0	0	0	0	0	0	0	10	0	0	0	0	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1974	2	0	0	0	0	85	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98	-98	-98
164	1974	3	375	140	95	3	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	0	0	86	0	220	418
164	1974	4	60	123	68	44	38	130	14	205	189	9	29	183	111	271	95	0	0	75	81	47	0	88	96	43	42	23	8	30	5	444	-98
164	1974	5	348	7	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	114	0	7	0	0	0	0	0	0	7	13
164	1974	6	48	10	0	0	26	0	0	14	0	0	54	296	0	0	5	173	16	0	0	0	0	0	0	194	16	0	47	45	3	19	-98
164	1974	7	111	58	66	3	13	78	28	75	0	3	0	5	40	35	0	0	17	0	0	0	159	0	0	0	0	0	0	0	0	0	0
164	1974	8	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	23	23	0	0	0	0	0	33	11
164	1974	9	0	0	100	0	0	0	46	0	30	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	1974	10	11	0	0	116	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	102	15	33	0	0	0	3	0	0	0
164	1974	11	0	67	106	43	60	108	82	53	58	119	10	0	0	0	0	19	77	76	99	0	0	0	0	0	0	6	0	0	0	0	-98
164	1974	12	0	0	0	203	54	32	0	0	0	0	0	0	0	4	6	44	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1975	1	25	0	0	0	0	0	0	0	94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1975	2	0	0	0	0	0	0	0	0	0	0	0	14	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98	-98	-98
164	1975	3	0	0	0	17	0	3	0	137	10	0	0	0	0	0	0	0	11	3	0	0	0	0	0	0	0	0	0	0	72	15	170
164	1975	4	43	0	0	13	0	0	0	0	0	111	213	16	0	215	29	154	314	5	34	8	5	159	206	27	180	0	0	0	0	0	-98
164	1975	5	6	4	0	0	0	0	0	0	0	0	137	82	0	582	167	233	34	3	0	23	0	0	0	26	0	0	75	409	23	35	43
164	1975	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	78	0	0	4	0	0	0	0	0	4	8	10	0	0	0	-98
164	1975	7	0	0	4	7	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	106	26	37	47	0	0	0	16	0
164	1975	8	0	0	0	0	3	4	0	0	0	0	4	3	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1975	9	0	237	8	0	0	16	58	0	0	173	33	31	0	0	9	509	72	0	0	0	0	0	0	0	0	61	4	74	10	81	-98
164	1975	10	0	0	0	0	0	5	0	0	16	27	0	0	0	0	0	0	0	0	15	11	137	164	0	0	0	40	10	97	89	0	0
164	1975	11	0	0	0	0	0	0	0	0	0	0	0	92	27	73	16	54	213	115	14	0	29	132	171	4	13	0	0	0	50	0	-98
164	1975	12	9	140	0	0	481	120	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
164	1976	1	154	0	0	0	0	0	0	0	0	0	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1976	2	0	0	202	6	50	0	0	0	0	0	0	0	0	0	0	71	0	0	0	0	0	0	0	38	11	29	16	0	0	-98	-98
164	1976	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	19	261	2	13	0	0	0	0
164	1976	4	0	0	0	0	0	0	0	0	3	170	55	76	0	318	147	4	7	0	7	0	0	0	53	51	0	26	25	45	0	0	-98
164	1976	5	0	0	0	0	7	0	57	0	0	0	0	3	0	0	52	32	78	1	0	5	51	7	566	0	0	0	0	0	0	0	0
164	1976	6	0	0	0	0	0	0	0	0	0	0	0	0	0	7	12	0	0	4	0	256	148	0	0	0	0	0	0	0	18	18	-98
164	1976	7	0	0	0	0	0	0	118	0	0	41	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0
164	1976	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	179	0	0	0	0	0	0	0
164	1976	9	35	467	0	49	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	28	6	0	0	0	0	0	0	-98
164	1976	10	0	0	8	95	8	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	19	0	0	0	0	0	0	0	0
164	1976	11	0	32	171	2	0	0	0	0	42	3	0	0	0	0	0	0	0	106	510	52	121	112	2	0	13	335	21	0	179	75	-98
164	1976	12	190	13	0	0	0	0	0	5	0	0	0	24	137	67	0	13	50	0	0	0	0	1	11	11	23	32	0	0	0	60	337
164	1977	1	1	89	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	155	8	0	0	0	0	29	0	15	0	0	0	0	0
164	1977	2	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	15	66	181	189	277	0	12	0	0	-98	-98	-98
164	1977	3	0	0	0	0	0	14	9	0	7	0	0	0	0	0	15	0	5	21	10	154	41	0	0	0	0	0	0	6	48	45	0
164	1977	4	0	0	0	63	869	0	414	305	28	74	36	60	498	372	78	0	21	5	4	41	93	9	21	159	96	326	56	520	158	679	-98
164	1977	5	233	320	0	0	82	0	0	662	493	60	128	262	19	163	537	130	0	19	21	0	0	0	0	0	0	0	0	0	0	0	0
164	1977	6	0	0	0	0	3	229	67	0	0	0	0	0	0	0	23	0	81	21	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	1977	7	0	0	0	1	60	5	38	28	0	0	365	0	0	0	7	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	10
164	1977	8	0	0	0	13	244	0	0	6	50	0	0	0	0	0	44	147	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
164	1977	9	0	0	0	0	0	0	0	1	0	0	23	0	0	0	0	82	3	4	69	53	0	0	0	0	0	0	0	0	0	0	-98
164	1977	10	0	0	0	0	0	0	0	0	16	0	0	0	0	10	0	0	0	0	7	31	75	23	40	81	0	0	0	0	2	16	152
164	1977	11	3	77	143	11	191	203	140	3	171	1	3	9	14	0	30	423	24	38	6	491	18	0	175	386	3	13	5	85	15	0	-98
164	1977	12	32	0	0	0	0	23	0	0	42	0	0	0	33	0	0	7	32	7	27	219	47	262	18	386	0	0	0	0	0	0	0
164	1978	1	0	0	0	0	0	0	0	0	0	0	0	9	0	0	405	20	274	18	559	0	54	96	0	0	0	0	0	0	0	0	0
164	1978	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	107	5	23	50	55	32	0	16	54	0	0	0	-98	-98	-98
164	1978	3	13	2	0	0	0	0	102	0	68	0	0	0	980	29	123	6	7	0	67	16	29	90	393	616	147	19	21	84	177	0	0
164	1978	4	0	18	0	0	104	19	15	0	400	266	0	22	116	86	22	0	0	0	25	0	43	37	86	105	102	4	217	18	8	864	-98
164	1978	5	74	1	61	23	8	15	7	8	0	24	11	8	0	0	9	116	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
164	1978	6	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	3	13	25	4	0	0	0	0	0	2	10	26	1	-98
164	1978	7	0	2	0	5	1	0	0	0	0	0	0	6	9	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	66	11	5

164	1978	8	194	0	0	0	0	0	2	0	0	0	0	0	7	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	440
164	1978	9	0	0	0	0	0	0	0	0	3	16	0	0	0	0	0	0	0	0	0	0	0	112	15	1	0	0	0	0	0	7	-98
164	1978	10	8	0	0	0	0	0	0	0	0	0	0	0	166	0	0	0	0	0	0	173	465	0	0	12	195	16	136	0	0	165	0
164	1978	11	0	147	22	264	14	0	36	0	0	0	0	0	0	127	77	0	36	0	9	121	178	13	7	38	81	4	0	0	0	85	-98
164	1978	12	26	127	140	16	96	0	0	0	0	35	4	52	130	271	64	0	0	68	113	39	0	0	0	0	0	0	0	0	108	0	0
164	1979	1	0	0	0	0	0	0	16	0	0	0	0	0	9	0	7	7	33	31	0	11	7	2	0	0	7	11	0	88	352	39	88
164	1979	2	172	359	41	98	0	0	0	0	173	37	0	11	0	0	2	0	0	100	36	0	0	623	0	0	0	6	0	0	-98	-98	-98
164	1979	3	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	1	26	690	242	268	0	0	0	105	84	0	0	0	0	0	0
164	1979	4	0	0	36	7	140	61	2	98	132	31	56	69	24	69	26	10	0	15	20	5	0	0	65	10	243	102	15	24	33	0	-98
164	1979	5	35	15	27	7	0	0	322	56	267	9	0	195	0	0	0	0	0	0	0	0	38	76	75	45	23	286	310	9	9	0	36
164	1979	6	97	11	0	12	0	63	0	19	4	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	57	0	6	0	0	-98
164	1979	7	0	13	11	0	0	0	127	10	0	0	0	0	0	0	7	0	0	0	1	0	0	0	0	0	267	0	0	0	0	0	0
164	1979	8	0	0	0	0	0	4	4	0	0	11	6	2	54	8	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1979	9	0	4	0	0	0	0	0	481	0	6	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	7	0	0	-98
164	1979	10	0	0	8	0	4	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	26	2	0	11	0	96	34	0	0	0	0
164	1979	11	0	0	6	83	226	0	24	3	334	94	74	14	145	0	0	0	15	2	0	0	4	7	0	0	0	0	0	0	0	43	-98
164	1979	12	387	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	17	0	0	30	0	186	51	0	5	9	0	0	0
164	1980	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	101	277	526
164	1980	2	122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	-98	-98
164	1980	3	17	134	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	0	0	0	25	124	24	5
164	1980	4	0	0	0	0	0	0	0	11	63	0	0	17	46	57	7	23	88	330	48	203	32	5	0	80	49	0	0	0	0	0	-98
164	1980	5	494	560	242	307	315	317	359	41	6	0	153	35	552	0	64	46	1256	25	0	0	0	14	60	0	3	14	2	0	186	250	14
164	1980	6	0	0	0	0	0	18	7	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	110	0	0	0	0	0	133	2	-98
164	1980	7	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	4	0	0
164	1980	8	0	0	0	0	0	11	34	78	0	0	0	0	24	0	0	0	0	0	10	0	0	0	5	11	0	0	0	0	0	0	0
164	1980	9	0	0	0	11	0	0	0	0	0	6	0	0	0	214	0	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	-98
164	1980	10	0	1	75	143	189	0	232	51	10	0	30	0	47	12	357	830	250	0	0	0	98	98	12	7	0	11	53	0	0	0	0
164	1980	11	0	1	75	143	189	0	232	51	10	0	30	0	47	12	357	830	250	0	0	0	98	98	12	7	0	11	53	0	0	0	-98
164	1980	12	0	0	0	107	36	49	27	0	0	0	0	0	31	0	0	0	19	66	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1981	1	0	0	0	94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52	0	0	0	0	0	0	0	0	0
164	1981	2	0	0	0	0	0	0	0	0	0	0	0	31	10	0	1	0	16	2	0	0	0	0	0	0	0	0	0	0	-98	-98	-98
164	1981	3	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	5	36	0	76	0	139	453	6	46	78	62	0	410	62	14
164	1981	4	416	30	379	8	186	130	0	0	59	336	735	261	174	12	1117	600	800	61	0	0	0	47	0	0	42	13	0	-99	0	280	-98
164	1981	5	0	28	15	10	7	128	607	561	125	2	0	135	65	664	5	10	0	0	36	10	0	0	0	0	0	0	0	0	0	44	0
164	1981	6	0	0	0	0	12	0	0	7	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	3	0	54	0	-98
164	1981	7	0	0	0	0	0	0	0	0	0	0	8	21	0	21	1	0	0	0	0	0	0	0	0	0	0	6	0	0	48	0	0
164	1981	8	0	0	0	0	58	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	15	0	0	0	0	235	0	66
164	1981	9	0	0	0	0	7	0	0	0	0	0	0	0	30	0	0	0	0	0	-99	27	0	0	21	26	0	0	255	21	0	0	-98
164	1981	10	0	0	0	0	0	8	0	51	0	0	0	0	0	0	0	0	0	0	41	62	0	2	0	0	162	23	92	6	0	0	0
164	1981	12	0	0	0	0	189	35	2	4	0	0	0	0	3	0	18	18	50	15	3	0	0	0	32	11	0	0	0	0	0	0	0
164	1982	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1982	2	0	0	0	0	0	0	0	0	0	0	0	0	8	99	87	0	0	0	0	0	0	0	0	0	0	0	0	0	-98	-98	-98
164	1982	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	194	0	0	0	0	0	0	0	259	85	60	19
164	1982	4	8	8	0	32	0	0	30	99	9	0	0	0	0	0	19	73	0	116	28	135	40	16	7	397	0	342	204	560	20	0	-98
164	1982	5	10	0	10	675	54	16	32	95	81	2	97	0	83	102	216	0	53	0	202	176	0	11	0	56	19	137	47	1	4	0	2
164	1982	6	2	0	0	0	0	0	12	0	0	0	0	0	25	0	0	0	3	18	6	1	87	180	7	0	12	5	1	0	0	0	-98
164	1982	7	1	0	0	0	0	0	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	10	38	0	191	0	0	0	0	0
164	1982	8	29	0	0	0	0	0	1	31	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0
164	1982	9	0	0	0	0	1	0	0	0	0	0	0	0	0	123	0	0	0	0	88	0	0	7	6	0	74	0	0	42	0	0	-98
164	1982	10	0	0	0	0	0	90	0	0	0	2	74	75	26	3	0	50	156	387	76	212	50	4	86	31	0	0	0	32	37	112	15
164	1982	11	282	10	0	56	0	0	0	72	195	0	2	0	204	88	11	38	144	41	22	0	0	0	1	169	158	491	102	114	0	151	-98
164	1982	12	717	91	589	173	0	3	21	0	12	10	0	0	5	0	14	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1983	1	0	0	0	0	1	7	0	0	0	0	0	0	0	0	39	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0
164	1983	2	1	77	0	0	0	0	0	0	0	0	675	7	68	388	0	0	115	248	212	30	0	0	0	0	0	0	0	0	-98	-98	-98
164	1983	3	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	670	4	0	0	0	0
164	1983	4	0	0	0	0	27	0	0	0	0	0	0	27	7	0	21	2	0	0	0	100	2	14	332	192	114	564	156	117	21	33	-98

164	1983	5	4	12	0	1	0	58	3	6	3	0	5	32	1	3	0	51	153	0	0	0	0	15	32	0	6	0	0	0	7	0	0
164	1983	6	0	0	0	71	11	0	2	0	0	0	0	0	0	1	0	0	0	0	21	6	6	3	0	0	0	0	0	10	0	0	-98
164	1983	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	78	78	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0
164	1983	8	0	0	0	0	0	0	0	0	0	100	0	0	0	25	0	0	0	0	3	44	72	21	0	0	3	0	0	0	0	24	0
164	1983	9	0	0	0	0	0	0	0	2	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	-98
164	1983	10	0	0	177	31	76	11	0	10	65	1	0	0	23	54	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	56
164	1983	11	121	10	25	0	41	0	0	0	0	0	0	0	25	0	0	0	0	0	5	0	0	0	0	0	6	0	0	0	3	13	-98
164	1984	1	0	0	0	0	0	0	0	14	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
164	1984	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	-98	-98
164	1984	3	16	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	10	0	0	0	0	0	0	0	0	13	0	0	10	0	0
164	1984	4	0	0	0	0	0	0	0	32	124	59	42	0	0	12	0	124	0	0	0	0	0	0	0	34	135	85	0	0	0	138	-98
164	1984	5	0	0	0	0	0	16	0	0	2	0	0	0	0	8	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1984	6	0	0	2	0	0	0	0	0	22	0	0	0	0	0	37	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	1984	7	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	16	0	19	11	24	0	5	0	0	0	0	0	0	0	0
164	1984	8	0	0	0	0	0	25	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	29	0	1	0
164	1984	9	12	0	0	156	0	0	0	0	0	0	0	0	23	54	0	0	0	0	0	34	0	0	0	0	0	0	27	0	0	0	-98
164	1984	10	0	0	0	0	21	14	31	248	20	4	150	4	0	0	0	55	0	0	34	18	30	19	387	20	40	123	0	0	0	3	11
164	1984	11	0	22	6	30	69	63	210	15	0	156	34	33	62	11	181	0	84	0	0	0	0	0	0	14	0	317	35	4	16	41	-98
164	1984	12	46	26	0	0	0	0	16	7	0	93	441	28	0	0	0	0	0	0	0	31	48	0	0	0	0	0	0	0	0	0	0
164	1985	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1985	2	0	254	48	0	94	3	6	28	94	90	153	18	0	0	0	0	0	5	0	0	0	0	0	0	0	0	134	0	-98	-98	-98
164	1985	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	27	440	0	63	49	17	0	0	3	19	436	2	87	162
164	1985	4	0	0	7	10	29	0	0	82	73	86	12	239	38	181	396	480	81	7	67	36	16	9	0	0	78	7	0	0	123	263	-98
164	1985	5	136	18	166	23	18	0	0	4	139	3	0	20	0	20	96	29	0	26	0	0	0	0	0	28	0	0	1	0	0	0	0
164	1985	6	0	0	3	0	0	0	0	0	0	0	0	7	2	0	0	0	183	3	13	5	0	0	0	0	0	0	0	0	0	0	-98
164	1985	7	0	0	0	1	0	35	13	0	0	0	0	220	0	5	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
164	1985	8	0	0	0	16	0	0	0	12	10	6	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	8	6	0	0
164	1985	9	20	0	0	0	93	0	0	3	4	0	0	0	0	0	0	0	0	0	0	41	0	0	0	0	0	0	0	0	0	0	-98
164	1985	10	0	0	0	0	0	0	0	0	28	93	0	0	0	0	13	3	3	4	26	0	0	0	19	128	0	0	2	17	0	0	0
164	1985	11	0	2	117	0	76	268	291	2	32	0	50	10	0	0	0	0	28	42	45	2	2	34	76	6	0	23	0	0	0	11	-98
164	1985	12	22	20	23	4	67	1	11	0	4	121	91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	421	0	0	0	0
164	1986	1	0	0	0	0	0	0	2	0	23	0	23	13	38	20	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0
164	1986	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98	-98	-98
164	1986	3	0	0	0	2	0	126	112	12	30	0	0	0	0	0	0	4	284	0	0	97	6	6	0	0	0	65	0	0	7	50	0
164	1986	4	29	0	0	0	0	397	14	79	559	84	0	0	147	0	1	17	28	0	0	0	0	184	76	2	0	157	151	167	160	139	-98
164	1986	5	19	5	166	0	0	516	1045	168	0	0	0	0	37	60	0	0	0	5	51	49	27	119	89	6	162	0	0	3	43	21	0
164	1986	6	176	5	0	0	0	0	0	0	0	0	0	0	24	0	0	25	9	0	0	0	0	17	0	0	0	0	0	0	6	0	-98
164	1986	7	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	6	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
164	1986	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	2	0	0	0	0	0	4	21	0	0	0	5
164	1986	9	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	1986	11	10	94	95	75	61	0	0	2	2	324	78	39	67	51	0	11	90	0	5	0	446	126	30	44	22	79	27	63	83	1	-98
164	1986	12	171	10	0	0	312	591	10	0	24	5	0	0	0	0	0	0	0	2	83	0	0	0	0	0	0	0	0	0	0	0	0
164	1987	1	0	66	140	43	100	0	0	4	0	2	0	0	0	0	88	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1987	2	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	114	0	0	0	0	0	0	0	0	0	-98	-98	-98
164	1987	3	0	0	0	0	4	0	0	0	15	360	0	0	0	0	0	0	0	5	123	0	0	0	0	0	0	0	0	0	0	0	0
164	1987	4	0	0	0	0	397	251	246	20	0	23	86	53	228	2	0	0	0	787	28	350	4	188	0	0	7	0	0	0	0	605	-98
164	1987	5	255	9	0	0	0	0	11	15	89	110	2	15	0	0	0	8	2	9	3	0	0	5	103	79	1	12	0	0	0	17	198
164	1987	6	44	34	0	50	106	202	15	0	0	0	29	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	73	16	143	-98
164	1987	7	6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1987	8	0	0	0	0	0	0	0	15	33	10	0	17	8	2	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1987	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	34	36	0	0	0	0	74	-98
164	1987	10	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0
164	1987	11	0	0	0	32	15	81	197	163	6	0	508	84	87	0	34	0	0	0	0	0	0	112	104	0	0	0	2	147	2	0	-98
164	1987	12	0	37	276	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1988	1	0	0	0	7	2	4	68	0	31	86	0	0	0	0	0	120	442	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1988	2	0	82	0	0	0	0	0	0	118	0	0	0	0	0	0	0	0	0	0	18	35	0	0	0	0	0	0	0	0	-98	-98
164	1988	3	0	0	59	6	72	0	0	0	0	25	0	0	0	0	5	0	0	27	204	0	0	0	212	212	0	81	216	204	0	0	0
164	1988	4	172	18	0	2	214	221	0	120	172	0	9	0	0	6	21	388	122	8	272	112	0	195	310	0	227	288	0	91	917	0	-98

164	1988	5	270	334	0	4	170	347	261	417	0	2	89	0	0	0	0	42	136	6	49	209	82	0	0	0	0	0	0	0	0	0	0
164	1988	6	0	0	0	0	0	0	0	52	19	0	0	636	20	0	0	0	42	19	0	0	0	0	0	31	0	0	0	0	87	0	-98
164	1988	7	0	0	0	0	0	0	0	0	0	0	0	0	0	96	13	0	0	0	0	0	0	18	0	0	0	0	0	0	6	3	0
164	1988	8	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	48	117	5	1	2	17	44	0	0	0	10	48	0	0
164	1988	9	78	11	0	0	0	0	0	0	0	0	7	3	0	0	0	0	16	7	22	0	0	0	0	4	0	0	0	0	0	0	-98
164	1988	10	88	0	0	5	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	5	0	0	0	0	0	94	0
164	1988	11	0	0	6	0	57	114	0	16	132	75	19	0	0	7	11	15	8	32	0	38	282	7	0	0	10	0	0	0	0	0	-98
164	1988	12	0	0	0	0	0	0	10	37	0	27	63	0	0	0	0	0	0	16	109	403	123	238	0	35	128	0	220	37	12	0	0
164	1989	1	0	0	0	0	387	201	0	0	0	0	0	0	0	218	33	112	0	21	0	4	91	0	28	7	0	0	0	0	0	0	0
164	1989	2	0	0	0	156	21	164	2	45	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98	-98	-98
164	1989	3	0	0	0	0	0	0	0	0	0	0	0	156	119	36	0	0	66	31	57	87	187	0	0	13	0	0	0	0	0	50	0
164	1989	4	41	15	0	428	18	400	174	210	120	58	3	20	0	5	0	7	0	0	38	0	0	7	26	174	443	0	309	81	65	5	-98
164	1989	5	8	31	0	0	0	12	488	170	74	38	157	332	143	0	20	0	68	802	0	5	22	0	0	0	0	136	47	25	0	0	0
164	1989	6	0	0	252	0	0	0	0	0	0	0	0	0	27	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	1989	7	0	0	13	0	25	27	154	11	0	0	0	77	8	0	0	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1989	8	0	0	10	0	75	17	0	0	0	73	0	0	18	0	0	18	5	0	0	0	0	0	0	0	0	0	12	0	6	2	0
164	1989	9	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	8	30	369	19	0	0	52	0	12	16	0	8	0	0	-98
164	1989	10	0	3	0	0	8	5	19	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	14	62	154	91	175	19
164	1989	11	0	0	0	0	0	0	0	85	137	73	0	0	29	14	0	34	63	0	8	89	13	62	130	0	30	128	73	15	88	78	-98
164	1989	12	2	34	4	0	0	0	42	176	122	44	19	5	0	0	0	0	0	0	0	0	30	87	16	4	0	643	91	0	0	105	622
164	1990	1	5	426	3	0	0	0	0	0	0	73	0	0	0	0	0	0	0	0	0	11	9	0	0	0	0	0	0	0	0	0	0
164	1990	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	118	8	84	0	7	0	0	59	0	0	-98	-98	-98
164	1990	3	0	0	0	115	198	106	180	155	43	0	4	62	606	427	0	14	6	0	0	26	0	87	13	54	0	0	0	0	0	39	23
164	1990	4	665	510	14	87	204	5	31	10	12	26	6	32	48	27	0	44	50	4	0	15	265	376	40	0	0	4	0	0	0	0	-98
164	1990	5	0	0	0	0	0	0	93	46	349	0	5	245	482	140	0	0	0	0	4	16	0	104	0	0	59	82	0	8	0	0	0
164	1990	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0	0	75	-98
164	1990	7	0	0	0	0	0	6	3	0	0	22	0	0	0	0	119	0	0	0	0	2	0	0	0	5	0	0	0	0	0	0	0
164	1990	8	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	8	0	0	0	2	4	0	0	0	0	2	0	0	0	11	55
164	1990	9	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	24	0	0	0	0	0	0	0	0	0	0	83	-98
164	1990	11	124	7	59	25	7	2	316	61	0	0	6	107	77	150	91	129	93	49	92	0	0	0	5	0	0	0	0	0	0	0	-98
164	1990	12	0	17	5	30	4	0	28	19	0	65	316	79	46	0	84	8	85	40	0	3	0	0	0	0	0	0	0	0	0	0	100
164	1991	1	63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	21	0	0	0	0
164	1991	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98	-98	-98
164	1991	3	0	0	0	0	0	0	0	0	0	2	0	0	13	6	0	0	0	0	0	0	0	0	0	149	309	241	2	100	112	6	0
164	1991	4	0	313	41	66	4	118	37	0	0	0	0	0	1	0	23	0	5	35	0	100	0	0	0	7	0	0	0	489	214	31	-98
164	1991	5	78	1	0	3	0	0	74	24	0	9	202	139	485	8	0	2	529	148	198	12	93	39	108	4	11	56	26	89	137	0	55
164	1991	6	0	4	0	16	12	0	119	0	0	0	0	0	0	0	42	26	0	0	13	0	0	0	0	0	0	0	0	0	0	0	-98
164	1991	7	0	0	5	0	11	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0
164	1991	8	0	0	0	0	0	0	0	0	0	68	306	16	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
164	1991	9	15	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	6	2	0	0	6	0	0	0	0	0	0	-98
164	1991	10	0	0	0	0	0	3	8	0	0	0	28	0	0	62	56	82	0	0	1	0	9	28	0	0	0	39	0	0	0	0	0
164	1991	11	47	46	0	51	0	0	0	1	29	52	48	60	34	10	85	63	101	0	12	5	38	438	599	17	25	26	34	6	0	0	-98
164	1991	12	22	0	0	0	0	69	74	62	64	201	41	0	0	0	0	0	0	0	287	406	8	5	7	0	0	12	0	0	0	0	0
164	1992	1	0	0	0	0	0	0	0	0	0	0	0	0	27	1	45	4	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
164	1992	2	0	0	0	477	0	0	0	259	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98	-98
164	1992	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	260	0	0	0	24	18	0	0	0	0	0	0	0	0	0
164	1992	4	118	396	0	0	3	1	361	363	363	579	3	0	0	23	0	0	0	178	0	0	204	0	0	0	0	374	54	299	273	438	-98
164	1992	5	61	452	83	15	0	0	0	0	0	9	0	0	22	20	11	56	0	0	0	0	0	106	0	0	0	0	0	8	101	0	0
164	1992	6	0	0	0	0	9	0	0	0	0	9	187	0	17	0	0	0	0	0	0	51	0	0	10	0	0	0	0	0	0	0	-98
164	1992	7	8	113	280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1992	8	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	7	4	0	0	0	0	0	0	0	3	30	0	0	0	0	0
164	1992	9	0	0	0	0	0	15	11	0	2	20	5	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	-98
164	1992	10	22	68	40	0	0	0	0	0	0	0	15	0	0	95	0	52	61	0	0	0	0	0	0	0	0	0	77	41	30	0	11
164	1992	11	85	94	142	62	63	70	0	0	29	0	0	20	1	109	0	545	0	0	0	0	0	0	3	5	0	0	5	11	22	83	-98
164	1992	12	1	0	37	0	0	25	176	35	3	147	0	0	34	0	34	354	9	2	0	0	0	0	0	0	0	0	0	0	30	45	32
164	1993	1	90	13	0	0	55	130	519	0	86	0	2	68	69	0	222	40	36	83	258	334	0	0	0	0	477	122	37	3	72	35	0
164	1993	2	0	0	0	0	0	269	12	556	0	645	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98	-98	-98

164	1993	3	0	0	0	0	0	0	0	93	0	0	0	95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	91	0
164	1993	4	0	0	0	0	0	49	0	0	0	0	0	0	5	0	148	36	4	9	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	1993	5	0	0	216	153	20	0	185	0	0	47	67	0	121	75	3	14	9	0	0	0	0	40	0	2	0	0	0	0	0	0	0
164	1993	6	0	0	0	152	38	0	14	4	29	210	15	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	1993	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0
164	1993	8	0	0	0	0	6	0	0	0	0	0	0	0	111	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1993	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	1993	10	0	0	0	0	0	0	5	2	0	0	0	0	0	25	40	0	0	0	0	0	0	0	0	0	0	0	0	0	130	229	23
164	1993	11	23	349	0	0	0	0	34	79	30	0	0	0	0	0	0	6	0	0	36	40	92	7	0	0	0	41	0	59	211	5	-98
164	1993	12	31	0	31	34	453	493	0	0	0	0	0	0	11	0	0	0	15	0	0	0	0	0	0	0	7	0	7	0	0	0	0
164	1994	2	0	0	0	0	0	0	0	0	0	0	75	263	20	9	505	10	0	0	0	0	0	46	0	0	0	0	0	0	-98	-98	-98
164	1994	3	0	0	0	18	7	0	0	0	0	0	0	0	0	140	0	0	0	0	3	0	0	0	30	71	25	3	0	294	0	0	0
164	1994	4	0	0	0	0	0	126	0	135	182	0	31	20	346	0	311	0	0	0	0	0	229	0	392	358	155	81	22	0	0	82	-98
164	1994	5	35	32	67	0	0	0	26	3	0	0	68	0	14	10	291	18	50	0	125	115	0	0	27	9	16	0	0	236	0	0	0
164	1994	6	0	0	0	0	0	0	0	0	101	0	0	0	0	0	0	7	0	9	0	0	0	0	0	0	0	0	0	11	0	70	-98
164	1994	7	0	28	17	0	0	0	0	0	0	0	0	128	0	0	16	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
164	1994	8	0	29	0	2	0	0	4	0	0	18	1	0	0	225	257	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1994	9	0	0	0	0	14	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	-98
164	1994	10	0	0	0	0	0	0	3	0	0	0	0	195	418	0	0	0	22	7	9	0	3	115	106	0	0	0	0	0	0	0	0
164	1994	11	0	4	0	334	267	129	43	200	0	391	148	69	202	134	26	78	3	0	0	2	154	5	0	0	0	21	12	41	65	127	-98
164	1994	12	0	0	0	67	266	15	122	51	2	3	0	0	5	0	0	0	0	0	0	0	0	0	138	0	8	0	0	0	0	0	0
164	1995	1	0	139	0	0	0	0	0	0	0	0	3	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1995	2	0	0	0	0	0	0	0	60	77	321	22	48	0	276	364	0	0	0	0	0	0	0	0	0	0	0	0	0	-98	-98	-98
164	1995	3	0	374	615	77	32	0	0	31	0	0	0	0	0	140	0	0	0	0	0	0	0	0	256	76	57	0	20	0	0	4	0
164	1995	4	0	0	28	2	106	4	0	1	0	62	59	0	0	0	0	0	0	0	297	14	30	0	0	0	0	15	182	31	126	140	-98
164	1995	5	418	147	39	0	0	734	5	223	8	0	7	14	0	3	164	64	60	6	11	0	0	0	0	0	0	33	0	16	79	72	0
164	1995	6	0	0	81	0	79	0	8	0	0	0	0	0	0	0	3	20	0	0	0	0	0	0	0	0	0	0	14	35	6	67	-98
164	1995	7	17	0	0	0	0	55	0	0	0	0	0	0	0	0	0	0	0	0	0	2	30	0	7	0	1	6	0	0	0	0	0
164	1995	9	0	0	3	4	103	0	0	0	11	47	7	11	0	0	0	0	0	0	0	0	0	0	7	0	0	99	0	0	0	0	-98
164	1995	11	0	76	1	0	0	0	0	0	0	0	0	117	81	127	144	0	6	0	0	6	0	130	0	0	87	10	31	136	0	0	-98
164	1995	12	11	26	7	0	0	0	0	0	0	0	0	145	23	0	0	49	50	13	0	0	0	3	0	0	3	0	2	0	0	0	0
164	1996	1	0	0	0	0	0	0	0	0	0	0	64	0	0	0	0	7	0	0	0	33	78	0	0	0	0	0	0	0	0	0	0
164	1996	2	0	0	0	0	3	37	0	0	0	0	9	0	0	0	0	53	325	0	0	16	0	0	0	0	0	0	12	0	0	-98	-98
164	1996	3	0	0	0	196	0	0	0	0	0	145	0	0	0	47	0	0	0	0	26	65	0	104	0	0	0	463	0	131	5	0	32
164	1996	4	214	9	0	0	0	157	22	588	0	0	3	6	0	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	103	-98
164	1996	5	3	0	0	0	11	1	0	0	0	0	2	3	3	116	3	0	4	305	4	199	10	67	26	0	53	82	2	0	0	0	0
164	1996	6	0	34	44	50	0	0	0	92	45	19	14	90	123	49	0	0	0	0	0	0	0	1	0	10	0	12	0	0	0	0	-98
164	1996	7	0	0	0	0	0	5	23	3	0	0	5	61	8	0	42	46	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1996	9	197	0	19	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	1996	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0
164	1996	11	5	10	78	210	0	0	13	2	0	23	258	170	45	189	5	0	0	0	302	96	65	0	0	135	34	1	36	0	0	0	-98
164	1996	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1997	1	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1997	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98	-98	-98
164	1997	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1997	5	413	0	85	190	68	152	0	0	11	18	27	0	0	86	153	0	0	0	0	0	3	26	76	6	0	0	0	0	0	0	14
164	1997	6	0	0	0	0	0	0	0	0	14	0	0	0	0	2	0	0	0	8	4	0	8	0	0	0	0	0	0	8	5	0	-98
164	1997	7	0	3	0	0	0	0	0	10	1	6	0	0	0	0	0	0	0	0	0	0	0	0	18	12	0	0	0	0	0	0	0
164	1997	8	0	0	0	0	0	0	61	31	0	7	0	0	0	0	27	3	0	0	0	0	0	24	0	0	0	0	0	0	0	0	0
164	1997	9	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	-98
164	1997	10	0	0	0	22	0	47	1	18	0	5	37	142	67	1	0	0	0	58	63	43	596	2	5	0	0	0	0	0	176	89	185
164	1997	11	59	69	22	316	219	150	269	3	13	0	17	9	0	178	274	25	14	475	0	3	93	0	46	222	216	101	201	356	429	59	-98
164	1997	12	0	82	139	280	36	278	60	71	0	73	0	36	62	0	4	15	10	155	0	0	0	7	0	116	107	78	204	146	0	2	0
164	1998	1	49	22	20	425	0	76	145	27	78	87	639	46	81	490	817	435	10	0	20	3	0	0	0	0	0	0	74	47	16	0	4
164	1998	2	0	0	0	0	0	2	10	5	523	207	225	47	84	151	56	66	7	0	21	38	0	0	0	0	0	0	0	0	-98	-98	-98
164	1998	3	0	0	0	0	0	0	0	45	9	6	0	0	0	0	0	6	0	0	0	97	163	126	8	78	148	14	0	11	2	0	26
164	1998	4	0	0	56	0	48	47	0	0	82	10	320	137	52	9	0	0	0	2	0	132	0	10	10	0	26	0	1	69	27	80	-98

164	1998	5	290	200	83	98	102	216	157	173	76	398	152	116	0	33	9	452	4	0	0	0	465	18	47	0	15	110	881	32	0	0	0
164	1998	6	0	0	0	0	64	0	206	456	2	0	0	0	0	0	0	0	0	1	8	0	0	0	0	0	127	0	0	0	0	0	-98
164	1998	7	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	386	11	0	0	0	0	0	0	0	11	0
164	1998	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	0	2	0	0	0	0	135	88	0	0	0	0	0	0
164	1998	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	247	0	0	-98
164	1998	10	0	6	65	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1998	11	38	0	0	29	0	0	0	136	30	54	0	0	0	0	0	0	32	88	4	3	3	29	0	51	0	32	16	0	3	14	-98
164	1998	12	0	4	0	0	2	0	0	28	0	0	0	0	0	0	0	0	630	0	25	0	0	0	0	0	0	0	0	0	0	0	0
164	1999	1	0	0	0	0	0	0	0	0	111	5	0	0	0	0	58	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
164	1999	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	-98	-98	-98
164	1999	3	0	0	0	0	0	0	0	0	152	70	15	455	125	21	26	0	26	50	0	0	0	0	0	0	75	526	22	79	6	13	189
164	1999	4	284	0	51	28	0	28	6	157	45	368	0	0	0	0	0	109	0	0	252	0	37	0	32	0	0	0	0	30	1	313	-98
164	1999	5	13	0	0	0	0	6	0	0	26	0	0	0	30	0	0	7	169	0	0	0	0	0	0	0	0	0	0	0	7	0	0
164	1999	6	9	0	14	0	0	0	0	7	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	-98
164	1999	7	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	23	8	4	0	0	0	0	0	0	0	0	1	0	9	0	0
164	1999	8	0	0	0	0	0	0	0	0	0	0	0	8	0	0	9	15	0	21	6	0	0	0	0	400	7	0	0	0	0	130	16
164	1999	9	6	0	0	2	0	0	2	0	0	0	0	137	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	1999	10	0	0	0	0	0	0	0	0	0	0	3	0	30	0	0	0	7	0	0	0	0	0	0	0	30	41	52	61	0	0	0
164	1999	11	0	0	0	0	0	351	14	48	5	28	153	234	82	40	38	20	230	33	101	30	108	0	2	24	158	40	41	49	464	574	-98
164	1999	12	532	204	0	158	4	213	85	31	0	11	0	0	0	0	0	0	0	50	126	155	34	20	64	10	1	0	91	48	0	0	0
164	2000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	18	0	0	0	0	0	0	0	0	0
164	2000	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98	-98
164	2000	3	23	0	0	0	0	0	0	0	0	0	0	0	0	235	0	46	0	0	16	0	0	0	0	0	56	0	19	0	0	0	0
164	2000	4	49	0	0	283	201	44	12	23	10	0	2	0	0	0	0	0	0	0	0	0	0	272	156	25	0	0	0	0	0	0	-98
164	2000	5	2	32	0	0	0	26	0	426	214	0	2	0	0	0	0	18	0	0	0	0	0	0	0	0	0	390	90	0	3	0	0
164	2000	6	0	0	0	0	0	0	0	0	0	0	116	20	0	0	0	30	0	170	103	0	0	0	0	0	0	0	0	0	0	0	-98
164	2000	7	0	0	0	5	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	10	5	6	0	0	0	0	11	5
164	2000	8	0	0	0	0	71	0	0	2	0	0	0	0	0	12	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	2000	9	0	0	0	0	0	0	0	0	0	0	0	0	85	0	0	0	0	0	155	2	0	0	0	0	0	0	144	0	0	0	-98
164	2000	10	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	80	147	0	21	0	0	0	0	0	0	0	0	0	0	0
164	2000	11	89	0	24	54	0	176	0	0	0	33	3	0	15	13	47	9	268	62	12	305	383	15	52	2	57	101	0	27	0	0	-98
164	2000	12	67	0	0	0	0	0	57	0	52	113	127	0	0	0	0	161	333	2	0	48	20	0	0	0	0	0	0	0	0	0	0
164	2001	1	0	0	274	524	20	413	149	585	23	200	19	204	1284	3	0	0	0	0	0	0	8	0	375	5	175	8	16	0	15	0	0
164	2001	2	0	0	0	0	212	0	0	29	0	14	0	23	0	0	0	0	0	0	0	0	0	0	10	0	29	0	0	0	-98	-98	-98
164	2001	3	0	0	0	0	263	630	0	0	0	0	0	122	112	0	0	0	23	0	8	0	0	0	0	42	256	777	240	240	0	161	52
164	2001	4	12	0	0	70	158	35	194	150	78	0	0	0	0	0	52	0	0	0	48	0	293	72	0	57	1	0	0	115	18	97	-98
164	2001	5	0	541	94	27	2	57	0	0	0	0	40	0	22	0	67	0	0	0	0	0	0	0	15	0	0	0	218	6	0	0	0
164	2001	6	0	0	0	0	67	991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	4	0	0	0	0	2	0	0	0	-98
164	2001	7	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	3	32	120	83	0	0	0	8	3	0	0	0	0
164	2001	8	0	5	0	0	0	0	0	23	0	0	0	148	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	2001	9	0	0	0	0	0	0	276	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	2001	10	5	3	4	22	0	187	21	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	0	0	40	9
164	2001	11	247	10	48	330	99	19	0	0	20	0	0	196	243	102	45	0	0	0	0	0	43	24	0	11	110	5	35	0	0	0	-98
164	2001	12	0	0	0	0	0	0	0	0	8	0	27	14	6	46	0	0	2	25	5	0	0	0	0	0	0	0	0	0	0	0	0
164	2002	1	0	0	0	0	83	0	0	0	0	0	0	0	35	168	144	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	2002	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0	6	0	0	0	0	0	2	0	122	24	357	5	-98	-98	-98
164	2002	3	0	84	409	13	0	85	0	0	146	117	0	13	0	0	0	7	0	0	8	3	0	0	3	3	0	0	0	0	0	0	8
164	2002	4	0	13	0	0	0	0	0	0	0	0	0	34	0	0	89	170	19	1	5	151	7	285	42	11	27	0	120	183	866	29	-98
164	2002	5	192	164	4	305	5	23	168	13	46	66	18	156	8	0	0	0	161	0	0	79	21	0	0	0	0	0	0	0	0	0	0
164	2002	6	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	2002	7	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	210
164	2002	8	0	0	6	0	0	0	0	0	0	8	2	0	3	15	0	0	0	0	5	0	0	0	0	25	0	0	0	0	0	0	0
164	2002	9	0	0	0	0	0	0	46	0	0	0	0	36	0	0	0	0	180	0	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	2002	10	0	35	0	0	0	0	0	0	12	179	0	0	0	0	0	0	0	0	0	0	0	83	208	90	0	106	12	0	3	24	0
164	2002	11	204	0	0	11	142	163	99	0	0	14	0	0	229	107	302	58	145	0	41	2	34	0	0	0	0	0	0	2	62	0	-98
164	2002	12	0	0	208	171	10	20	0	0	24	0	0	177	12	62	5	0	0	0	152	106	466	59	23	52	22	123	237	403	289	0	7
164	2003	1	247	0	0	129	144	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

164	2003	2	0	0	0	0	47	0	0	0	0	89	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98	-98	-98
164	2003	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	97	28	0	0	70	66	3	0	0	0
164	2003	4	0	0	0	0	0	0	0	0	0	0	0	0	0	317	0	14	0	0	0	138	583	486	337	0	0	0	48	56	39	311	-98
164	2003	5	40	106	166	26	164	83	112	537	28	4	6	219	39	403	4	27	0	0	0	5	69	49	25	9	18	0	86	76	4	50	120
164	2003	6	0	200	0	0	0	46	12	0	112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	2003	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	4	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0
164	2003	8	0	0	0	8	0	0	0	0	14	0	7	0	0	2	0	0	31	0	0	12	6	2	0	0	18	23	0	0	0	0	0
164	2003	9	0	0	0	0	0	0	0	0	0	0	313	0	0	119	0	0	8	2	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	2003	10	2	4	5	3	13	0	0	0	0	0	0	4	0	0	0	0	100	8	0	0	0	0	0	22	41	29	0	47	27	256	148
164	2003	11	40	88	40	10	78	0	0	0	0	0	0	0	339	60	0	0	0	0	0	286	59	114	0	542	0	4	12	2	0	0	-98
164	2003	12	93	2	3	28	0	0	0	29	3	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
164	2004	1	0	10	8	2	12	0	0	0	0	0	0	0	0	245	679	30	0	0	0	0	0	247	106	0	0	0	0	0	0	0	0
164	2004	2	0	56	25	3	0	0	0	39	109	0	14	0	0	0	10	32	0	0	0	0	0	27	2	0	0	0	0	0	0	-98	-98
164	2004	3	0	0	0	0	0	0	0	0	30	68	310	38	0	0	0	0	0	0	0	0	0	0	0	0	13	0	138	0	0	78	210
164	2004	4	0	0	0	0	380	94	150	122	588	624	24	41	29	15	0	0	0	0	0	0	0	0	16	74	87	78	9	0	427	360	-98
164	2004	5	146	628	674	30	415	0	13	0	0	31	16	0	0	9	0	0	26	0	0	0	0	0	0	0	0	0	0	0	0	4	0
164	2004	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	8	80	2	0	-98
164	2004	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	2004	8	0	0	0	0	0	0	0	0	0	0	97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0
164	2004	9	0	4	0	0	0	0	0	0	0	0	0	0	6	10	22	0	0	0	0	0	5	0	0	0	13	2	172	0	0	0	-98
164	2004	10	4	14	0	0	0	0	0	0	0	0	0	0	0	16	3	93	0	32	28	7	8	0	277	90	19	115	3	13	35	0	0
164	2004	11	0	0	122	0	39	49	2	249	36	0	0	119	10	56	0	180	8	3	0	0	0	177	53	563	8	0	0	0	0	5	-98
164	2004	12	4	0	30	0	5	37	166	62	69	5	0	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0	0	0	210	0	0

Rainfall Data

Source: Kenya Meteorological Department, Ministry of Transport and Communication

Station 9136164(=164): Dagoretti Corner **Data period: 2005~2008**

No Date: -98

Missing data: -99

Data Unit: x10-1 mm

Sta.	Year	Mon.	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	17th	18th	19th	20th	21st	22nd	23rd	24th	25th	26th	27th	28th	29th	30th	31st
164	2005	1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	976	0	0	0	26	0.1	26
164	2005	2	0	0	0	0	0	2	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	350	-98	-98	-98
164	2005	3	13	0	0	0	0	0	0	2	0.1	0	0	2	47	0.1	0	0	0	32	27	8	14	47	0.1	194	0	0	0	0	0	0	0
164	2005	4	0	0	3	94	19	16	94	516	39	10	34	0	0	0	0	6	3	0	0	0	3	0	0	0	0	0	6	310	113	360	-98
164	2005	5	0	98	8	18	0.5	36	127	596	121	20	0	0	0	0	14	24	0	0	0	370	99	0	7	155	4	274	93	345	21	2	0
164	2005	6	0	0	0	0	0	0	0.1	20	0	0	0	0	0	0	0	2	0.1	3	0	84	37	19	0.1	0	0	0	0	0	0	0	-98
164	2005	7	0	0.1	0	0.1	0	0	0	19	0	0	0	0	0	0	0	0	0	20	3	0.1	0	5	0.1	0	0	0	21	5	10	59	24
164	2005	8	3	0	1	0.1	0	0.1	0.1	0	0	5	11	8	2	7	4	26	0.1	0	0	0	0.1	0	0	0	0	0.1	0	0	0	49	0.1
164	2005	9	3	0	0	0	168	0	0	0	11	0	10	5	7	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98
164	2005	10	0	0	0	0	0	0	0	0	0.1	66	0	0	0	187	19	0	0	9	0.1	0	77	12	2	74	0	11	0	0	0	0	0
164	2005	11	17	27	0	167	392	4	0	0	0	130	153	10	28	39	0	0	0	0.1	0	0.1	28	115	6	14	14	0	0.1	0	0	0.1	-98
164	2005	12		0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	2006	1	0.1	34	0	0	0	0	0	0	0	0	0	4	0	0	23	0	0	0	6	0	14	0	0	0	0	0	0	0	0	0	0
164	2006	2	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	21	87	-98	-98	-98
164	2006	3	91	286	266	0	47	536	0.1	57	0	0	0	0.1	5	0	0	0	0	0	0.1	0.1	0.1	12	0	0	28	0.1	0	0	66	168	0
164	2006	4	0	64	398	66	536	701	318	186	31	24	18	5	0	0	11	200	6	90	22	63	38	0	71	10	53	84	0.1	46	41	0	-98
164	2006	5	45	140	209	166	84	4	0.1	519	50	49	0	0	17	144	0	0	0	0	0	0	0	0	0	0	11	8	0	0	19	0	0
164	2006	6	0	0	0	5	0	0	0	76	0	0.1	14	0	0	0.1	0	0	0	0	0	0	0	0	0	0.1	7	0.1	0	0	0	0.1	-98
164	2006	7	0.1	0	0	0	0	0	0	0.1	0	0	30	0	0	0.1	0.1	0.1	0	0	0	0	10	10	0	0	0	0.1	7	11	0.1	4	0
164	2006	8	0	0	96	198	0.1	0.1	6	28	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	82	41	0	0	0	0
164	2006	9	0	0	0	8	30	0	0	0	0.1	0.1	0.1	0.1	0.1	0	6	0.1	11	0.1	200	188	0.1	0	0	0	0	0	0	0	17	35	-98
164	2006	10	0	0	0	0	0	0	0.1	0.1	0	0	0	8	38	0	0	80	210	0	0	0.1	0.1	9	0	43	0	0	0	0.1	0	0	154
164	2006	11	84	0.1	1	0	71	143	82	0	0	231	407	93	46	42	186	6	126	56	13	10	0.1	525	105	0	2	16	674	39	133	19	-98
164	2006	12	5	90	0	4	19	0	64	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	154	136	1	8	112	242	614	24	278	53	0
164	2007	1	0	0	64	68	0	0	0	0	0	0	0	0	113	0	5	0	0	0	10	0	0	0	0	0	0	0	0	0	0	6	17
164	2007	2	164	0	0	18	0	0	0	0	0	67	211	0	375	0	0	0	0	0	0	0	0	0	0	6	68	91	70	3	-98	-98	-98
164	2007	3	0	0	5	0	0	0	0	0	24	17	76	0	0	0	0	0	0	0	90	11	0	0.1	11	0	37	32	0	0	0.1	9	0
164	2007	4	0.1	0	0	0	0	6	0	0	0	142	29	0.1	37	77	0	12	772	48	0	67	14	2	239	371	111	12	50	0	0.1	7	-98
164	2007	5	0	0	0	0.1	8	0.1	0	0.1	7	0	53	16	2	0	0.1	157	585	14	0	0	0	0	0	0	0	26	0	0.1	6	0	226
164	2007	6	2	16	0.1	5	0.1	0.1	0	6	150	4	0	0.1	24	262	0	0	0	0	0	0	0	0	0.1	0	0.1	0.1	4	0.1	0.1	0	-98
164	2007	7	0	0	0	0	0	9	0	0	0	0	1	0	0	0	0	0	9	0	0.1	0	0	0	0	0.1	0	0	0	100	222	180	31
164	2007	8	0	0	56	1	0	0	6	0.1	3	2	20	0	8	0	0	0	74	11	7	151	0.1	0	0	0.1	0	0	0	0	26	0	0
164	2007	9	0	21	0	0.1	0.1	0	0	0	143	2	10	249	23	50	6	4	0	0	0	0	0	0	0	0	0	0	0	0.1	7	0	-98
164	2007	10	0	0.1	0	0	0	39	28	0.1	0	2	36	0	0.1	0	0	0	0	0	0	0	165	0	0	0.1	0.1	42	0	0	0	0	72
164	2007	11	62	0	0	0	0	0.1	0.1	0	0.1	48	16	59	52	4	132	38	11	0	8	10	45	28	73	0	0	0	0	40	38	25	-98
164	2007	12	32	25	0	0.1	0	0.1	0.1	0	28	10	89	23	0	0	0	0	0	0	0	163	0.1	0	0	0	0	0.1	0	22	0	0	0
164	2008	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	170	98	38	46	12	36	0	0	0	0	0	0	0	0	0	0	0
164	2008	2	0	0	0	0	0	5	142	41	24	16	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-98	-98
164	2008	3	0.1	0	0	0	8	0.1	24	0.1	0	0	0	0	14	20	0	0	0	0	22	191	236	0	150	28	14	197	123	298	0	0	0
164	2008	4	0	0	0	0	5	0	0.1	0	41	36	56	37	17	0.1	0	0	0	26	50	13	239	130	62	220	65	16	0	0	0	0.1	-98
164	2008	5	0.1	0	0	0	0	0.1	0.1	0.1	5	0.1	0	0	0	0	0	0	6	6	17	0	0	0.1	8	40	0	0	0	244	0	0	0
164	2008	6	0	0	0	0	0	0	0	0	0	0	0	1	0.1	11	0	2	0	0	0.1	0	0	9	13	0	0	0	0	0	0	0	-98
164	2008	7	0.1	0	0	82	0	0	0	0	0	0	378	0.1	3	19	0	0.1	0	0	0	0.1	0.1	16	7	0.1	0	0	0.1	0	2	8	36
164	2008	8	12	0.1	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0	0.1	35	0.1	33	3	0.1	0.1	0	0	3	0	0	0
164	2008	9	194	0.1	0.1	0	0	0	0.1	232	342	0.1	126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	-98
164	2008	10	0.1	70	2	270	8	0.1	0	0	0	0.1	49	6	0	0	0	153	16	14	236	131	82	59	17	16	8	1	0	0	0	0	0
164	2008	11	31	0	0	0	580	559	120	103	52	60	20	0	0	140	0	0.1	0	0	0	0	0	0	0	0	2	33	0.1	0	0	14	-98
164	2008	12	0.1	0	0	0	0.1	0	0	5	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0

（2）ガンベル法による降雨量計算

Rainfall Data and Gumbel Method (Exteam Value distribution)

(1) Rank i	(2) Year	(2) Rainfall x (mm)	(3) Exceedance Probability F(x)	(4) x^2	(5) Peak Variate y
1	1973	139.1	0.97500	19,348.81	3.6762
2	2001	128.4	0.95000	16,486.56	2.9702
3	1980	125.6	0.92500	15,775.36	2.5515
4	1981	111.7	0.90000	12,476.89	2.2504
5	1986	104.5	0.87500	10,920.25	2.0134
6	1978	98.0	0.85000	9,604.00	1.8170
7	1971	97.6	0.82500	9,525.76	1.6483
8	2005	97.6	0.80000	9,525.76	1.4999
9	1998	88.1	0.77500	7,761.61	1.3669
10	1977	86.9	0.75000	7,551.61	1.2459
11	1972	85.5	0.72500	7,310.25	1.1345
12	1989	80.2	0.70000	6,432.04	1.0309
13	1970	77.5	0.67500	6,006.25	0.9338
14	2007	77.2	0.65000	5,959.84	0.8422
15	1995	73.4	0.62500	5,387.56	0.7550
16	2006	70.1	0.60000	4,914.01	0.6717
17	1979	69.0	0.57500	4,761.00	0.5917
18	1982	67.5	0.55000	4,556.25	0.5144
19	1983	67.5	0.52500	4,556.25	0.4395
20	1990	66.5	0.50000	4,422.25	0.3665
21	1988	63.6	0.47500	4,044.96	0.2951
22	1987	60.5	0.45000	3,660.25	0.2250
23	1991	59.9	0.42500	3,588.01	0.1559
24	1997	59.6	0.40000	3,552.16	0.0874
25	1996	58.8	0.37500	3,457.44	0.0194
26	2004	58.8	0.35000	3,457.44	-0.0486
27	2003	58.3	0.32500	3,398.89	-0.1168
28	1975	58.2	0.30000	3,387.24	-0.1856
29	2008	58.0	0.27500	3,364.00	-0.2554
30	1976	56.6	0.25000	3,203.56	-0.3266
31	1993	55.6	0.22500	3,091.36	-0.3999
32	1992	54.5	0.20000	2,970.25	-0.4759
33	1994	50.5	0.17500	2,550.25	-0.5556
34	1985	48.0	0.15000	2,304.00	-0.6403
35	1999	46.4	0.12500	2,152.96	-0.7321
36	1974	44.4	0.10000	1,971.36	-0.8340
37	1984	44.1	0.07500	1,944.81	-0.9518
38	2000	42.6	0.05000	1,814.76	-1.0972
39	2002	40.9	0.02500	1,672.81	-1.3053
	Total	2,831.2		228,868.8	
	平均 Σx/N=	72.59	Σx²/N=	5868.431	
		$\overline{x}$		$\overline{x^2}$	

*) (3): F(x)=1-j/(N+1)
(5): -ln{-lnF(x)}

Sx = $(\overline{x^2}-(\overline{x})^2)$^0.5 = 24.4770

$\overline{y}$ = 0.543 Sy = 1.1388 (N=39, See Table A)

1/a=Sx/Sy= 21.4937

$\overline{x_0} = \overline{x}-(1/a)*\overline{y}$ = 60.919

x=60.919+21.4937*y

確率年TとyのTable Bに示されているので、これを上式に代入して確率雨量xが求まる。

確率年 T	F(%)	$\overline{y}$	(1/a)*y	確率雨量 (mm/day) x				
2	50	0.3665	7.877	68.80				
3	67	0.9027	19.402	**80.32**	⇒	=(24*6)^(2/3)*X/24	91.9 (mm/hr)	側溝用
4	75	1.2459	26.779	87.70				
5	80	1.4994	32.228	**93.15**	⇒	=(24*6)^(2/3)*X/24	106.6 (mm/hr)	横断管用
10	90	2.2504	48.369	109.29				
20	95	2.9702	63.840	124.76				
30	97	3.3843	72.741	133.66				
40	98	3.6763	79.017	139.94				
50	98	3.9019	83.866	144.79				
100	99	4.6002	98.875	159.79				

Table A - Sumple no. and y',Sy

Sumple No.	$\overline{y}$	Sy
15	0.5128	1.0206
16	0.5157	1.0316
17	0.5181	1.0411
18	0.5202	1.0493
19	0.5220	1.0565
20	0.5236	1.0628
21	0.5252	1.0696
22	0.5268	1.0754
23	0.5283	1.0811
24	0.5296	1.0864
25	0.5309	1.0915
26	0.5320	1.0961
27	0.5332	1.1004
28	0.5343	1.1047
29	0.5353	1.1086
30	0.5362	1.1124
31	0.5371	1.1159
32	0.5380	1.1193
33	0.5388	1.1226
34	0.5396	1.1255
35	0.5403	1.1285
36	0.5410	1.1313
37	0.5418	1.1339
38	0.5424	1.1363
39	0.5430	1.1388
40	0.5436	1.1413
41	0.5442	1.1436
42	0.5448	1.1458
43	0.5453	1.1480
44	0.5458	1.1499
45	0.5463	1.1519
46	0.5468	1.1538
47	0.5473	1.1557
48	0.5477	1.1574
49	0.5481	1.1590
50	0.5485	1.1607
51	0.5489	1.1623
52	0.5493	1.1638
53	0.5497	1.1653
54	0.5501	1.1667
55	0.5504	1.1681
56	0.5508	1.1696
57	0.5511	1.1708
58	0.5515	1.1721
59	0.5518	1.1734
60	0.5521	1.1747
61	0.5524	1.1759
62	0.5527	1.1770
63	0.5530	1.1782
64	0.5533	1.1793
65	0.5536	1.1804
66	0.5538	1.1814
67	0.5541	1.1824
68	0.5543	1.1834
69	0.5546	1.1844
70	0.5548	1.1854
71	0.5550	1.1864
72	0.5552	1.1873
73	0.5555	1.1882
74	0.5557	1.1890
75	0.5559	1.1898
76	0.5561	1.1906
77	0.5563	1.1915
78	0.5565	1.1923
79	0.5567	1.1931
80	0.5569	1.1938

Table B - T and y

確率年 T	1/T= 1−F	極値変量 y
500	0.00200	6.21361
400	0.00250	5.99021
300	0.00333	5.70213
250	0.00400	5.51946
200	0.00500	5.29581
150	0.00667	5.00729
100	0.01000	4.60015
80	0.01250	4.37574
60	0.01667	4.08595
50	0.02000	3.90194
40	0.02500	3.67625
30	0.03333	3.38429
25	0.04000	3.19853
20	0.05000	2.97020
15	0.06667	2.67375
10	0.10000	2.25037
8	0.12500	2.01342
7	0.14286	1.86983
6	0.16667	1.70198
5	0.20000	1.49940
4	0.25000	1.24590
3	0.33333	0.90272
2	0.50000	0.36651

（3）雨水流出量の計算

表－雨水流出量の計算（側溝）

No.	Catchments Area A	Return Period	Reinfall R	Discharge Coefficient	Discharge Q
	ha		mm/hr	C	cu.m/sec
路面、商業地域	0.5	3	91.9	0.80	0.102
	1.0	3	91.9	0.80	0.204
	1.5	3	91.9	0.80	0.306
	2.0	3	91.9	0.80	0.408
C=0.8	2.5	3	91.9	0.80	0.511
	3.0	3	91.9	0.80	0.613
	3.5	3	91.9	0.80	0.715
	4.0	3	91.9	0.80	0.817
	4.5	3	91.9	0.80	0.919
	5.0	3	91.9	0.80	1.021
住宅地域	0.5	3	91.9	0.60	0.077
	1.0	3	91.9	0.60	0.153
	1.5	3	91.9	0.60	0.230
	2.0	5	91.9	0.60	0.306
	2.5	3	91.9	0.60	0.383
C=0.6	3.0	3	91.9	0.60	0.460
	3.5	3	91.9	0.60	0.536
	4.0	3	91.9	0.60	0.613
	4.5	5	91.9	0.60	0.689
	5.0	3	91.9	0.60	0.766
間地庭園の多い住宅地域	0.5	3	91.9	0.40	0.051
	1.0	3	91.9	0.40	0.102
	1.5	3	91.9	0.40	0.153
	2.0	5	91.9	0.40	0.204
	2.5	3	91.9	0.40	0.255
	3.0	3	91.9	0.40	0.306
C=0.4	3.5	3	91.9	0.40	0.357
	4.0	3	91.9	0.40	0.408
	4.5	5	91.9	0.40	0.460
	5.0	3	91.9	0.40	0.511

表－雨水流出量の計算（横断管）

No.	Catchments Area A	Return Period	Reinfall	Discharge Coefficient	Discharge Q
	ha		mm/hr	C	cu.m/sec
路面、商業地域	0.5	5	106.6	0.80	0.118
	1.0	5	106.6	0.80	0.237
	1.5	5	106.6	0.80	0.355
	2.0	5	106.6	0.80	0.474
C=0.8	2.5	5	106.6	0.80	0.592
	3.0	5	106.6	0.80	0.711
	3.5	5	106.6	0.80	0.829
	4.0	5	106.6	0.80	0.948
	4.5	5	106.6	0.80	1.066
	5.0	5	106.6	0.80	1.184
住宅地域	0.5	5	106.6	0.60	0.089
	1.0	5	106.6	0.60	0.178
	1.5	5	106.6	0.60	0.267
	2.0	5	106.6	0.60	0.355
	2.5	5	106.6	0.60	0.444
C=0.6	3.0	5	106.6	0.60	0.533
	3.5	5	106.6	0.60	0.622
	4.0	5	106.6	0.60	0.711
	4.5	5	106.6	0.60	0.800
	5.0	5	106.6	0.60	0.888
間地庭園の多い住宅地域	0.5	5	106.6	0.40	0.059
	1.0	5	106.6	0.40	0.118
	1.5	5	106.6	0.40	0.178
	2.0	5	106.6	0.40	0.237
	2.5	5	106.6	0.40	0.296
	3.0	5	106.6	0.40	0.355
C=0.4	3.5	5	106.6	0.40	0.415
	4.0	5	106.6	0.40	0.474
	4.5	5	106.6	0.40	0.533
	5.0	5	106.6	0.40	0.592

※）Q=A*R*C／360

（4）排水量の計算

表- 排水計算（管路）

No.	Pipe Dia. φ(m)	Roughness n	Catchments Area (ha)	Return Period	Rainfall (mm/hr)	Discharge Coefficient	Discharge Q(m3/sec)	Gradient i(%/100)	Velocity V(m/sec)	W. Depth (m)	Sec. Area (m^2)	R (m)	Spec.	Remarks
ML6-1A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.015	2.264	0.215	0.090	0.118	DP-600	Side Ditch, (0+000~0+320)
ML6-2A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.050	3.488	0.157	0.059	0.091	DP-600	Side Ditch, (0+320~0+560)
ML6-3A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.025	2.722	0.188	0.075	0.106	DP-600	Side Ditch, (0+560~0+700)
ML6-4A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.025	2.722	0.188	0.075	0.106	DP-600	Side Ditch, (0+700~0+820)
ML6-5A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.025	2.722	0.188	0.075	0.106	DP-600	Side Ditch, (0+820~0+920)
ML6-6A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.005	1.512	0.291	0.135	0.147	DP-600	Side Ditch, (0+920~1+140)
ML6-7A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.040	3.221	0.166	0.063	0.096	DP-600	Side Ditch, (1+140~1+350)
ML6-8A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.060	3.722	0.150	0.055	0.088	DP-600	Side Ditch, (1+350~1+500)
ML6-9A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.015	2.264	0.215	0.090	0.118	DP-600	Side Ditch, (1+500~1+700)
ML6-10A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.010	1.953	0.239	0.105	0.128	DP-600	Side Ditch, (1+700~1+960)
ML6-11A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.010	1.953	0.239	0.105	0.128	DP-600	Side Ditch, (1+960~2+200)
ML6-12A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.020	2.512	0.199	0.081	0.111	DP-600	Side Ditch, (2+200~2+520)
ML6-13A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.010	1.953	0.239	0.105	0.128	DP-600	Side Ditch, (2+520~2+620)
ML6-14A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.030	2.906	0.179	0.070	0.102	DP-600	Side Ditch, (2+620~2+860)
ML6-1B	0.594	0.013	1.5	5	106.6	0.8	0.355	0.005	1.709	0.417	0.208	0.176	DP-600	Cross Drainage, (0+320)
ML6-2B	0.594	0.013	1.0	5	106.6	0.8	0.237	0.005	1.569	0.318	0.151	0.155	DP-600	Cross Drainage, (0+700)
ML6-3B	0.594	0.013	1.0	5	106.6	0.8	0.237	0.005	1.569	0.318	0.151	0.155	DP-600	Cross Drainage, (0+820)
ML6-4B	0.594	0.013	1.5	5	106.6	0.8	0.355	0.005	1.709	0.417	0.208	0.176	DP-600	Cross Drainage, (1+140)
ML6-5B	0.594	0.013	1.5	5	106.6	0.8	0.355	0.005	1.709	0.417	0.208	0.176	DP-600	Cross Drainage, (1+500)
ML6-6B	0.594	0.013	1.5	5	106.6	0.8	0.355	0.005	1.709	0.417	0.208	0.176	DP-600	Cross Drainage, (1+960)
ML6-7B	0.594	0.013	1.5	5	106.6	0.8	0.355	0.005	1.709	0.417	0.208	0.176	DP-600	Cross Drainage, (2+200)
ML6-8B	0.594	0.013	1.0	5	106.6	0.8	0.237	0.005	1.569	0.318	0.151	0.155	DP-600	Cross Drainage, (2+520)
ML6-9B	0.594	0.013	1.5	5	106.6	0.8	0.355	0.005	1.709	0.417	0.208	0.176	DP-600	Cross Drainage, (2+860)
ML3-1A	0.594	0.013	1.5	3	91.9	0.8	0.306	0.038	3.528	0.209	0.087	0.115	DP-600	Side Ditch, (0+000~0+540)
ML3-2A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.030	2.906	0.179	0.070	0.102	DP-600	Side Ditch, (0+540~0+700)
ML3-3A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.010	1.953	0.239	0.105	0.128	DP-600	Side Ditch, (0+700~0+940)
ML3-4A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.010	1.953	0.239	0.105	0.128	DP-600	Side Ditch, (0+940~1+200)
ML3-5A	0.594	0.013	1.5	3	91.9	0.8	0.306	0.025	3.045	0.233	0.101	0.125	DP-600	Side Ditch, (1+200~1+620)
ML3-6A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.015	2.264	0.215	0.090	0.118	DP-600	Side Ditch, (1+620~1+790)
ML3-1B	0.594	0.013	1.5	5	106.6	0.8	0.355	0.005	1.709	0.417	0.208	0.176	DP-600	Cross Drainage, (0+540)
ML3-1B	0.594	0.013	1.0	5	106.6	0.8	0.237	0.005	1.569	0.318	0.151	0.155	DP-600	Cross Drainage, (1+620)
ML7-1A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.005	1.512	0.291	0.135	0.147	DP-600	Side Ditch, (0+000~0+160)
ML7-2A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.014	2.179	0.221	0.094	0.120	DP-600	Side Ditch, (0+160~0+460)
ML7-3A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.020	2.512	0.199	0.081	0.111	DP-600	Side Ditch, (0+460~0+740)
ML7-4A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.060	3.722	0.150	0.055	0.088	DP-600	Side Ditch, (0+740~1+080)
ML7-5A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.070	3.931	0.144	0.052	0.085	DP-600	Side Ditch, (1+080~1+280)
ML7-6A	0.594	0.013	2.0	3	91.9	0.8	0.408	0.025	3.286	0.273	0.124	0.140	DP-600	Side Ditch, (1+280~1+800)
ML7-7A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.080	4.122	0.139	0.050	0.082	DP-600	Side Ditch, (1+800~1+940)
ML7-8A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.080	4.122	0.139	0.050	0.082	DP-600	Side Ditch, (1+940~2+160)
ML7-9A	0.594	0.013	1.5	3	91.9	0.8	0.306	0.010	2.170	0.301	0.141	0.150	DP-600	Side Ditch, (2+160~2+600)
ML7-10A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.005	1.512	0.291	0.135	0.147	DP-600	Side Ditch, (2+600~2+980)
ML7-11A	0.594	0.013	1.5	3	91.9	0.8	0.306	0.005	1.662	0.375	0.184	0.169	DP-600	Side Ditch, (2+980~3+300)
ML7-12A	0.594	0.013	1.0	3	91.9	0.8	0.204	0.005	1.512	0.291	0.135	0.147	DP-600	Side Ditch, (2+980~3+300)
ML7-1B	0.594	0.013	1.0	5	106.6	0.8	0.237	0.005	1.569	0.318	0.151	0.155	DP-600	Cross Drainage, (0+160)
ML7-2B	0.594	0.013	1.0	5	106.6	0.8	0.237	0.005	1.569	0.318	0.151	0.155	DP-600	Cross Drainage, (0+460)
ML7-3B	0.594	0.013	1.0	5	106.6	0.8	0.237	0.005	1.569	0.318	0.151	0.155	DP-600	Cross Drainage, (0+740)
ML7-4B	0.594	0.013	1.5	5	106.6	0.8	0.355	0.005	1.709	0.417	0.208	0.176	DP-600	Cross Drainage, (1+800)
ML7-5B	0.594	0.013	1.5	5	106.6	0.8	0.355	0.005	1.709	0.417	0.208	0.176	DP-600	Cross Drainage, (2+160)
ML7-6B	0.594	0.013	1.5	5	106.6	0.8	0.355	0.005	1.709	0.417	0.208	0.176	DP-600	Cross Drainage, (3+300)

※）開水路区間は断面積が管路より大きく、安全側となるため計算は省略する。